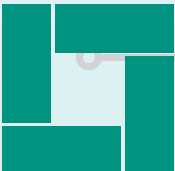
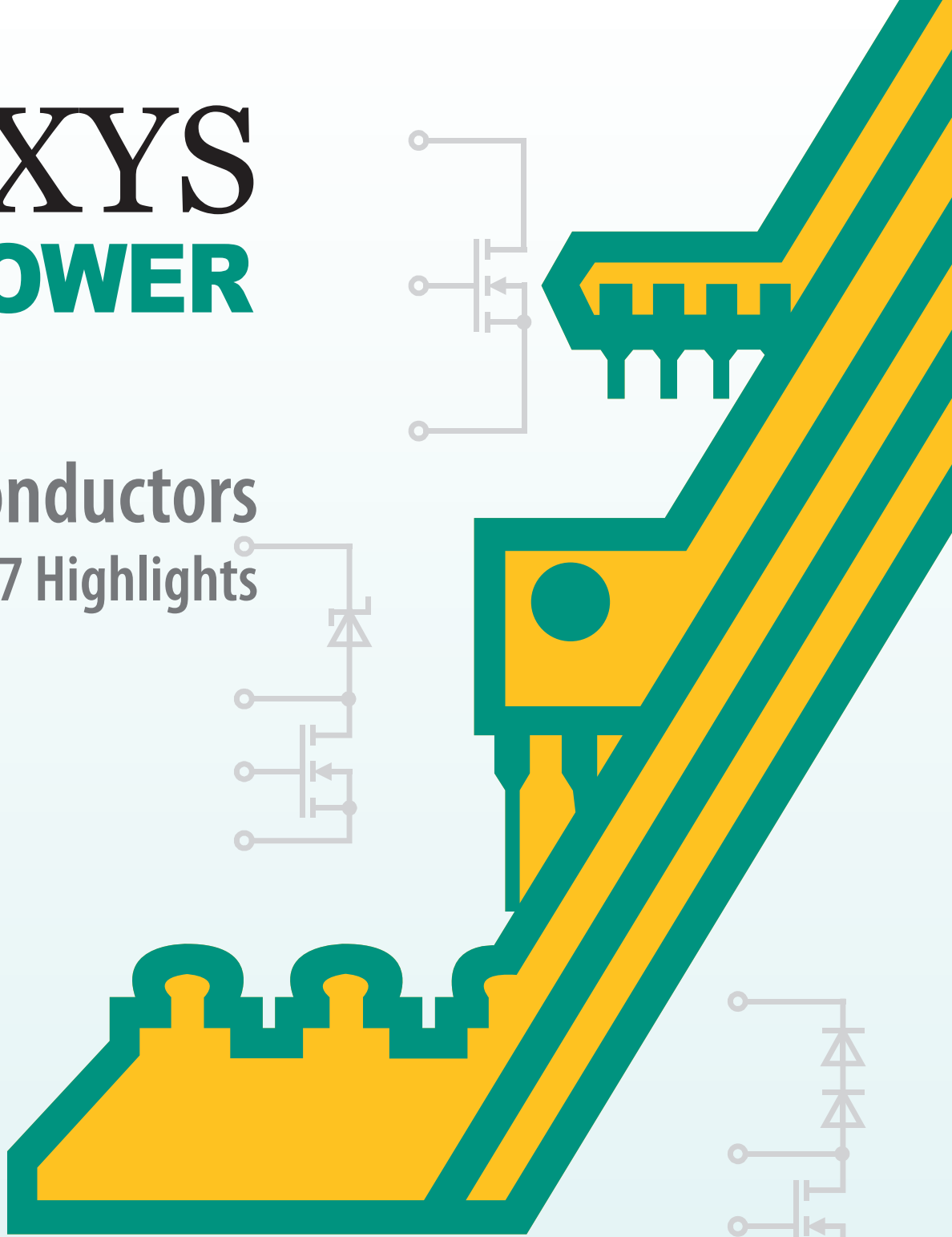




# Semiconductors

## PCIM 2017 Highlights



**World of IXYS**  
**World of Inspiration**

# World of IXYS

## World of Inspiration



### Corporate Overview

IXYS Corporation (Nasdaq: IXYS), was founded as a silicon valley power semiconductor company. IXYS pioneered the high voltage power MOSFET and IGBT technologies, with the highest power density most rugged high voltage products.

IXYS today is a leading Cleantech semiconductor company developing and manufacturing products to improve power conversion efficiency, generate clean energy, control motors, improve automation, improve medical equipment, electrify transportation from bikes to cars, and water treatment. IXYS and its divisions is a development pioneer of power semiconductors, solid state relays, GaAs base RF amplifiers, MCU's and IC's necessary for reducing the world's dependence on fossil fuels and improve our health.

IXYS is one of the few worldwide semiconductor companies that offer the full product portfolio for power management. We offer rectifiers, fast diodes, MOSFETs, IGBTs and thyristors, in discrete and as integrated power modules. We offer the necessary IC's to drive the power devices and the MCU's to add digital control.

With three major wafer FAB's and hundreds of patents, IXYS continues to invest in technologies through R&D in the USA, Europe and Asia, with focus on serving its customers. IXYS works with a customer base of over 2,500 telecommunications, transportation, industrial medical, environmental, aerospace and consumer electronics companies.

### Product Portfolios- THE WORLD OF IXYS

IXYS has three power MOS product lines, which include power MOSFETs, IGBTs and BIMOSFETs. IXYS' MOS based power devices are used in power conversion systems and are focused on voltage applications from 60 to 7000 volts. IXYS offers bipolar products consisting of rectifiers, thyristors, press-pack IGBTs and GTO thyristors. IXYS offers a variety of standard and custom power modules that integrate the above products for its customers.

IXYS IC division (CLARE) designs and produces SOI base HVIC's flexible display drivers, driver IC's, optically isolated drivers, solid state relays (SSR), isolated AC switches, optocouplers, photovoltaic chips and ASIC's. With the IXYS San Sebastian Division (ISS), we provide advanced RFID IC's, solutions and Custom IC designs.

Through MWT and IXYS Colorado, we manufacture RF and microwave products.

With the Zilog's industry proven and rugged MCU's, we complement our POWER and IC products with matched digital power management and embedded control. We have introduced unique power management reference designs to control motors, LED lights, battery charging and motion sensing. The added S3 low cost MCU product lines serve consumer white goods, home automation and remote controls. With the Radio Pulse Division we offer SOC's that integrate RF Zigbee transceivers and MCU's for the consumer, security, industrial, home automation, energy management, LED lighting and IoT markets.

Today, IXYS provides sub-systems and power assembly products based on customers demand.

For further information visit: [www.ixys.com](http://www.ixys.com)

# IGBT & MOSFET GATE DRIVERS

## • LOW-SIDE GATE DRIVERS

| Part Number | Output Type | $I_{PEAK}$<br>$T_c=25^\circ C$<br>(A <sub>p</sub> ) | Output Resistance (Ω) | Available Logic Configurations | Enable Function | Under-voltage Lockout (V) | Package Type           |
|-------------|-------------|-----------------------------------------------------|-----------------------|--------------------------------|-----------------|---------------------------|------------------------|
| IXD_630     | SINGLE      | 30                                                  | 0.4                   | I, N, D                        | •               | $V_{CC} \leq 12.5$        | 57, 58                 |
| IXD_630M    | SINGLE      | 30                                                  | 0.4                   | I, N, D                        | •               | $V_{CC} \leq 9$           | 57, 58                 |
| IXD_614     | SINGLE      | 14                                                  | 0.8                   | I, N, D                        | •               | -                         | 20, 53, 57, 58         |
| IXD_609     | SINGLE      | 9                                                   | 1                     | I, N, D                        | •               | -                         | 20, 53, 54, 56, 57, 58 |
| IXD_604     | DUAL        | 4                                                   | 2.5                   | F, I, N, D                     | •               | -                         | 20, 53, 54, 56         |
| IX4423N     | DUAL        | 3                                                   | 4                     | I                              | -               | -                         | 54                     |
| IX4424N     | DUAL        | 3                                                   | 4                     | N                              | -               | -                         | 54                     |
| IX4424G     | DUAL        | 3                                                   | 4                     | N                              | -               | -                         | 20                     |
| IX4425N     | DUAL        | 3                                                   | 4                     | F                              | -               | -                         | 54                     |
| IXD_602     | DUAL        | 2                                                   | 4                     | F, I, N                        | -               | -                         | 20, 53, 54, 56         |
| IX4426      | DUAL        | 1.5                                                 | 8                     | I                              | -               | -                         | 54, 56                 |
| IX4427      | DUAL        | 1.5                                                 | 8                     | N                              | -               | -                         | 54, 56                 |
| IX4428      | DUAL        | 1.5                                                 | 8                     | F                              | -               | -                         | 54, 56                 |

## \* AEC-Q100 Qualified Low-Side Gate Drivers

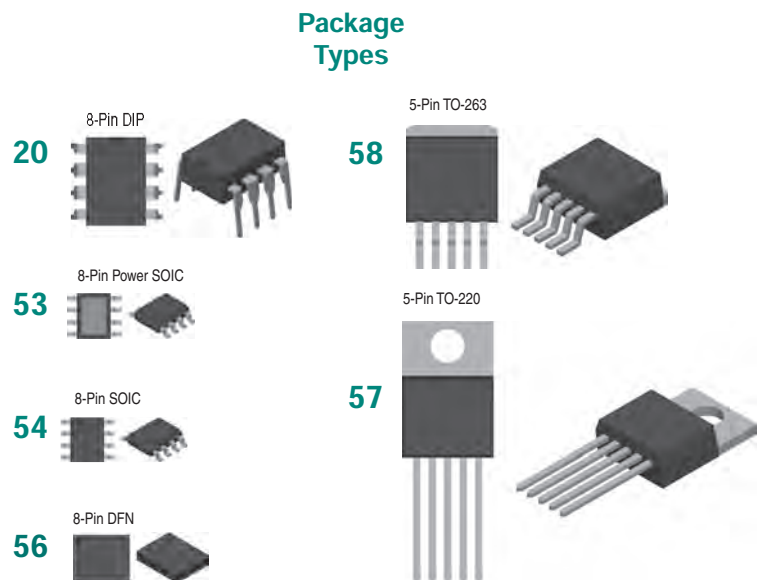
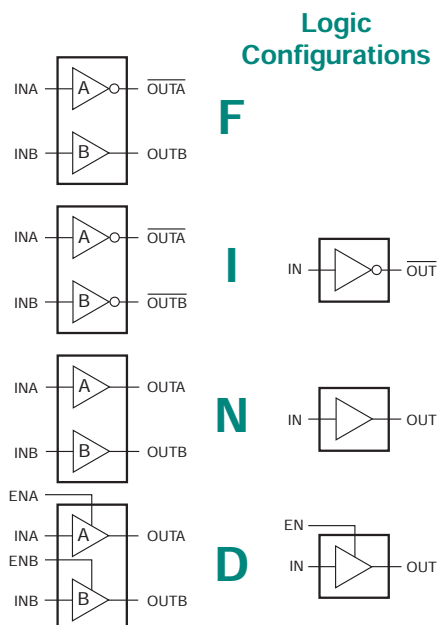
| Part Number | Output Type | $I_{PEAK}$<br>$T_c=25^\circ C$<br>(A <sub>p</sub> ) | Output Resistance (Ω) | Available Logic Configurations | Enable Function | Package Type |
|-------------|-------------|-----------------------------------------------------|-----------------------|--------------------------------|-----------------|--------------|
| IXD_614SI   | SINGLE      | 14                                                  | 0.8                   | I, N, D                        | •               | 53           |
| IXD_609SI   | SINGLE      | 9                                                   | 1                     | I, N, D                        | •               | 53           |
| IXD_604SI   | DUAL        | 4                                                   | 2.5                   | F, I, N, D                     | •               | 53           |
| IXD_604SIA  | DUAL        | 4                                                   | 2.5                   | F, I, N, D                     | •               | 54           |

### Features:

- AEC-Q100 qualified parts \*
- 1.5A to 30A peak source/sink drive current
- Wide operating voltage range: 4.5V to 35V
- -40°C to +125°C extended operating temperature range
- Logic input withstands negative swing of up to -5V
- Matched rise and fall times
- Low propagation delay time
- Low 10μA supply current
- Low output impedance

### Applications:

- Efficient power MOSFET and IGBT switching
- Switch mode power supplies
- Motor controls
- DC to DC converters
- Class-D switching amplifiers
- Pulse transformer driver

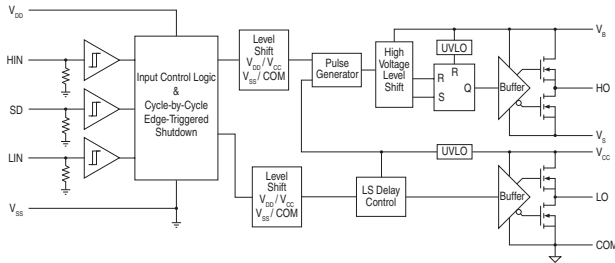


## • HIGH VOLTAGE HALF-BRIDGE GATE DRIVERS

- Floating channel for bootstrap operation up to 600V with a 700V absolute maximum rating
- Gate drive supply range from 10V to 20V
- 3.3V logic compatible
- UVLO for both high-side and low-side outputs
- Matched propagation delays

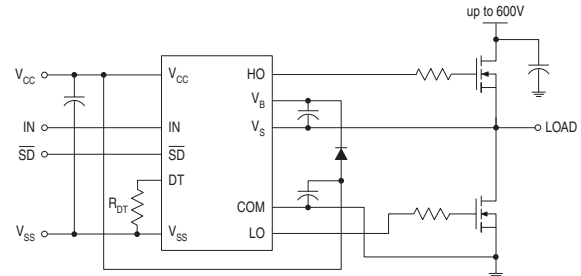
### IX2113:

- Outputs capable of sourcing and sinking 2A



### IX21844:

- Outputs capable of sourcing 1.4A and sinking 1.6A
- Programmable dead time



## • OPTICALLY COUPLED GATE DRIVERS

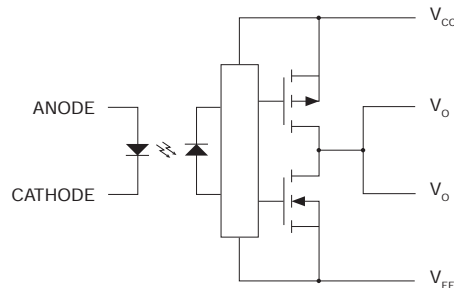
- 3750V<sub>rms</sub> input to output isolation
- ±2.5A maximum peak current
- Wide temperature range -40°C to +100°C
- UVLO with hysteresis

### IX3120:

- 15V to 30V operating range for driving IGBT gates

### IX3180:

- 10V to 20V operating range for driving MOSFET gates



## • DUAL LOW SIDE SiC MOSFET & IGBT GATE DRIVER: IX2204

- Provides a negative gate drive voltage to ensure the turn-off of SiC MOSFETs & high power IGBTs
- Outputs can be paralleled for IGBT gate drives that require higher gate drive current

### Features:

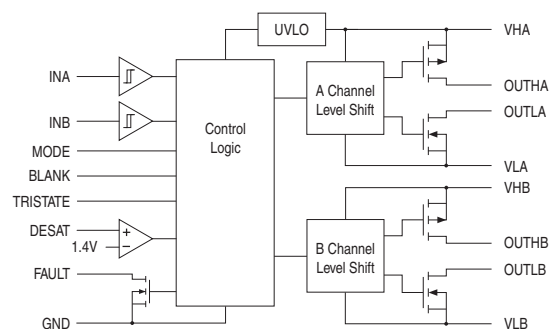
- High output current: 2A source/4A sink
- Wide operating voltage range: -10V to +26V
- Negative gate drive capability
- Desaturation detection circuit
- Separate source and sink outputs
- Programmable blanking and output tristate
- TTL compatible inputs
- -40°C to +125°C extended operating temperature range
- Under-voltage lockout circuitry
- Fault status output

### Applications:

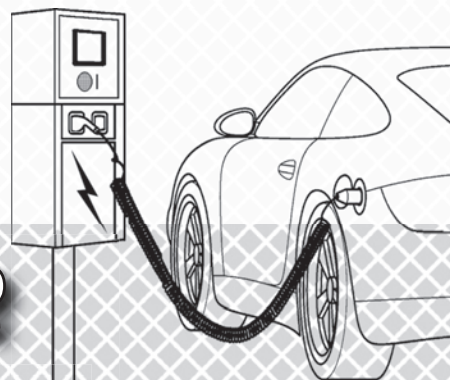
- Ideal for driving SiC devices
- Efficient IGBT switching
- Motor controls
- Switch mode power supplies

The IX2204 has a programmable two-level turn-off feature that protects the device against excessive voltages when the IGBT is being turned off due to an over-current situation.

### IX2204



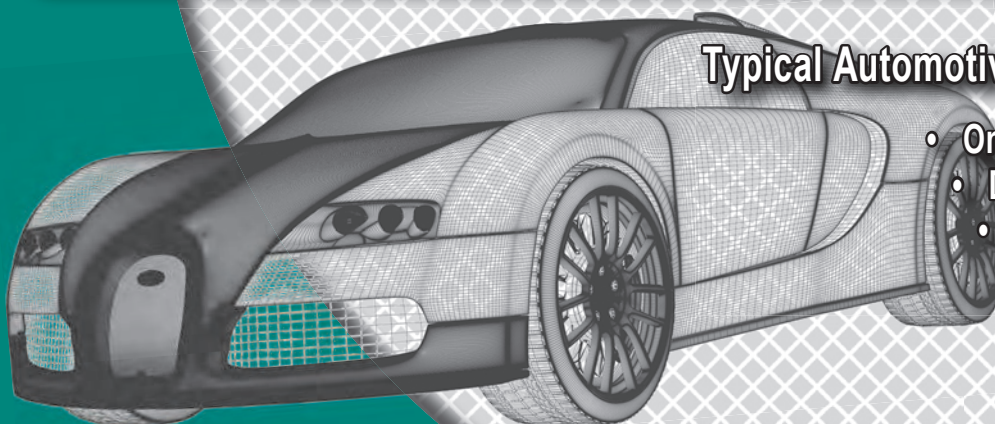




# Automotive Grade MOSFET and IGBT Gate Drivers

## ***World Class Performance, Robustness, and Reliability***

IXYS Integrated Circuits Division (ICD) Automotive Grade Gate Drivers are used by customers worldwide. IXYS ICD offers AEC Q100 qualified dual 4A and single 9A and 14A drivers. For additional margin in harsh automotive applications, these automotive grade gate drivers have an absolute maximum voltage rating of 40V and are packaged in a thermally enhanced 8-pin SOIC package. All devices have a Grade 1 (-40°C to +125°C) operating temperature range.



## **Typical Automotive Applications:**

- On-Board Chargers
- DC/DC Converters
- EV Motor Drives
- SiC Gate Driver

| IXYS ICD<br>Part Number | Number of<br>Channels | Peak Output<br>Current | Channel Input<br>Logic    |
|-------------------------|-----------------------|------------------------|---------------------------|
| IXDD604SI               | 2                     | 4A                     | Non-Inverting with Enable |
| IXDF604SI               | 2                     | 4A                     | Inverting & Non-Inverting |
| IXDI604SI               | 2                     | 4A                     | Inverting                 |
| IXDN604SI               | 2                     | 4A                     | Non-Inverting             |
| IXDD609SI               | 1                     | 9A                     | Non-Inverting with Enable |
| IXDI609SI               | 1                     | 9A                     | Inverting                 |
| IXDN609SI               | 1                     | 9A                     | Non-Inverting             |
| IXDD614SI               | 1                     | 14A                    | Non-Inverting with Enable |
| IXDI614SI               | 1                     | 14A                    | Inverting                 |
| IXDN614SI               | 1                     | 14A                    | Non-Inverting             |

Visit IXYS IC Division's Automotive Grade MOSFET & IGBT Gate Driver Web Page:  
[www.ixysic.com/Products/Automotive.htm](http://www.ixysic.com/Products/Automotive.htm)

## Transformer Coupled Driver Logic Interface (IX6610)

Capable of sourcing and sinking a peak current of 10A, the IX6611 is a secondary side, intelligent, high-speed gate driver designed to drive both IGBTs and Power MOSFETs. It contains the necessary circuit blocks for pulse transformer isolated applications. High-frequency narrow pulses (as short as 500ns) can be used for transmitting bidirectional signals across the isolation barrier to avoid duty cycle restrictions and prevent transformer saturation. Other features include supply under and over voltage lockout, thermal shutdown, overcurrent and over voltage protection. The IX6611 is designed to operate over a temperature range of -40°C and +125°C and available in a 16-pin SOIC with an exposed thermal pad.

### FEATURES

- TTL Logic level micro-controller Interface
- Pulse transformer bidirectional data interface
- Short input pulse suppression
- Interlock and dead time control
- Four 1A pulse transformer drivers
- Two 1A drivers for push-pull power converter for the secondary side power supply
- Non-overlap operation of high side and low side drivers
- Internal startup oscillator
- Primary side fault monitoring
- Secondary side fault monitoring
- Two fault status outputs
- 2mA quiescent current (non- switching)

### APPLICATIONS

- Pulse transformer coupled IGBT/MOSFET gate driver interface

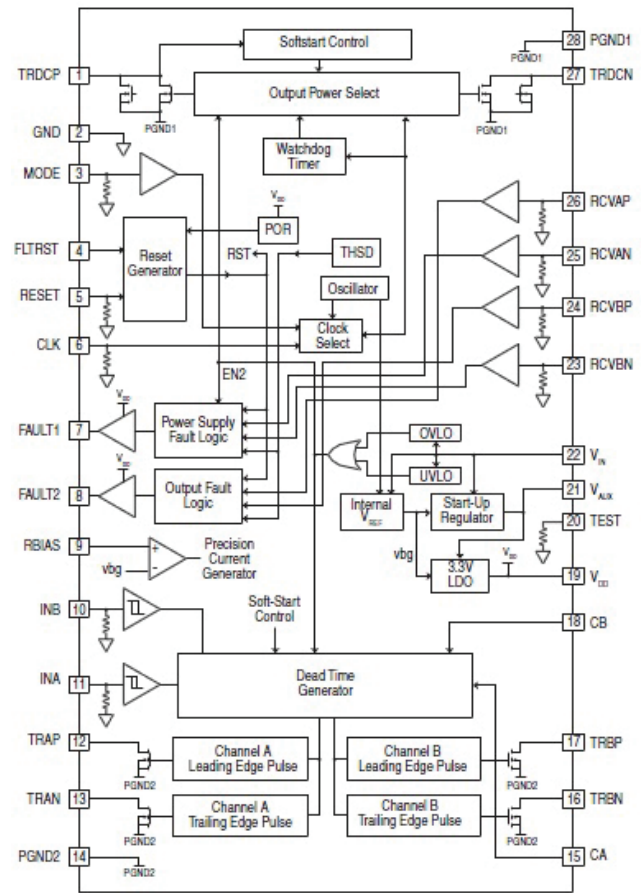
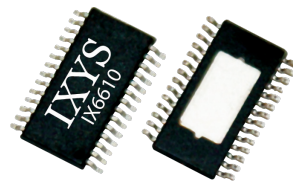


Figure 2: IX6610 Functional Block Diagram

## High-Speed Gate Driver (IX6611)

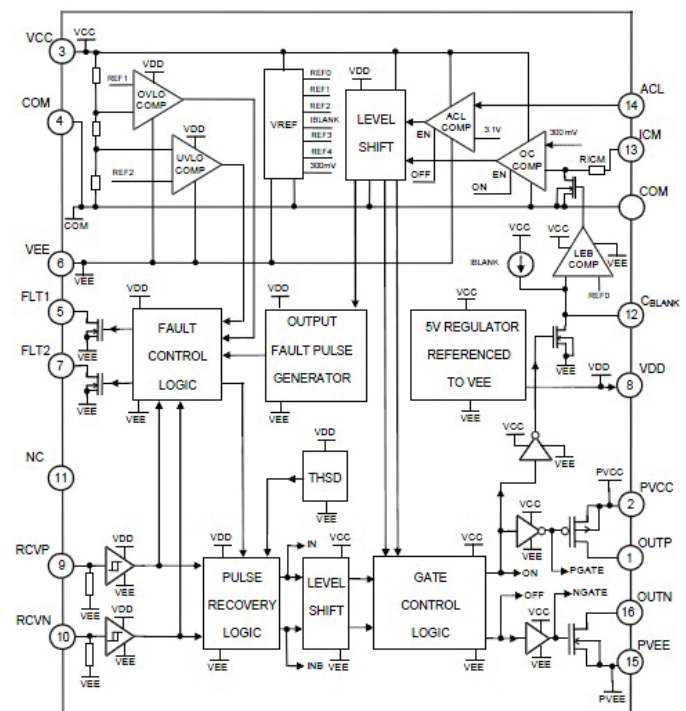
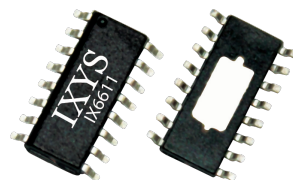
Capable of sourcing and sinking a peak current of 10A, the IX6611 is a secondary side, intelligent, high-speed gate driver designed to drive both IGBTs and Power MOSFETs. It contains the necessary circuit blocks for pulse transformer isolated applications. High-frequency narrow pulses (as short as 500ns) can be used for transmitting bidirectional signals across the isolation barrier to avoid duty cycle restrictions and prevent transformer saturation. Other features include supply under and over voltage lockout, thermal shutdown, overcurrent and over voltage protection. The IX6611 is designed to operate over a temperature range of -40°C and +125°C and available in a 16-pin SOIC with an exposed thermal pad.

### FEATURES

- Input compatible with pulse transformer
- 10A peak source and sink current gate drive
- Separate source and sink outputs
- Negative gate drive capability
- Over current protection with adjustable blanking time
- Advanced active clamping protection
- Under voltage lockout protection
- Over voltage lockout protection
- Two 1A pulse transformer drivers for fault communication

### APPLICATIONS

- AC and DC motor drives
- UPS systems
- High voltage DC/DC converters





# 4000V Isolated Gate Driver Module

## IXIDM140103: 30A and IXIDM1401: 10A

The new IXIDM1403/IXIDM1401 driver module combines supreme compactness with the highest performance and reliability. It comprises a dual-channel driver core that targets medium power dual-channel IGBTs for up to 4kV and applications such as inverters, drives & automation, UPS, renewable energy, transportation and medical. Its parallel capability allows easy high power system design. It supports switching up to 250 kHz, short-circuit protection, advanced active clamping and supply-voltage monitoring.



### APPLICATIONS

- Various Appliances with Motors Operating by Microcontrollers
- Wind power and photovoltaic
- Industrial drives
- Electric/hybrid drive commercial vehicles
- Uninterruptible power supplies (UPS)
- Driving large parallel-connected IGBTs
- Medical (MrT, CT, X-ray)
- Tractions Applications

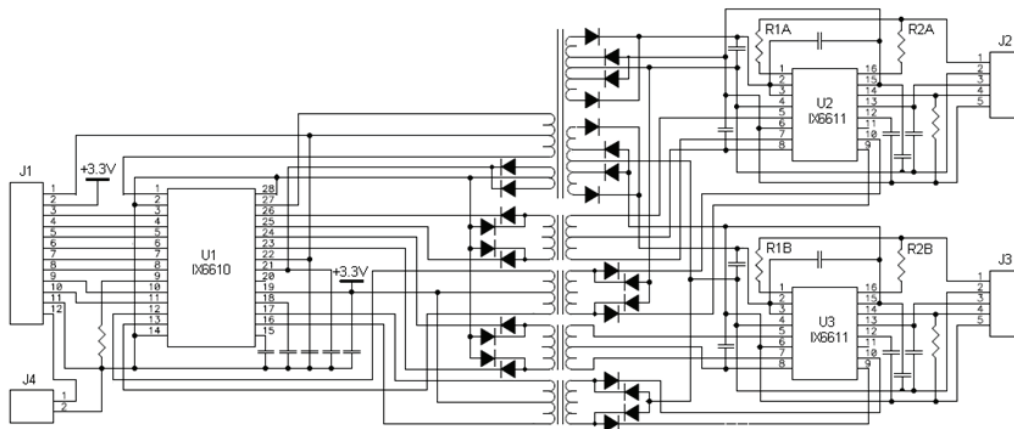
### KEY FEATURES

- Dual Channel Driver for Half-Bridge Switching Modules
- Blocking voltages up to 4000 V
- Minimum Input Pulse Width 500 ns
- Input to Output Gate Driver Signal Propagation Delay <100 ns
- Gate Drive Pulse Width Distortion <20 ns
- Internal Power Supply for Isolated Drivers with up to 2 W Output Power per Channel
- +15 V/-5 V Isolated Gate Driver Output Voltage to Drive IGBTs with up to 10 A or 30A Pulse Current
- 3 V TTL Logic Level Microcontroller Interface
- Non-Overlap Operation of High Side and Low Side Drivers allows use Single Signal Source to drive Half-Bridge Modules
- Hardware-programmable Dead Time
- Single 15 V Power Supply Operations
- Gate current  $\pm 10A$  or  $\pm 30A$
- Under- and Over-Voltage Lockout Protection
- Up to 50 mA 3.3 V Load Capability Output to Drive an External MCU
- Cycle-by-cycle IGBT Over-current Protection
- Advanced Active Clamping
- FAULT Signals Informing MCU about Over-Voltage, Under-Voltage, and Over-Current Conditions at Isolated Gate Drivers
- Latched FAULT Signals from Gate Drivers to Let MCU Read Fault Information Asynchronously
- Operating Ambient Temperature: -400C~+1050C
- Driver and Internal Power Supply Over- Temperature Protection with 1500C Threshold and 250C Hysteresis
- Footprint: 50 mm x 50 mm

### KEY DATA OVERVIEW

| Parameter                                  |          | Min  | Typical | Max        | Unit |
|--------------------------------------------|----------|------|---------|------------|------|
| Nominal supply voltage                     |          | 12   | 15      | 16         | V    |
| Supply current @ fIN=0 Hz                  |          |      | 25      |            | mA   |
| Supply Current at Full Load                |          |      | 160     |            | mA   |
| Output power per channel                   |          |      | 2       |            | W    |
| Gate voltage swing                         | Positive | 12   | 15      | 20         | V    |
|                                            | Negative | -10  | -7.5    | -5         | V    |
| Peak output current                        |          | -10  |         | +10        | A    |
| Minimum Pulse Width                        |          |      | 500     |            | ns   |
| Input Signal Propagation Delay Time        |          |      | 100     |            | ns   |
| Input Pulse Width Distortion               |          | -20  |         | +20        | ns   |
| Input Pulse Duty cycle                     |          | 0    |         | 100        | %    |
| Dead Time Programmability Range            |          | 50   |         | 2000°C (F) | ns   |
| Fault Signals Propagation Delay Time       |          |      | 100     |            | ns   |
| ACL Comparator Threshold (to VEE)          |          |      | 3.1     |            | V    |
| Over-current Comparator Threshold (to COM) |          |      | 300     |            | mV   |
| MCU Supply Output Voltage                  |          |      | 3.3     |            | V    |
| MCU Supply Short Circuit Current           |          |      | 100     |            | mA   |
| Operating temperature                      |          | -40  |         | +105       | 0C   |
| Dielectric test voltage                    |          | 4000 |         |            | VAC  |

### BASIC SCHEMATIC OF THE IXIDM1401



The IXIDM1401 targets medium-power, half-bridge IGBT and MOSFET applications. The driver supports switching up to 250 kHz at best-in-class efficiency. The IXIDM1401 comprises a complete dual-channel IGBT driver core, fully equipped with an isolated DC/DC converter, short-circuit protection, advanced active clamping and supply-voltage monitoring. It is a driver core equipped with the IXYS Corporation IX6610/6611 chipset of application-specific integrated circuits that covers the main range of functions needed to design intelligent gate drivers.

## Ultra Junction Power MOSFETs

Developed using the charge compensation principle and proprietary process technology, these new devices exhibit the lowest on-state resistances, along with low gate charges and superior dv/dt performance. Their avalanche capability also enhances the device ruggedness. In addition, thanks to the fast soft-recovery body diode, the Ultra-Junction MOSFETs help reduce switching losses and electromagnetic interference (EMI).

### FEATURES

- Ultra low on-resistance  $R_{DS(on)}$  and gate charge  $Q_g$
- Fast body diode
- dv/dt ruggedness
- Avalanche rated
- Low package inductance
- International standard packages

### ADVANTAGES

- Higher efficiency
- High power density
- Easy to mount
- Space savings

### APPLICATIONS

- Industrial switched-mode and resonant-mode power supplies
- Electric vehicle battery chargers
- AC and DC motor drives
- DC-DC converters
- Renewable-energy inverters
- Power Factor Correction (PFC) circuits
- Robotics and servo control

| Part Number                                                        | $V_{DSS}$<br>(V) | $I_{D25}$<br>$T_c = 25^\circ\text{C}$<br>(A) | $R_{DS(on)}$<br>max<br>$T_j = 25^\circ\text{C}$<br>(m $\Omega$ ) | $Q_{g(on)}$<br>typ<br>(nC) | $C_{iss}$<br>typ<br>(pF) | $t_{rr}$<br>typ<br>(ns) | $R_{thJC}$<br>max<br>( $^\circ\text{C}/\text{W}$ ) | $P_D$<br>max<br>(W) | Package Type |
|--------------------------------------------------------------------|------------------|----------------------------------------------|------------------------------------------------------------------|----------------------------|--------------------------|-------------------------|----------------------------------------------------|---------------------|--------------|
| <b>250V X3-Class HiPerFET™ Power MOSFETs with Fast Body Diodes</b> |                  |                                              |                                                                  |                            |                          |                         |                                                    |                     |              |
| IXFJ80N25X3                                                        | 250              | 44                                           | 0.02                                                             | 5430                       | 83                       | 105                     | 1.2                                                | 104                 | ISO TO-247   |
| IXFA80N25X3                                                        | 250              | 80                                           | 0.018                                                            | 5430                       | 83                       | 105                     | 0.4                                                | 310                 | TO-263       |
| IXFH80N25X3                                                        | 250              | 80                                           | 0.018                                                            | 5430                       | 83                       | 105                     | 0.4                                                | 310                 | TO-247       |
| IXFP80N25X3                                                        | 250              | 80                                           | 0.018                                                            | 5430                       | 83                       | 105                     | 0.4                                                | 310                 | TO-220       |
| <b>650V X2-Class HiPerFET™ Power MOSFETs with Fast Body Diodes</b> |                  |                                              |                                                                  |                            |                          |                         |                                                    |                     |              |
| IXFA8N65X2                                                         | 650              | 8                                            | 0.45                                                             | 790                        | 11                       | 105                     | 0.83                                               | 150                 | TO-263       |
| IXFH60N65X2                                                        | 650              | 60                                           | 0.052                                                            | 6300                       | 108                      | 180                     | 0.16                                               | 780                 | TO-247-4L    |
| IXFH60N65X2-4                                                      | 650              | 60                                           | 0.052                                                            | 6300                       | 108                      | 180                     | 0.16                                               | 780                 | TO-247-4L    |
| IXFT60N65X2HV                                                      | 650              | 60                                           | 0.052                                                            | 6300                       | 108                      | 180                     | 0.16                                               | 780                 | TO-268HV     |
| IXFH80N65X2                                                        | 650              | 80                                           | 0.038                                                            | 8300                       | 140                      | 200                     | 0.14                                               | 890                 | TO-247       |
| IXFH80N65X2-4                                                      | 650              | 80                                           | 0.038                                                            | 8300                       | 140                      | 200                     | 0.14                                               | 890                 | TO-247-4L    |
| IXFK120N65X2                                                       | 650              | 120                                          | 0.024                                                            | 14000                      | 240                      | 220                     | 0.1                                                | 1250                | TO-264       |
| IXFN150N65X2                                                       | 650              | 145                                          | 0.017                                                            | 21000                      | 355                      | 260                     | 0.12                                               | 1040                | SOT-227      |
| IXFB150N65X2                                                       | 650              | 150                                          | 0.017                                                            | 21000                      | 355                      | 260                     | 0.08                                               | 1560                | PLUS264      |
| IXFN170N65X2                                                       | 650              | 170                                          | 0.013                                                            | 27000                      | 434                      | 270                     | 0.107                                              | 1170                | SOT-227      |
| <b>850V X-Class HiPerFET™ Power MOSFETs with Fast Body Diodes</b>  |                  |                                              |                                                                  |                            |                          |                         |                                                    |                     |              |
| IXFA4N85X                                                          | 850              | 3.5                                          | 2.5                                                              | 247                        | 7                        | 170                     | 0.83                                               | 150                 | TO-263       |
| IXFT40N85XHV                                                       | 850              | 40                                           | 0.145                                                            | 3700                       | 98                       | 200                     | 0.145                                              | 860                 | TO-268HV     |
| IXFK66N85X                                                         | 850              | 66                                           | 0.065                                                            | 8900                       | 230                      | 250                     | 0.1                                                | 1250                | TO-264       |
| IXFX66N85X                                                         | 850              | 66                                           | 0.065                                                            | 8900                       | 230                      | 250                     | 0.1                                                | 1250                | PLUS247      |
| IXFB90N85X                                                         | 850              | 90                                           | 0.041                                                            | 13300                      | 340                      | 250                     | 0.07                                               | 1785                | PLUS264      |
| IXFN90N85X                                                         | 850              | 90                                           | 0.041                                                            | 13300                      | 340                      | 250                     | 0.104                                              | 1200                | SOT-227      |
| IXFN110N85X                                                        | 850              | 110                                          | 0.033                                                            | 17000                      | 425                      | 205                     | 0.107                                              | 1170                | SOT-227      |

## XPT™ / X2PT™ Power IGBTs 1200V up to 4500V

Designed using the proprietary thin-wafer technology called Extreme-light Punch-Through (XPT™) and the state-of-the-art IGBT process, these devices exhibit such qualities as reduced thermal resistance, low tail current, and high-speed switching capability. Also, thanks to the positive temperature coefficient of their on-state voltage, these very high voltage IGBTs are ideally suited for parallel device operation, which provides cost-effective solutions compared to series-connected, lower-voltage device ones. This also results in reduction in the associated gate drive circuitry, further simplifying the design, saving PCB board space, and improving the reliability of the overall system.

### FEATURES

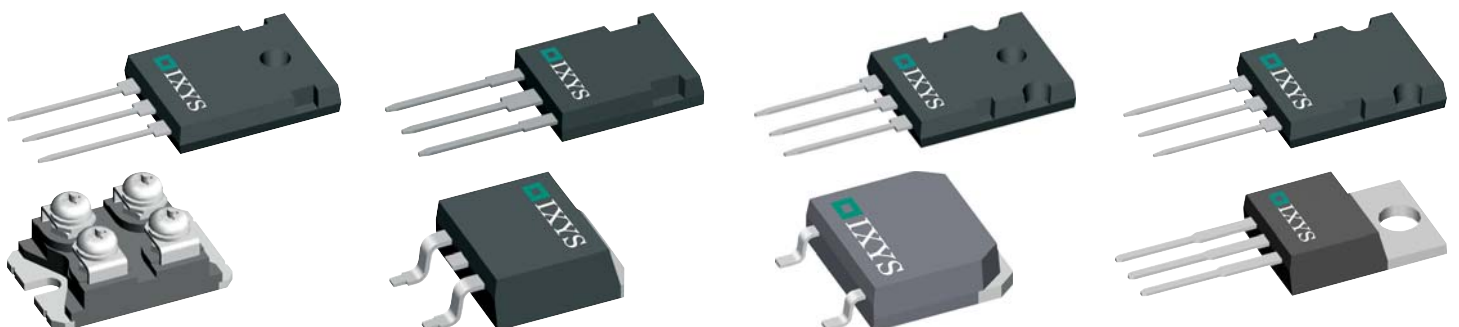
- High blocking voltages
- Low on-state voltage
- High power density
- Co-packed fast recovery diodes
- International standard size packages

### APPLICATIONS

- Pulser circuits
- Capacitor discharge circuits
- High-voltage power supplies
- Laser & X-ray generators
- AC switches

| Part Number                            | V <sub>CE5</sub> (V) | I <sub>C25</sub> T <sub>C</sub> =25°C (A) | I <sub>C110</sub> T <sub>C</sub> =110°C (A) | V <sub>CE(sat)</sub> max T <sub>J</sub> =25°C (V) | t <sub>fi</sub> typ T <sub>J</sub> =150°C (ns) | E <sub>off</sub> typ T <sub>J</sub> =150°C (mJ) | R <sub>thJC</sub> max IGBT (°C/W) | Configuration | Package Style  |
|----------------------------------------|----------------------|-------------------------------------------|---------------------------------------------|---------------------------------------------------|------------------------------------------------|-------------------------------------------------|-----------------------------------|---------------|----------------|
| <b>1200V X2PT™ Planar IGBTs</b>        |                      |                                           |                                             |                                                   |                                                |                                                 |                                   |               |                |
| IXG70IF1200NA                          | 1200                 | 130                                       | 86 (100°C)                                  | 2.2                                               | 100                                            | 5.3 (50A)                                       | 0.3                               | Copacked      | SOT-227        |
| IXG100IF1200HF                         | 1200                 | 140                                       | 104 (100°C)                                 | 2.2                                               | 100                                            | 5.3 (50A)                                       | 0.2                               | Copacked      | PLUS247™       |
| IXG100IF1200KB                         | 1200                 | 140                                       | 104 (100°C)                                 | 2.2                                               | 100                                            | 5.3 (50A)                                       | 0.2                               | Copacked      | TO-264         |
| <b>1700V XPT™ Planar IGBTs</b>         |                      |                                           |                                             |                                                   |                                                |                                                 |                                   |               |                |
| IXYH24N170C                            | 1700                 | 58                                        | 24                                          | 3.8                                               | 120                                            | 2.7                                             | 0.3                               | Single        | TO-247         |
| IXYN30N170CV1                          | 1700                 | 88                                        | 30                                          | 3.7                                               | 178                                            | 4.5                                             | 0.22                              | Copacked      | SOT-227        |
| IXYH30N170C                            | 1700                 | 108                                       | 30                                          | 3.7                                               | 178                                            | 4.5                                             | 0.16                              | Single        | TO-247         |
| IXYX30N170CV1                          | 1700                 | 108                                       | 30                                          | 3.7                                               | 178                                            | 4.5                                             | 0.16                              | Copacked      | PLUS247™       |
| <b>2500V XPT™ Planar IGBTs</b>         |                      |                                           |                                             |                                                   |                                                |                                                 |                                   |               |                |
| IXYH25N250CHV                          | 2500                 | 95                                        | 25                                          | 4                                                 | 350                                            | 10.5                                            | 0.16                              | Single        | TO-247HV       |
| IXYT25N250CHV                          | 2500                 | 95                                        | 25                                          | 4                                                 | 350                                            | 10.5                                            | 0.16                              | Single        | TO-268HV       |
| IXYX25N250CV1                          | 2500                 | 95                                        | 25                                          | 4                                                 | 350                                            | 10.5                                            | 0.16                              | Copacked      | PLUS247        |
| IXYX25N250CV1HV                        | 2500                 | 95                                        | 25                                          | 4                                                 | 350                                            | 10.5                                            | 0.16                              | Copacked      | TO-247PLUS-HV  |
| <b>High Voltage X2PT™ Planar IGBTs</b> |                      |                                           |                                             |                                                   |                                                |                                                 |                                   |               |                |
| IXG65I3300KN                           | 3300                 | 85                                        | 48 (100°C)                                  | 2.8                                               | 400 (125°C)                                    | 60                                              | 0.34                              | Single        | ISOPLUS264-HV™ |
| IXG50I4500KN*)                         | 4500                 | 74                                        | 42 (100°C)                                  | 3.2                                               | 1350 (125°C)                                   | 73                                              | 0.34                              | Single        | ISOPLUS264-HV™ |

\*) recommended free wheeling diode: DHG45I4500KO in ISOPLUS264™ package



## IXYS Silicon Carbide Package Power - Mosfets

Silicon Carbide is known as a semiconductor material offering very fast switching, very low on state and switching losses and increased power density. These features can be used achieving smaller and more efficient converters following the trend to higher bus voltages. Examples among others are high efficient DC-DC converters, solar inverters, UPS systems or supercharger solutions.

IXYS offers Silicon Carbide solutions based on IXYS own ISOPLUS packaging technology offering transfer molded packages like ISOPLUS i4 or SMPD with dies mounted on DCB (Direct Copper Bonded) substrates featuring insulation towards heat sink. Furthermore ISOPLUS SMPD is made for SMD placement facilitating efficient mounting for cost reduction. MiniBLOC (SOT-227) package is a solution based on unique thermal design of high thermal conductivity AlN ceramic substrates.

All these packages allow for dense layouts following markets demand for smaller inverter designs, higher power density and efficiency.

### FEATURES / ADVANTAGES

- Very fast switching
- Highest efficiency
- Highest power density

#### ISOPLUS Packages

- 3kV isolation voltage towards heatsink
- Low stray inductance
- Low coupling capacity
- Low thermal impedance
- Excellent reliability

### APPLICATIONS

- Solar inverters
- High voltage DC/DC converters
- Motor drives
- Switch mode power supplies
- PFC
- UPS
- Battery chargers
- Induction heating

| SiC Mosfet Products | $V_{DS}$ (V) | $R_{DS(ON)}$ typ (mΩ) | Package | Circuit       |
|---------------------|--------------|-----------------------|---------|---------------|
| IXFN 130N90SK *     | 900          | 10                    | SOT-227 | Single Mosfet |
| IXFN 27N120SK *     | 1200         | 80                    | SOT-227 | Single Mosfet |
| IXFN 50N120SiC      | 1200         | 40                    | SOT-227 | Single Mosfet |
| IXFN 50N120SK *     | 1200         | 40                    | SOT-227 | Single Mosfet |
| MCB 40I1200TZ       | 1200         | 40                    | TO-263  | Single Mosfet |
| IXFN 70N120SK *     | 1200         | 25                    | SOT-227 | Single Mosfet |
| MCB 60I1200TZ       | 1200         | 25                    | TO-263  | Single Mosfet |
| IXFN 45N170SK *     | 1700         | 45                    | SOT-227 | Single Mosfet |
| IXFN 90N170SK *     | 1700         | 23                    | SOT-227 | Single Mosfet |

\*) Kelvin source gate connection

| SiC Mosfet Products | $V_{DS}$ (V) | $R_{DS(ON)}$ typ (mΩ) | Package    | Circuit            |
|---------------------|--------------|-----------------------|------------|--------------------|
| MCB 20P1200LB       | 1200         | 2 x 80                | SMPD       | Phase Leg          |
| MCB 25P1200TLB      | 1200         | 2 x 80                | SMPD       | Phase Leg + NTC    |
| MCB 30P1200LB       | 1200         | 2 x 40                | SMPD       | Phase Leg          |
| MCB 40P1200LB       | 1200         | 2 x 25                | SMPD       | Phase Leg          |
| MCB 60P1200TLB      | 1200         | 2 x 25                | SMPD       | Phase Leg + NTC    |
| MMCB 20WO1200TMI    | 1200         | 6 x 80                | MiniPack2B | 6-Pack open Source |





## IXYS Silicon Carbide Package Power - Diodes

Silicon Carbide Schottky diodes feature an excellent and temperature independent switching behavior with no reverse recovery behavior like silicon based fast recovery diodes. This enables the designer to increase system switching frequency for smaller and more efficient converters. For higher power Silicon Carbide diodes can be paralleled because of the positive temperature coefficient of the forward voltage.

IXYS offers Silicon Carbide solutions based on IXYS own ISOPLUS packaging technology offering transfer molded packages like ISOPLUS i4 or SMPD with dies mounted on DCB (Direct Copper Bonded) substrates featuring insulation towards heat sink. Furthermore ISOPLUS SMPD is made for SMD placement facilitating efficient mounting for cost reduction. MiniBLOC (SOT-227) package is a solution based on unique thermal design of high thermal conductivity AlN ceramic substrates.

ISO247 is the latest development of the ISOPLUS family. It is compatible to TO-247, does have a screw mounting hole but offers a DCB isolated backside with outstanding low thermal impedance. First ISO247 SiC products are common cathode DCG20C1200HR and DCG35C1200HR. Unique in TO-247 footprint are the phase legs DCG10P1200HR and DCG17P1200HR.

### FEATURES / ADVANTAGES

- Very fast switching
- Highest efficiency
- Highest power density

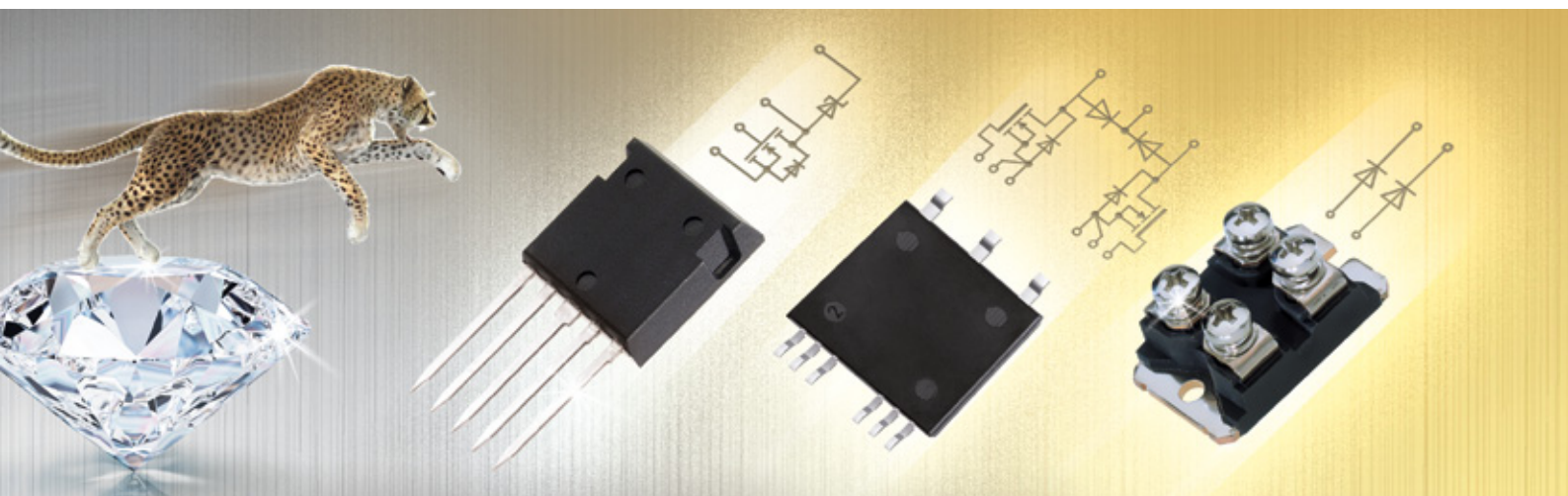
#### ISOPLUS Packages

- 3kV isolation voltage towards heatsink
- Low stray inductance
- Low coupling capacity
- Low thermal impedance
- Excellent reliability

### APPLICATIONS

- Solar inverters
- High voltage DC/DC converters
- Motor drives
- Switch mode power supplies
- PFC
- UPS
- Battery chargers
- Induction heating

| SiC Diode Products | $V_{RRM}$ (V) | $I_{DAV}$ & $d=0,5$ (A)              | Package    | Circuit        |
|--------------------|---------------|--------------------------------------|------------|----------------|
| DCG 45X1200NA      | 900           | 2 x 22                               | SOT-227    | Dual diode     |
| DCG 85X1200NA      | 1200          | 2 x 43                               | SOT-227    | Dual diode     |
| DCG 100X1200NA     | 1200          | 2 x 49                               | SOT-227    | Dual diode     |
| DCG 130X1200NA     | 1200          | 2 x 64                               | SOT-227    | Dual diode     |
| DCG 20C1200HR      | 1200          | 2 x 10                               | ISO247     | Common Cathode |
| DCG 35C1200HR      | 1200          | 2 x 17                               | ISO247     | Common Cathode |
| DCG 10P1200HR      | 2 x 1200      | 10                                   | ISO247     | Phase leg      |
| DCG 17P1200HR      | 2 x 1200      | 17                                   | ISO247     | Phase leg      |
| DCG 20B650LB       | 650           | 21                                   | SMPD       | Full bridge    |
| FBS 10-12SC        | 1200          | 4.5                                  | ISOPLUS i4 | Full bridge    |
| DCG 20B1200LB      | 1200          | 9.2                                  | SMPD       | Full bridge    |
| MKG 17RK600DCGLB   | 600           | Mosfet: 2 x 110 mΩ<br>Diode: 2 x 11A | SMPD       | Double boost   |



## SimBus F – Rectifier Phase-Legs with PressFit Pins

Today IXYS represents a new line of rectifier phase-legs in the standard industry package SimBus F. This is the first time IXYS offers the SimBus F package with PressFit Pins (PFP) for solder-free control contacts. The new range is available as diode-diode, thyristor-diode and thyristor-thyristor configuration.

To provide a high performance rectifier module IXYS has integrated several new features to the SimBus F. Internally the semiconductors are all contacted with the well-proven clip-solder-technology of IXYS known from several other standard packages as TO-240, Y4 (34 mm) or Y1 (50 mm). Additionally the main contacts are soldered on the DCB substrates (Direct Copper Bonded). The DCB has a new design called **DBthiC** that provides a thicker copper layer for the semiconductor. These three new integrated developments improve drastically the thermal management of the SimBus F module and give the rectifier phase-legs an outstanding performance. Last but not least the combination of rectifier phase-legs with the SimBus F and its standard industrial height of 17 mm allows easy bus bar connections between the rectifier and the inverter stages.

The portfolio of the different phase-leg types starts with three current ratings (250 – 600A) for two voltages classes (1600 – 2200 V). The DCB substrate allows an isolation voltage of 4300V between the terminals and the heat sink. On request IXYS provides a Phase Change Material (PCM) on the module backside for an optimized heat transfer and an easier handling in the assembly for the user.

### FEATURES / ADVANTAGES

- Package with **DBthiC** substrate
- Clip-solder-contacts for semiconductors
- Power terminals soldered on DCB
- Improved temperature and power cycling
- PressFit-Pins for PCB mounting
- Industry standard outline
- Height: 17 mm
- Isolation Voltage: 4300 V~
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current

- Option: Phase Change Material

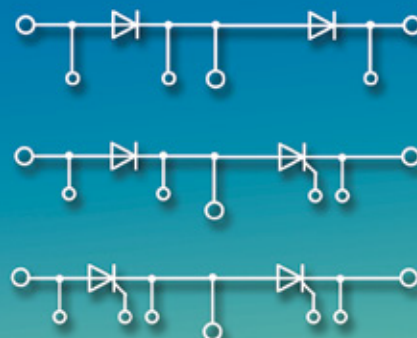
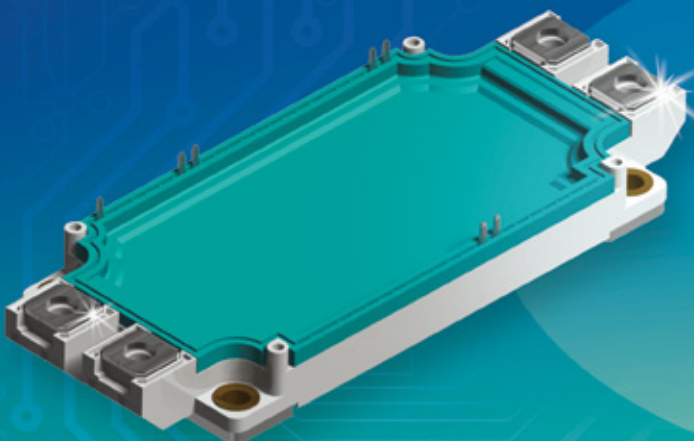
### APPLICATIONS

- Line rectifying 50/60 Hz
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors
- Softstart AC motor control
- AC power control
- Power converter
- Lighting and temperature control

| Diode – Diode    | $I_{FAV}$ (A) | $V_{RRM}$ (V) |
|------------------|---------------|---------------|
| MDMA300P1600PTSF | 300           | 1600          |
| MDNA300P2200PTSF | 300           | 2200          |
| MDMA425P1600PTSF | 425           | 1600          |
| MDNA425P2200PTSF | 425           | 2200          |
| MDMA600P1600PTSF | 600           | 1600          |
| MDNA600P2200PTSF | 600           | 2200          |

| Thyristor – Diode | $I_{FAV}$ (A) | $V_{RRM}$ (V) |
|-------------------|---------------|---------------|
| MCMA280PD1600PTSF | 280           | 1600          |
| MCNA250PD2200PTSF | 250           | 2200          |
| MCMA400PD1600PTSF | 400           | 1600          |
| MCNA360PD2200PTSF | 360           | 2200          |
| MCMA550PD1600PTSF | 550           | 1600          |
| MCNA500PD2200PTSF | 500           | 2200          |

| Thyristor – Thyristor | $I_{FAV}$ (A) | $V_{RRM}$ (V) |
|-----------------------|---------------|---------------|
| MCMA280P1600PTSF      | 280           | 1600          |
| MCNA250P2200PTSF      | 250           | 2200          |
| MCMA400P1600PTSF      | 400           | 1600          |
| MCNA360P2200PTSF      | 360           | 2200          |
| MCMA550P1600PTSF      | 550           | 1600          |
| MCNA500P2200PTSF      | 500           | 2200          |



## More Power and PressFit-Pins for Rectifier Bridges with integrated Brake function

Today IXYS represents the extension of its product line of rectifier bridges with integrated brake units. The current portfolio offers several new modules including many new feature to provide the customers a wide range of high integrated and powerful rectifier solutions.

Biggest improvement is the implementation of the new IGBT generation X2PT of IXYS for the brake units. The X2PT-IGBT is characterized by an improved switching and thermal behavior resulting in a higher robustness and reliability.

An important feature is the new DCB (Direct Copper Bonded) technology called **DBthiC** providing a thicker copper layer for the semiconductor. A higher integration for the rectifier, a lower thermal resistance and a higher long-term stability are the benefit especially for the package type E2.

For a high performance, solder free mounting IXYS provides PressFit-Pin (PFP) versions for the E2 package. Optionally this module type is available with a Phase Change Material (PCM) printed on the backside to achieve an optimized thermal connection for a clean and cost effective mounting with reduced effort for the user.

IXYS offers a wide current range from 75 up to 450 Amps; the voltage ratings of the rectifiers are available from 1200 up to 2200V. The three phase input rectifier provides two circuits: one time with diodes and second a half-controlled circuit with thyristors.

| Diode Rectifier   | I <sub>DAV</sub> (A) | V <sub>RRM</sub> (V) | Package | PFP | DBthiC |
|-------------------|----------------------|----------------------|---------|-----|--------|
| VUB72-12NOXT      | 75                   | 1200                 | V1      |     |        |
| VUB72-16NOXT      | 75                   | 1600                 | V1      |     |        |
| VUI72-16NOXT      | 75                   | 1600                 | V1      |     |        |
| VUB116-16NOXT     | 120                  | 1600                 | E2      |     |        |
| VUB120-16NOX      | 180                  | 1600                 | V2      |     |        |
| VUB120-16NOXT     | 180                  | 1600                 | V2      |     |        |
| VUB135-22NO1      | 150                  | 2200                 | E2      |     |        |
| VUB145-16NOXT     | 150                  | 1600                 | E2      |     |        |
| VUB160-16NOX      | 180                  | 1600                 | V2      |     |        |
| VUB160-16NOXT     | 180                  | 1600                 | V2      |     |        |
| MDMA210UB1600PTED | 210                  | 1600                 | E2      | x   | x      |
| MDNA210UB2200PTED | 210                  | 2200                 | E2      | x   | x      |
| MDMA240UB1600ED   | 240                  | 1600                 | E2      |     | x      |
| MDMA280UB1600PTED | 280                  | 1600                 | E2      | x   | x      |
| MDNA280UB2200PTED | 280                  | 2200                 | E2      | x   | x      |
| MDMA360UB1600PTED | 360                  | 1600                 | E2      | x   | x      |
| MDNA360UB2200PTED | 360                  | 2200                 | E2      | x   | x      |
| MDMA450UB1600PTED | 450                  | 1600                 | E2      | x   | x      |

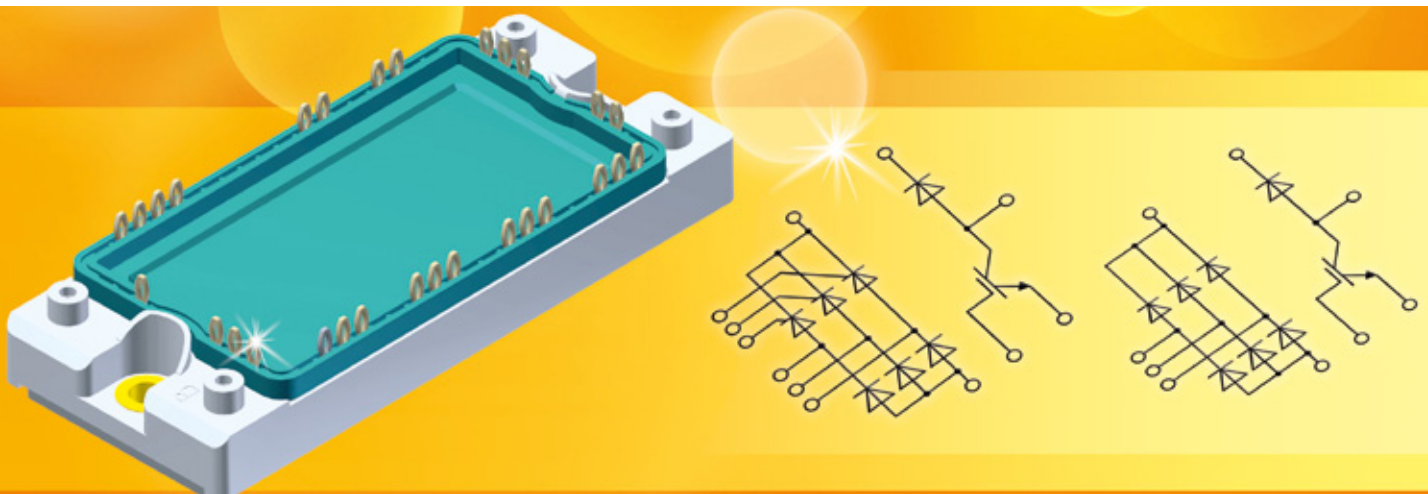
| Thyristor Rectifier | I <sub>DAV</sub> (A) | V <sub>RRM</sub> (V) | Package | PFP | DBthiC |
|---------------------|----------------------|----------------------|---------|-----|--------|
| VVZB120-16ioX       | 180                  | 1600                 | V2      |     |        |
| MCNA120UI2200TED    | 117                  | 2200                 | E2      |     |        |
| VVZB135-16ioXT      | 150                  | 1600                 | E2      |     |        |
| VVZB170-16ioXT      | 180                  | 1600                 | E2      |     |        |
| MCMA240UI1600ED     | 240                  | 1600                 | E2      |     | x      |
| MCMA240UI1600PED    | 240                  | 1600                 | E2      | x   | x      |
| MCMA245UI1600ED     | 240                  | 1600                 | E2      |     | x      |

### FEATURES / ADVANTAGES

- Package with **DBthiC** substrate
- Improved temperature and power cycling
- PressFit-Pins (PFP) for PCB mounting
- Industry standard outline
- Height: 17 mm
- Option: Phase Change Material (PCM)
- Isolation voltage: 4300 V~
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current
- X2PT – 2<sup>nd</sup> generation Xtreme light Punch Through
- Thin wafer technology -> low VCE(sat); low Rth
- Rugged design

### APPLICATIONS

- 50/60 Hz line rectifying
- 3~ Rectifier with Brake function for drive inverters





## X2PT... the efficient solution for motor drives

X2PT™ IGBTs are the second generation of Xtreme Light Punch Through XPT IGBTs. With an improved vertical structure and an improved design the X2PT™ IGBT benefits are a superior short circuit capability, 175°C max junction temperature, a further reduced  $V_{ce(sat)}$  and lower turn-off losses ( $E_{off}$ ) resulting in a competitive performance to latest trench devices but at reduced  $R_{th}$ .

This extremely rugged IGBT platform is ideal for critical applications that require low conduction and low switching losses with a 10  $\mu$ s short circuit withstand capability.

A large portfolio of modules with X2PT™ IGBTs co-packaged with ultrafast soft recovery SONIC™ diodes are available in standard E2, E3 and SIMBUS F packages offering improved die cooling and reduced mounting resistance by the use of thick copper layer DCBs (Direct Copper Bonded).

For solder free mounting IXYS further more offers PressFit-Pin (PFP) versions and optionally modules with Phase Change Material (PCM) printed on the copper base plate for easy and silicone free mounting.

### FEATURES / ADVANTAGES

- New cell design results in:
  - lower  $E_{off}$
  - lower  $V_{ce(sat)}$
  - $T_{jmax}$  of 175°C
  - reduced  $R_{th}$
  - very low gate charge
  - easy paralleling
  - square RBSOA @  $2 \times I_{nom}$
  - short circuit rated for 10  $\mu$ s
- Designs for 1200V and 1700V IGBTs

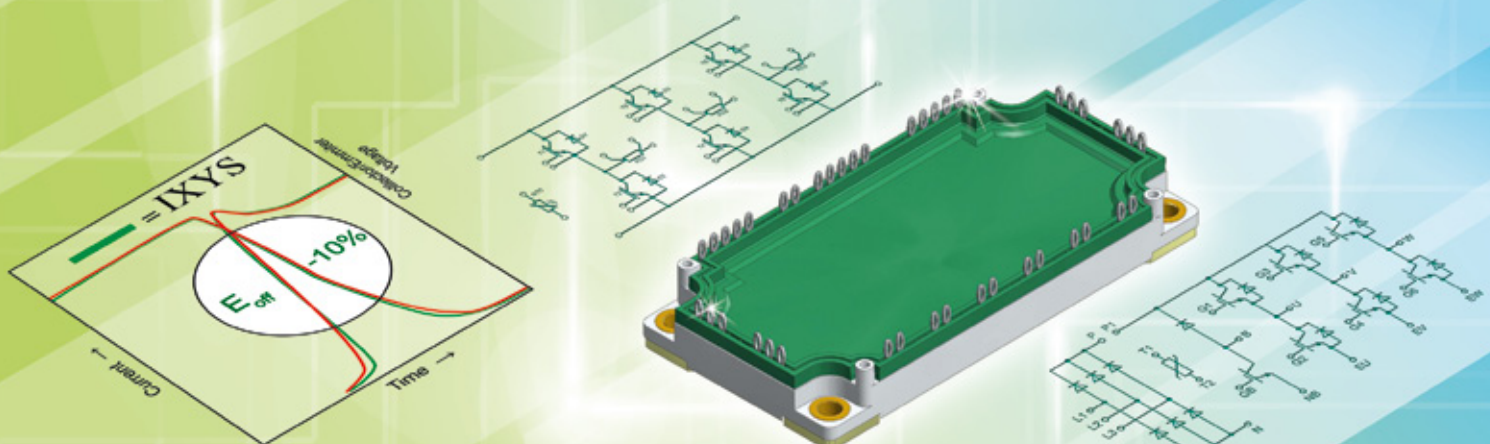
#### Options:

- Press fit pin
- Phase Change Material (PCM)

### APPLICATIONS

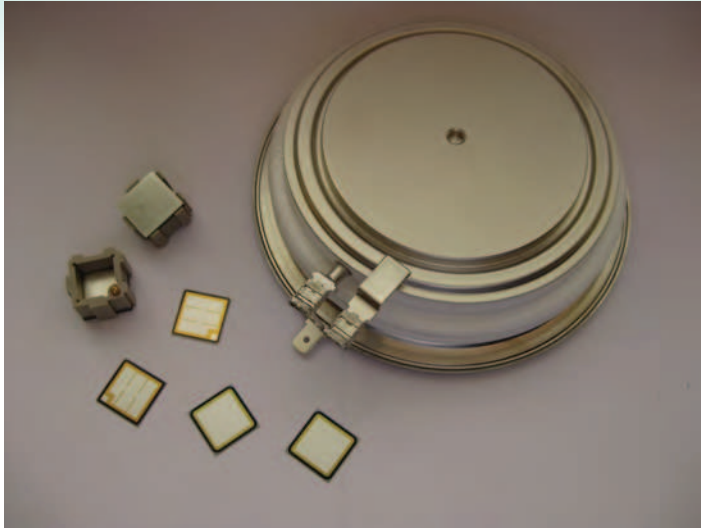
- AC motor control
- Servo and robot drives
- Solar inverter
- UPS inverter
- Welding equipment
- Inductive heating
- Pumps, Fans

| Products            | $V_{ce}$ (V) | $I_{c80}$ (A) | Circuit               | Package  |
|---------------------|--------------|---------------|-----------------------|----------|
| MIXG 70W1200TED     | 1200         | 79            | 6-pack                | E2       |
| MIXG 90W1200TED     | 1200         | 102           | 6-pack                | E2       |
| MIXG 70WB1200TEH    | 1200         | 79            | CBI                   | E3       |
| MIXG 90WB1200TEH    | 1200         | 102           | CBI                   | E3       |
| MIXG 120W1200DPFTEH | 1200         | 140           | 6-pack, HiPerFRED FWD | E3       |
| MIXG 120W1200TEH    | 1200         | 140           | 6-pack                | E3       |
| MIXG 180W1200TEH    | 1200         | 195           | 6-pack                | E3       |
| MIXG 240W1200TEH    | 1200         | 240           | 6-pack                | E3       |
| MIXG 120W1200STEH   | 1200         | 140           | 6-pack with Shunt     | E3       |
| MIXG 180W1200STEH   | 1200         | 195           | 6-pack with Shunt     | E3       |
| MIXG 240W1200STEH   | 1200         | 240           | 6-pack with Shunt     | E3       |
| MIXG 330PF1200TSF   | 1200         | 395           | Phase leg             | SIMBUS F |
| MIXG 360PF1200TED   | 1200         | 420           | Phase leg             | E2       |
| MIXG 490PF1200TSF   | 1200         | 580           | Phase leg             | SIMBUS F |
| MIXG 240RF1200TED   | 1200         | 250           | Brake                 | E2       |
| MIXG 360RF1200TED   | 1200         | 400           | Brake                 | E2       |





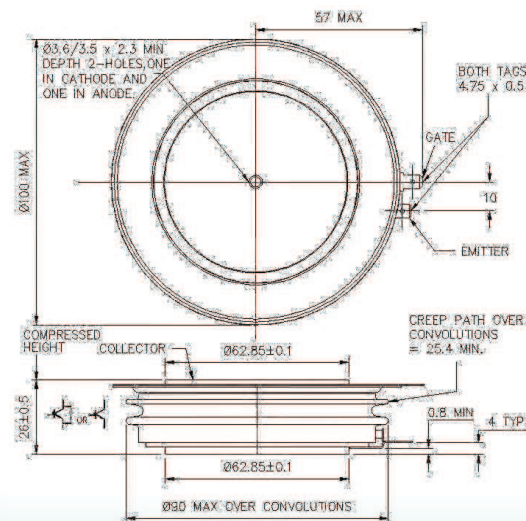
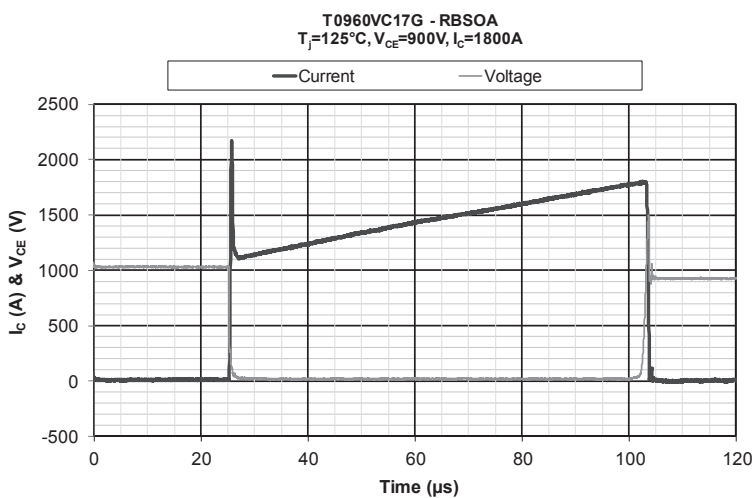
## T0960VC17G: New 1.7kV press-pack IGBT



- First of a new range of 1.7kV press-pack IGBT's
- Reverse conducting with fully rated integral diode.
- 960A nominal current rating in a 63mm electrode, 100mm overall diameter industry standard package.
- Short circuit failure mode

### Key parameters

- $V_{CES}$ , 1.7kV /  $I_C$ , 900A
- $V_{DC}$  link, 900V with 100 FIT
- $I_{CRM}$ , 1920A
- $V_{CE(sat)}$ , 3.3V @ 960A & 125°C
- $E_{ON}$ , 0.47J /  $E_{OFF}$ , 0.8J, nominal
- $R_{thJK}$ , 33.8K/kW, double side cooled
- Operating temperature -40 to +125°C
- $I_{SC}$ , 10.9kA, 10μs



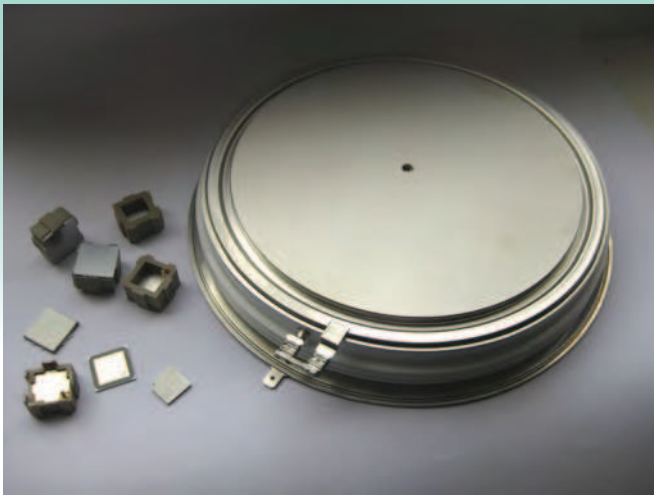
### Applications

- Traction including light rail, trams, trolley-bus and other electric vehicles;
- AC drives for harsh environments such as mining, marine and off shore, gas and oil installations;
- Renewable energy for wind turbines, hydro generation, wave-generation and solar;
- Any application where high power density and reliability are key considerations.

### Prospective product matrix

| Provisional part number | Electrode diameter (mm) | Integral diode |
|-------------------------|-------------------------|----------------|
| T0600NC17A              | 50                      | Yes            |
| T0840NC17E              | 50                      | No             |
| T0960VC17G              | 63                      | Yes            |
| T1440VC17E              | 63                      | No             |
| T1800TC17A              | 75                      | Yes            |
| T2520TC17E              | 75                      | No             |
| T2520TC17G              | 96                      | Yes            |

# T2960BB45EA: New 3kA, 4.5kV press-pack IGBT



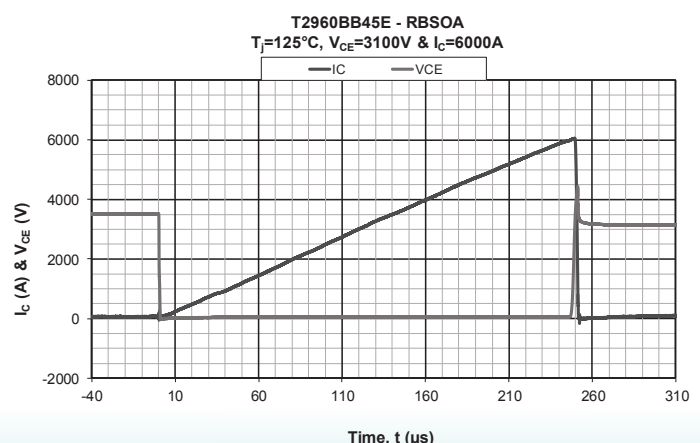
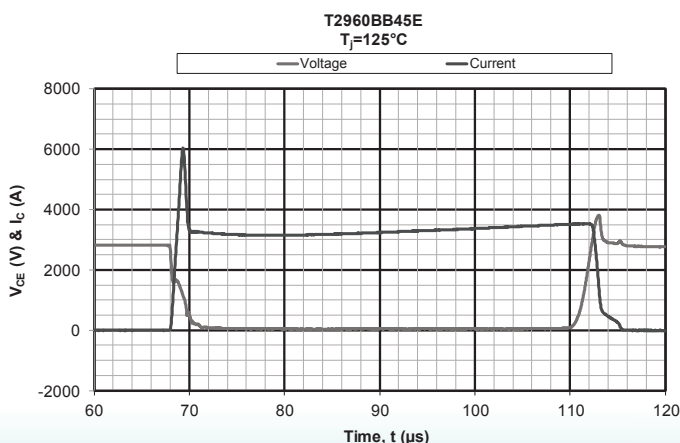
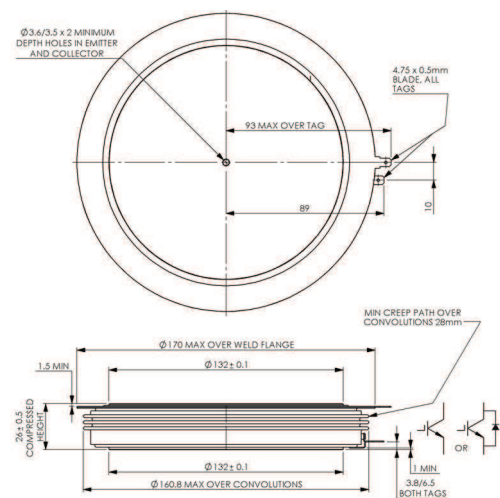
- 3kA nominal current rating in 132mm electrode 170mm overall diameter industry standard package
- Optimised HP Sonic FRD E3000EC45E also available
- Short circuit failure mode

## Applications

- Utilities: Flexible AC transmission systems, HVDC transmission, statcoms, VSC, SVC, etc.
- Medium voltage drives: Marine, oil and gas pumps, industrial drives etc.

## Key parameters

- $V_{CES}$ , 4.5kV /  $I_C$ , 3kA
- $V_{DC}$  link, 2.8kV with 100 FIT
- $I_{CRM}$ , 6kA
- $V_{CE(sat)}$ , 3.6V@3kA&125°C
- $E_{ON}$ , 11.5J /  $E_{OFF}$ , 17.5J, nominal
- $R_{thJK}$ , 4.2K/kW, double side cooled
- Operating temperature -40 to +125°C
- $I_{SC}$ , 10.9kA, 10μs



IXYS UK Westcode Ltd's BS EN ISO9001  
quality system is registered by BSI

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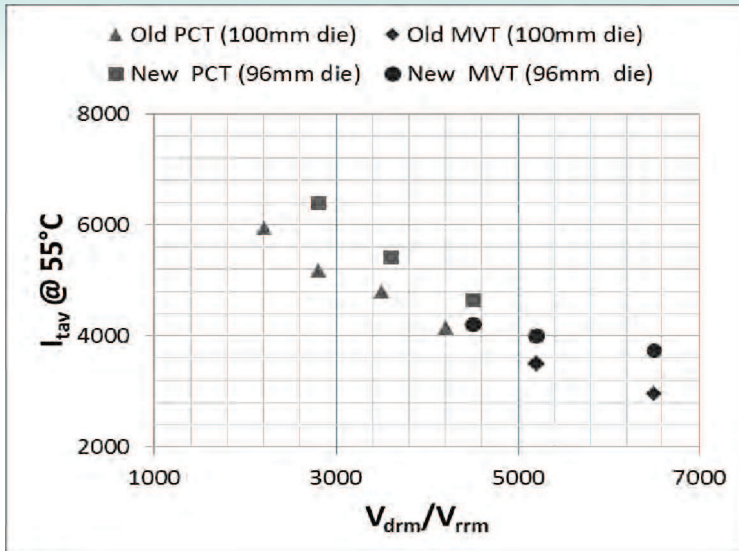
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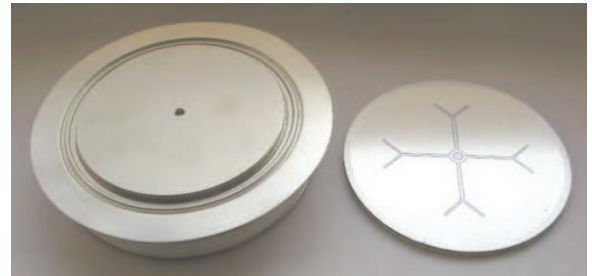
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# New 96mm die phase control and medium voltage thyristors

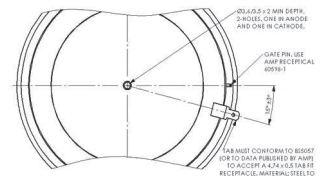
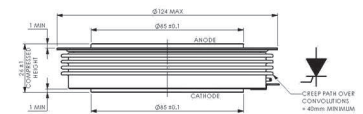


- Bonded die construction
- New smaller package design with 85mm electrode and 124mm overall diameter
- Higher average current rating than old 100mm die designs in large package
- Range includes medium voltage thyristors with optimised characteristics for series connection

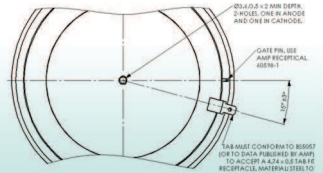
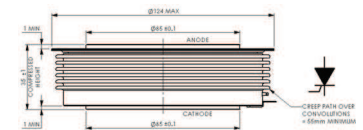


## Phase control thyristors

| Part No.   | $V_{DRM}$<br>$V_{RRM}$ | $I_{TAV}$<br>$T_K=55^{\circ}C$ | $I_{TSM}$<br>10ms 1/2 sine<br>$V_R \leq 60\% V_{RRM}$ | $I^2t$<br>A <sup>2</sup> s | $V_{TO}$ | $r_T$<br>@ $T_{JM}$ | $T_{JM}$ | $R_{thJC}$<br>180° Sine<br>120° Rect. | Fig. No. |
|------------|------------------------|--------------------------------|-------------------------------------------------------|----------------------------|----------|---------------------|----------|---------------------------------------|----------|
|            | V                      | A                              | A                                                     | A <sup>2</sup> s           | V        | mΩ                  | °C       | K/W<br>K/W                            |          |
| N4165EE400 | 4000                   | 4165                           | 56000                                                 | $15.7 \times 10^6$         | 0.977    | 0.177               | 125      | 0.006<br>0.00639                      | W108     |
| N4165EE450 | 4500                   | 4165                           | 56000                                                 | $15.7 \times 10^6$         | 0.977    | 0.177               | 125      | 0.006<br>0.00639                      | W108     |
| N4650EA400 | 4000                   | 4650                           | 56000                                                 | $15.7 \times 10^6$         | 0.977    | 0.177               | 125      | 0.005<br>0.00538                      | W107     |
| N4650EA450 | 4500                   | 4650                           | 56000                                                 | $15.7 \times 10^6$         | 0.977    | 0.177               | 125      | 0.005<br>0.00538                      | W107     |
| N4845EE320 | 3200                   | 4845                           | 65000                                                 | $21.1 \times 10^6$         | 0.913    | 0.125               | 125      | 0.006<br>0.00654                      | W108     |
| N4845EE360 | 3600                   | 4845                           | 65000                                                 | $21.1 \times 10^6$         | 0.913    | 0.125               | 125      | 0.006<br>0.00654                      | W108     |
| N5415EA320 | 3200                   | 5415                           | 65000                                                 | $21.1 \times 10^6$         | 0.913    | 0.125               | 125      | 0.005<br>0.00538                      | W107     |
| N5415EA360 | 3600                   | 5415                           | 65000                                                 | $21.1 \times 10^6$         | 0.913    | 0.125               | 125      | 0.005<br>0.00538                      | W107     |
| N5715EE240 | 2400                   | 5715                           | 80000                                                 | $32.0 \times 10^6$         | 0.840    | 0.085               | 125      | 0.006<br>0.00654                      | W108     |
| N5715EE280 | 2800                   | 5715                           | 80000                                                 | $32.0 \times 10^6$         | 0.840    | 0.085               | 125      | 0.006<br>0.00654                      | W108     |
| N6405EA240 | 2400                   | 6405                           | 80000                                                 | $32.0 \times 10^6$         | 0.840    | 0.085               | 125      | 0.005<br>0.00538                      | W107     |
| N6405EA280 | 2800                   | 6405                           | 80000                                                 | $32.0 \times 10^6$         | 0.840    | 0.085               | 125      | 0.005<br>0.00538                      | W107     |



W107



W108

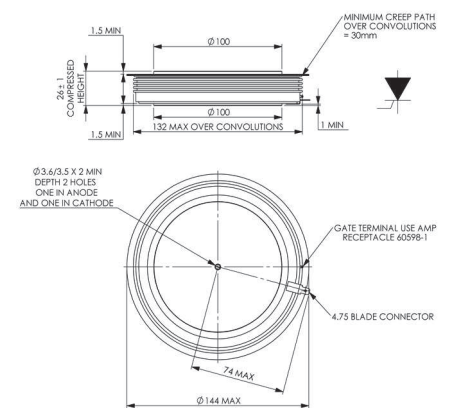
## Medium voltage thyristors (will also be available in W108 outline)

| Part No.   | $V_{DRM}$<br>$V_{RRM}$ | $I_{TAV}$<br>$T_K=55^{\circ}C$ | $I_{TSM}$<br>10ms 1/2 sine<br>$V_R \leq 60\% V_{RRM}$ | $I^2t$<br>A <sup>2</sup> s | $t_q$<br>@<br>200V/μs | Typ. Reverse Recovery<br>Charge<br>$T_{JM}$ | $V_{TO}$ | $r_T$<br>@ $T_{JM}$ | $T_{JM}$ | $R_{thJC}$<br>180° Sine<br>120° Rect. | Fig. No. |
|------------|------------------------|--------------------------------|-------------------------------------------------------|----------------------------|-----------------------|---------------------------------------------|----------|---------------------|----------|---------------------------------------|----------|
|            | V                      | A                              | A                                                     | A <sup>2</sup> s           | μs                    | $Q_{rr}$<br>@ $I_{TM}$                      | V        | mΩ                  | °C       | K/W<br>K/W                            |          |
| K3745EA600 | 6000                   | 3745                           | 35400                                                 | $6.26 \times 10^6$         | 1500-1800             | 14000                                       | 4000     | 10                  | 1.481    | 0.244                                 | W107     |
| K3745EA650 | 6500                   | 3745                           | 35400                                                 | $6.26 \times 10^6$         | 1500-1800             | 14000                                       | 4000     | 10                  | 1.481    | 0.244                                 | W107     |
| K4005EA480 | 4800                   | 4005                           | 43200                                                 | $9.33 \times 10^6$         | 1300-1600             | 8000                                        | 4000     | 10                  | 1.359    | 0.216                                 | W107     |
| K4005EA520 | 5200                   | 4005                           | 43200                                                 | $9.33 \times 10^6$         | 1300-1600             | 8000                                        | 4000     | 10                  | 1.359    | 0.216                                 | W107     |
| K4215EA420 | 4200                   | 4215                           | 47000                                                 | $11.0 \times 10^6$         | 1200-1500             | 4800                                        | 4000     | 10                  | 1.224    | 0.201                                 | W107     |
| K4215EA450 | 4500                   | 4215                           | 47000                                                 | $11.0 \times 10^6$         | 1200-1500             | 4800                                        | 4000     | 10                  | 1.224    | 0.201                                 | W107     |

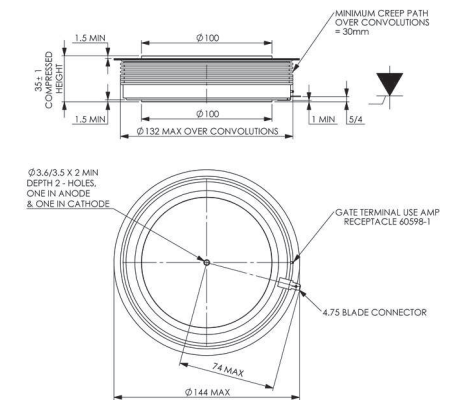
# New 115mm die phase control thyristors

- New 115mm bonded die device in same outline as old 100mm die device
- More than 40% increase in average current rating
- Medium voltage parts planned for late 2017

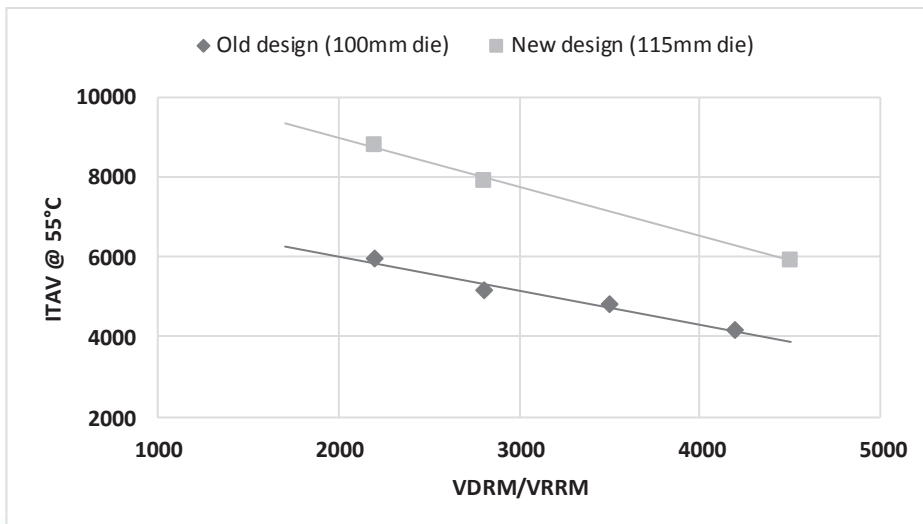
| Part No.   | $V_{DRM}$<br>$V_{RRM}$ | $I_{TAV}$<br>$T_K=55^\circ C$ | $I_{TSM}$<br>10ms 1/2 sine<br>$V_R \leq 60\% V_{RRM}$ | $I^2t$<br>A <sup>2</sup> s | $V_{TO}$<br>@ $T_{JM}$ | $r_T$<br>m $\Omega$ | $T_{JM}$<br>°C | $R_{thJC}$          |                      | Fig. No. |
|------------|------------------------|-------------------------------|-------------------------------------------------------|----------------------------|------------------------|---------------------|----------------|---------------------|----------------------|----------|
|            | V                      | A                             | A                                                     | A <sup>2</sup> s           | V                      | m $\Omega$          | °C             | 180°<br>Sine<br>K/W | 120°<br>Rect.<br>K/W |          |
| N5320FE400 | 4000                   | 5320                          | 78000                                                 | $30.42 \times 10^6$        | 1.060                  | 0.130               | 125            | 0.00475             | 0.00513              | W119     |
| N5320FE450 | 4500                   | 5320                          | 78000                                                 | $30.42 \times 10^6$        | 1.060                  | 0.130               | 125            | 0.00475             | 0.00513              | W119     |
| N5910FA400 | 4000                   | 5910                          | 78000                                                 | $30.42 \times 10^6$        | 1.060                  | 0.130               | 125            | 0.00400             | 0.00439              | W118     |
| N5910FA450 | 4500                   | 5910                          | 78000                                                 | $30.42 \times 10^6$        | 1.060                  | 0.130               | 125            | 0.00400             | 0.00439              | W118     |
| N7585FE240 | 2400                   | 7585                          | 110000                                                | $60.50 \times 10^6$        | 0.780                  | 0.062               | 125            | 0.00475             | 0.00513              | W119     |
| N7585FE280 | 2800                   | 7585                          | 110000                                                | $60.50 \times 10^6$        | 0.780                  | 0.062               | 125            | 0.00475             | 0.00513              | W119     |
| N7905FE180 | 1800                   | 7905                          | 117000                                                | $68.44 \times 10^6$        | 0.770                  | 0.056               | 125            | 0.00475             | 0.00513              | W118     |
| N7905FE220 | 2200                   | 7905                          | 117000                                                | $68.44 \times 10^6$        | 0.770                  | 0.056               | 125            | 0.00475             | 0.00513              | W118     |
| N8440FA240 | 2400                   | 8440                          | 110000                                                | $60.50 \times 10^6$        | 0.780                  | 0.062               | 125            | 0.00400             | 0.00439              | W119     |
| N8440FA280 | 2800                   | 8440                          | 110000                                                | $60.50 \times 10^6$        | 0.780                  | 0.062               | 125            | 0.00400             | 0.00439              | W119     |
| N8800FA180 | 1800                   | 8800                          | 117000                                                | $68.44 \times 10^6$        | 0.770                  | 0.056               | 125            | 0.00400             | 0.00439              | W118     |
| N8800FA220 | 2200                   | 8800                          | 117000                                                | $68.44 \times 10^6$        | 0.770                  | 0.056               | 125            | 0.00400             | 0.00439              | W118     |



W118



W119



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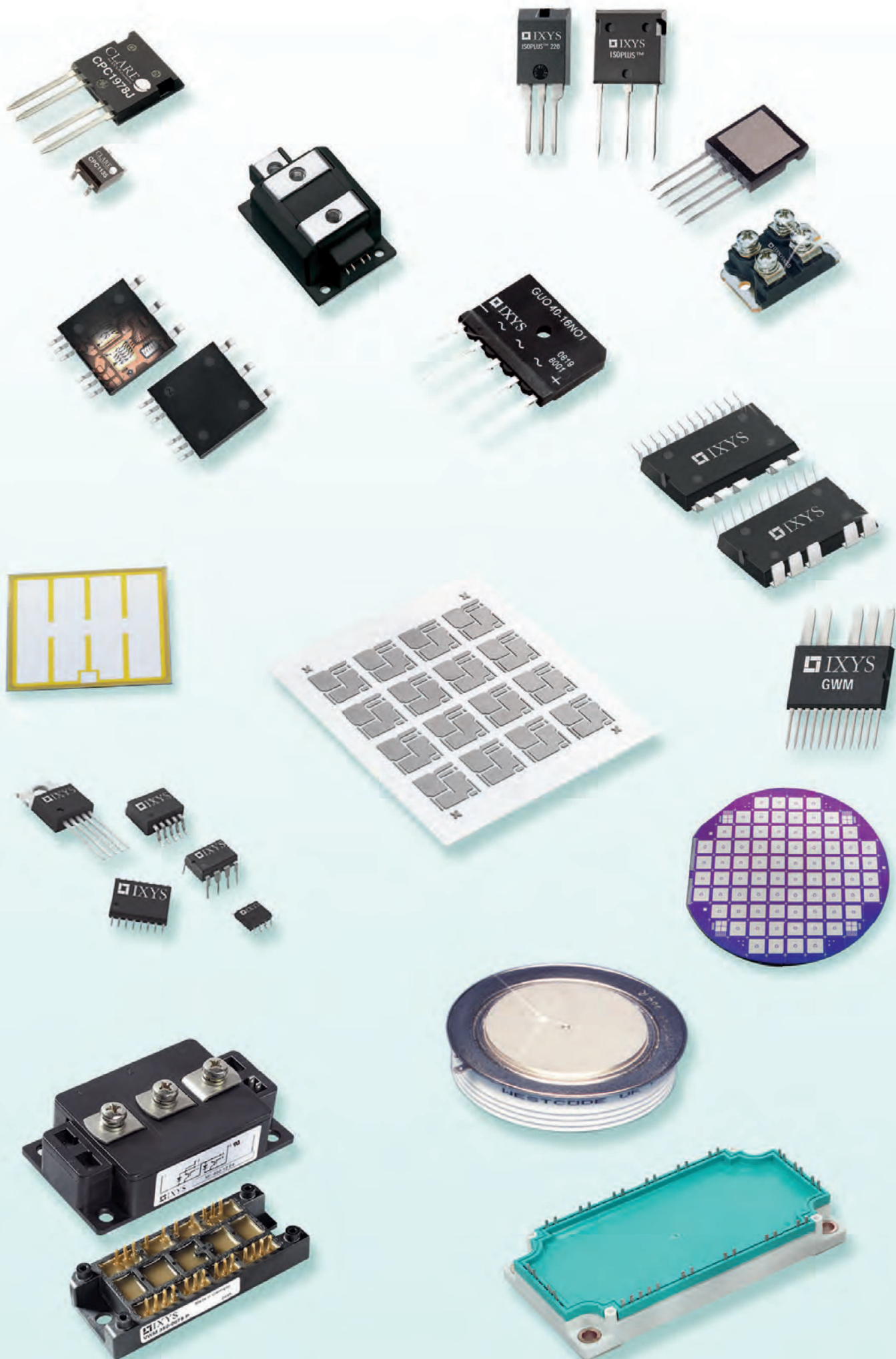
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