

## Diode

Fast Switching Emitter Controlled Diode

## IDW30E60

Emitter Controlled Diode series

Data sheet

Industrial & Multimarket

## Fast Switching Emitter Controlled Diode

### Features:

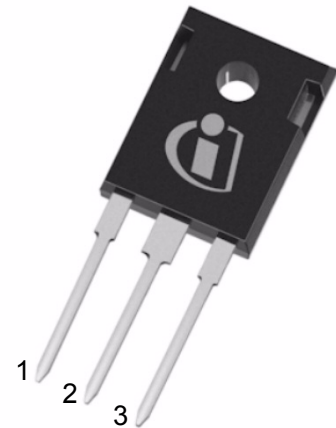
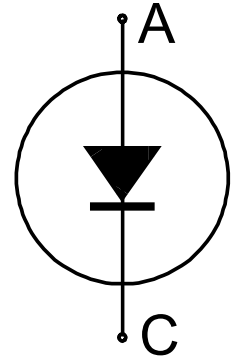
- Qualified according to JEDEC for target applications
- 600 V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage
- 175 °C junction operating temperature
- Easy paralleling
- Pb-free lead plating; RoHS compliant

### Applications:

- Switching diode for PFC applications with operating range up to 30kHz

### Package pin definition:

- Pin 1 - not connected
- Pin 2 - cathode
- Pin 3 - anode



### Key Performance and Package Parameters

| Type     | $V_{rrm}$ | $I_f$ | $V_f, T_{vj}=25^{\circ}\text{C}$ | $T_{vjmax}$ | Marking | Package    |
|----------|-----------|-------|----------------------------------|-------------|---------|------------|
| IDW30E60 | 600V      | 30A   | 1.65V                            | 175°C       | D30E60  | PG-TO247-3 |

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**Maximum ratings**

| Parameter                                                                                                      | Symbol      | Value        | Unit             |
|----------------------------------------------------------------------------------------------------------------|-------------|--------------|------------------|
| Repetitive peak reverse voltage                                                                                | $V_{RRM}$   | 600          | V                |
| Diode forward current, limited by $T_{vjmax}$<br>$T_C = 25^\circ\text{C}$<br>$T_C = 115^\circ\text{C}$         | $I_F$       | 60.0<br>30.0 | A                |
| Diode pulsed current, $t_p$ limited by $T_{vjmax}$                                                             | $I_{Fpuls}$ | 90.0         | A                |
| Diode surge non repetitive forward current<br>$T_C = 25^\circ\text{C}$ , $t_p = 10.0\text{ms}$ , sine halfwave | $I_{FSM}$   | 150.0        | A                |
| Power dissipation $T_C = 25^\circ\text{C}$                                                                     | $P_{tot}$   | 143.0        | W                |
| Operating junction temperature                                                                                 | $T_{vj}$    | -40...+175   | $^\circ\text{C}$ |
| Storage temperature                                                                                            | $T_{stg}$   | -55...+150   | $^\circ\text{C}$ |
| Soldering temperature,<br>wave soldering 1.6 mm (0.063 in.) from case for 10s                                  |             | 260          | $^\circ\text{C}$ |
| Mounting torque, M3 screw<br>Maximum of mounting processes: 3                                                  | $M$         | 0.6          | Nm               |

**Thermal Resistance**

| Parameter                                    | Symbol        | Conditions | Max. Value | Unit |
|----------------------------------------------|---------------|------------|------------|------|
| <b>Characteristic</b>                        |               |            |            |      |
| Diode thermal resistance,<br>junction - case | $R_{th(j-c)}$ |            | 1.05       | K/W  |
| Thermal resistance<br>junction - ambient     | $R_{th(j-a)}$ |            | 40         | K/W  |

**Electrical Characteristic, at  $T_{vj} = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter               | Symbol | Conditions                                                         | Value  |              |                | Unit    |
|-------------------------|--------|--------------------------------------------------------------------|--------|--------------|----------------|---------|
|                         |        |                                                                    | min.   | typ.         | max.           |         |
| Static Characteristic   |        |                                                                    |        |              |                |         |
| Diode forward voltage   | $V_F$  | $I_F = 30.0A$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 175^{\circ}C$ | -<br>- | 1.65<br>1.60 | 2.00           | V       |
| Reverse leakage current | $I_R$  | $V_R = 600V$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 175^{\circ}C$  | -<br>- | -<br>-       | 40.0<br>1000.0 | $\mu A$ |

**Electrical Characteristic, at  $T_{vj} = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter                                                         | Symbol | Conditions | Value |      |      | Unit |
|-------------------------------------------------------------------|--------|------------|-------|------|------|------|
|                                                                   |        |            | min.  | typ. | max. |      |
| Dynamic Characteristic                                            |        |            |       |      |      |      |
| Internal emitter inductance<br>measured 5mm (0.197 in.) from case | $L_E$  |            | -     | 13.0 | -    | nH   |

**Switching Characteristic, Inductive Load, at  $T_{vj} = 25^{\circ}\text{C}$** 

| Parameter | Symbol | Conditions | Value |      |      | Unit |
|-----------|--------|------------|-------|------|------|------|
|           |        |            | min.  | typ. | max. |      |

**Diode Characteristic, at  $T_{vj} = 25^{\circ}\text{C}$** 

|                                                                  |              |                                                                                                                         |   |      |   |                        |
|------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------|---|------|---|------------------------|
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 25^{\circ}\text{C},$<br>$V_R = 400\text{V},$<br>$I_F = 30.0\text{A},$<br>$dI_F/dt = 1000\text{A}/\mu\text{s}$ | - | 143  | - | ns                     |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                         | - | 1.20 | - | $\mu\text{C}$          |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                         | - | 13.0 | - | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                         | - | -108 | - | $\text{A}/\mu\text{s}$ |

**Switching Characteristic, Inductive Load, at  $T_{vj} = 175^{\circ}\text{C}$** 

| Parameter | Symbol | Conditions | Value |      |      | Unit |
|-----------|--------|------------|-------|------|------|------|
|           |        |            | min.  | typ. | max. |      |

**Diode Characteristic, at  $T_{vj} = 175^{\circ}\text{C}$** 

|                                                                  |              |                                                                                                                          |   |      |   |                        |
|------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------|---|------|---|------------------------|
| Diode reverse recovery time                                      | $t_{rr}$     | $T_{vj} = 175^{\circ}\text{C},$<br>$V_R = 400\text{V},$<br>$I_F = 30.0\text{A},$<br>$dI_F/dt = 1000\text{A}/\mu\text{s}$ | - | 255  | - | ns                     |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                          | - | 2.80 | - | $\mu\text{C}$          |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                          | - | 23.0 | - | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                          | - | -108 | - | $\text{A}/\mu\text{s}$ |

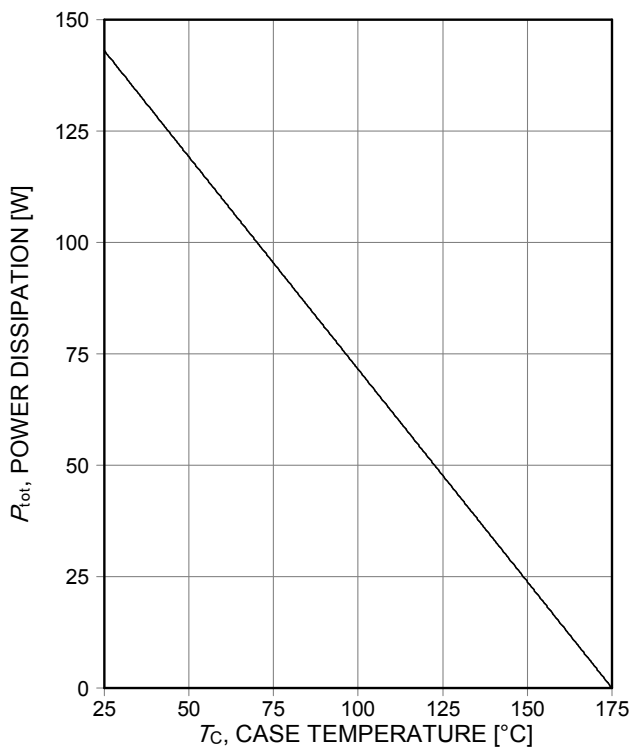


**Figure 1. Power dissipation as a function of case temperature**  
( $T_J \leq 175^\circ\text{C}$ )

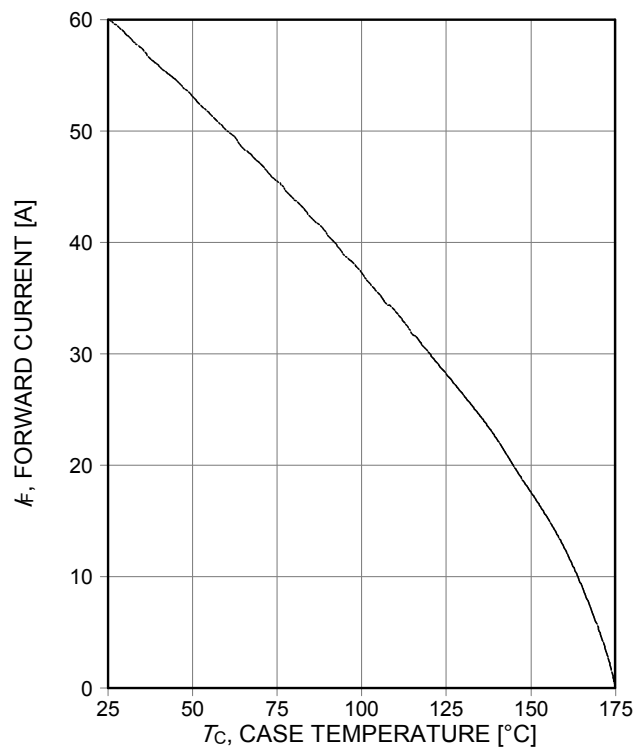


**Figure 2. Diode forward current as a function of case temperature**  
( $T_J \leq 175^\circ\text{C}$ )

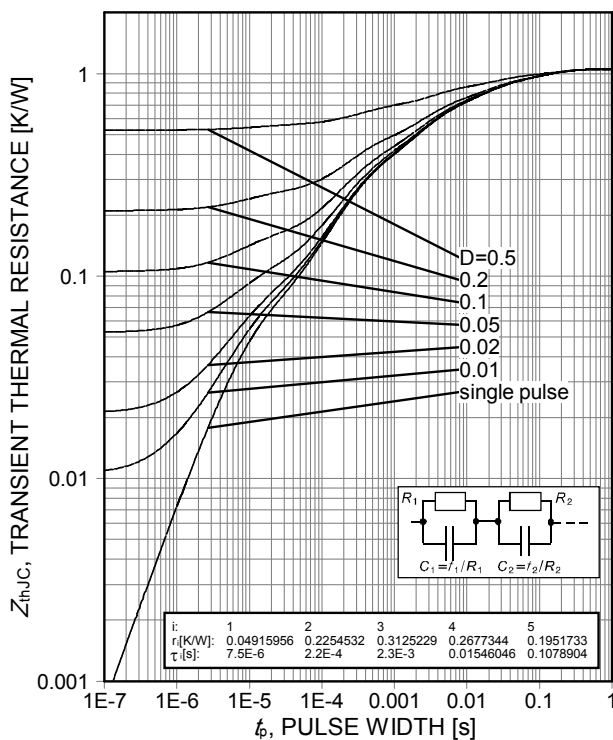


**Figure 3. Diode transient thermal impedance as a function of pulse width**  
( $D = t_p/T$ )

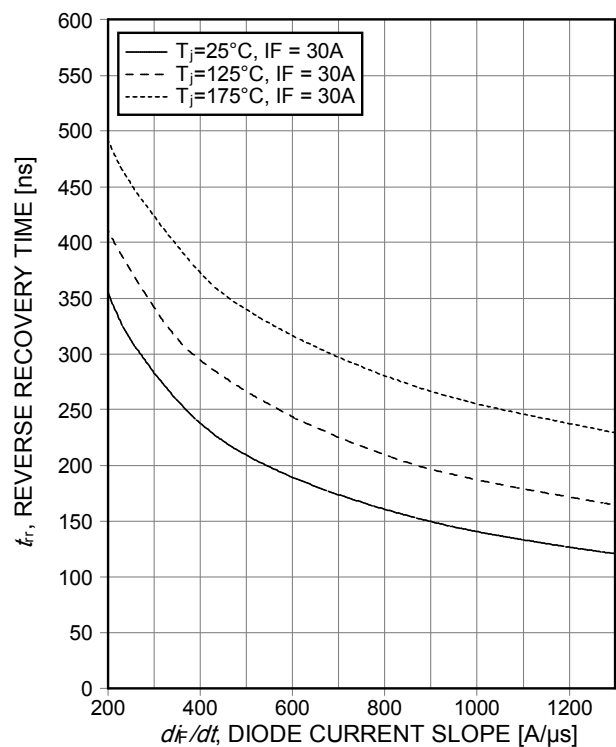


**Figure 4. Typical reverse recovery time as a function of diode current slope**  
( $V_R = 400\text{V}$ ,  $I_F = 30\text{A}$ , Dynamic test circuit in Figure E)

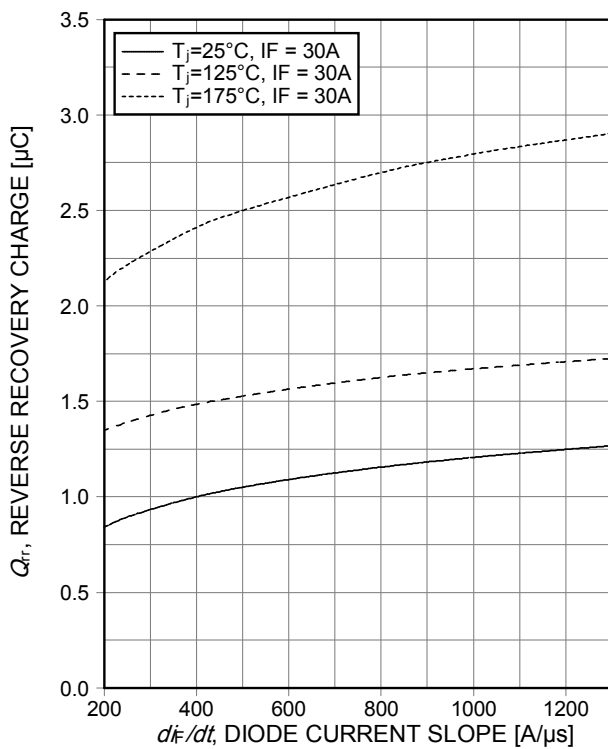


**Figure 5. Typical reverse recovery charge as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=30A$ , Dynamic test circuit in Figure E)

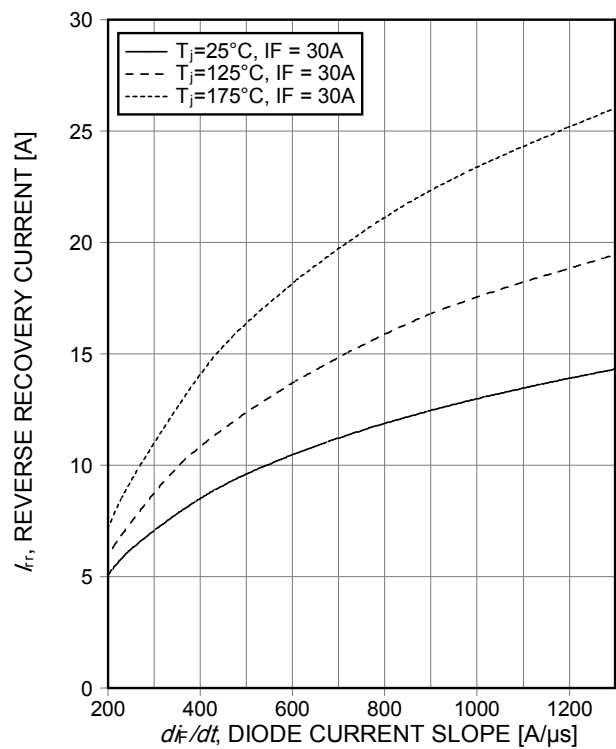


**Figure 6. Typical reverse recovery current as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=30A$ , Dynamic test circuit in Figure E)

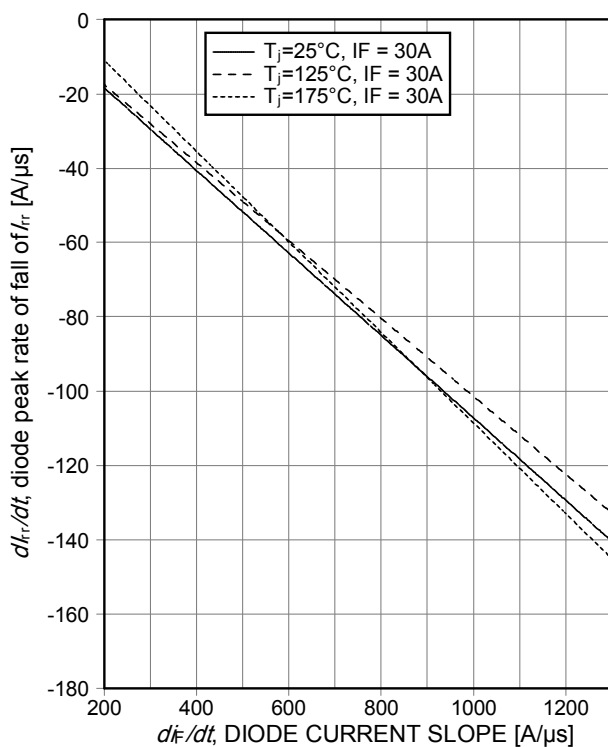


**Figure 7. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=30A$ , Dynamic test circuit in Figure E)

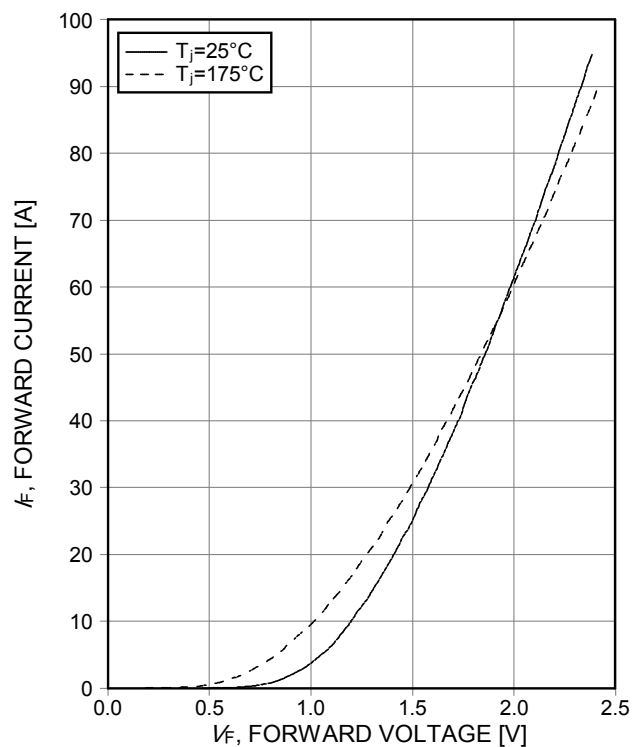


**Figure 8. Typical diode forward current as a function of forward voltage**

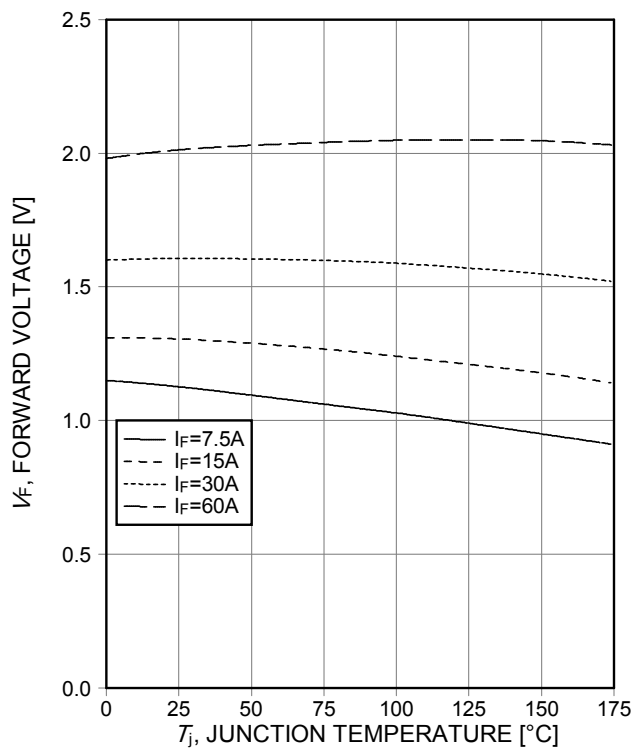
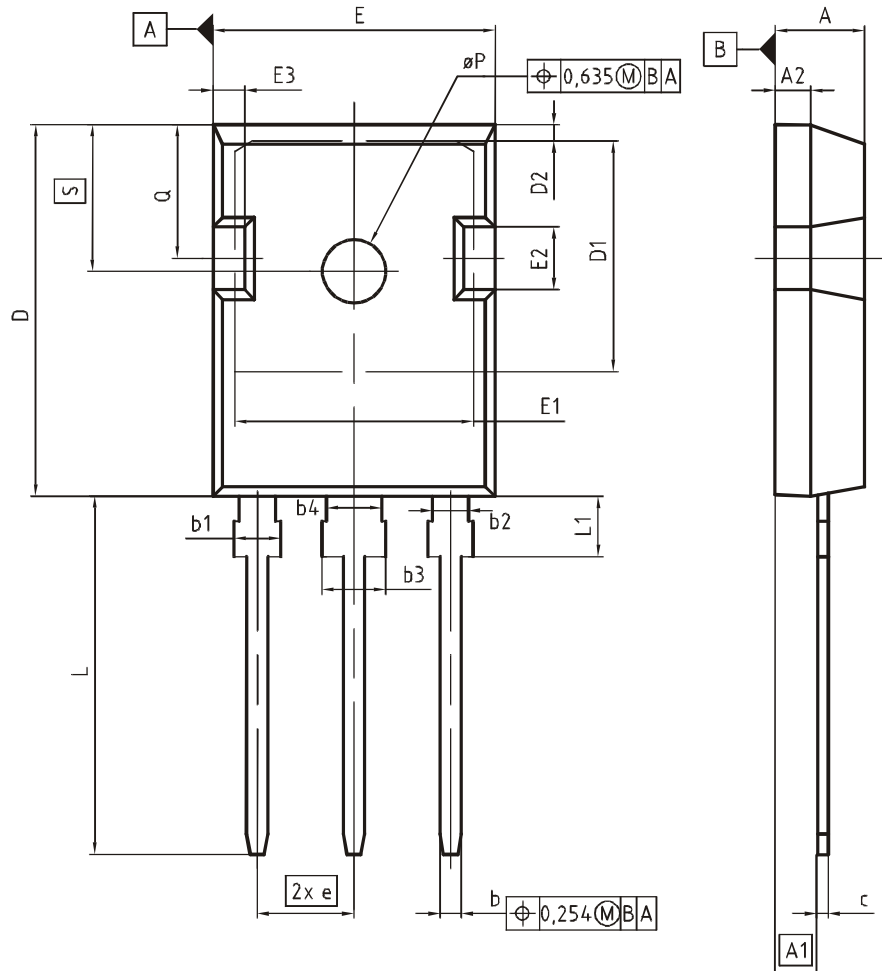
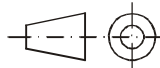


**Figure 9. Typical diode forward voltage as a function of junction temperature**

## PG-TO247-3



| DIM | MILLIMETERS |       | INCHES      |       |
|-----|-------------|-------|-------------|-------|
|     | MIN         | MAX   | MIN         | MAX   |
| A   | 4.83        | 5.21  | 0.190       | 0.205 |
| A1  | 2.27        | 2.54  | 0.089       | 0.100 |
| A2  | 1.85        | 2.16  | 0.073       | 0.085 |
| b   | 1.07        | 1.33  | 0.042       | 0.052 |
| b1  | 1.90        | 2.41  | 0.075       | 0.095 |
| b2  | 1.90        | 2.16  | 0.075       | 0.085 |
| b3  | 2.87        | 3.38  | 0.113       | 0.133 |
| b4  | 2.87        | 3.13  | 0.113       | 0.123 |
| c   | 0.55        | 0.68  | 0.022       | 0.027 |
| D   | 20.80       | 21.10 | 0.819       | 0.831 |
| D1  | 16.25       | 17.65 | 0.640       | 0.695 |
| D2  | 0.95        | 1.35  | 0.037       | 0.053 |
| E   | 15.70       | 16.13 | 0.618       | 0.635 |
| E1  | 13.10       | 14.15 | 0.516       | 0.557 |
| E2  | 3.68        | 5.10  | 0.145       | 0.201 |
| E3  | 1.00        | 2.60  | 0.039       | 0.102 |
| e   | 5.44 (BSC)  |       | 0.214 (BSC) |       |
| N   | 3           |       | 3           |       |
| L   | 19.80       | 20.32 | 0.780       | 0.800 |
| L1  | 4.10        | 4.47  | 0.161       | 0.176 |
| øP  | 3.50        | 3.70  | 0.138       | 0.146 |
| Q   | 5.49        | 6.00  | 0.216       | 0.236 |
| S   | 6.04        | 6.30  | 0.238       | 0.248 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| DOCUMENT NO.<br>Z8B00003327                                                                                  |
| SCALE<br>0 5 5 7.5mm                                                                                         |
| EUROPEAN PROJECTION<br> |
| ISSUE DATE<br>09-07-2010                                                                                     |
| REVISION<br>05                                                                                               |

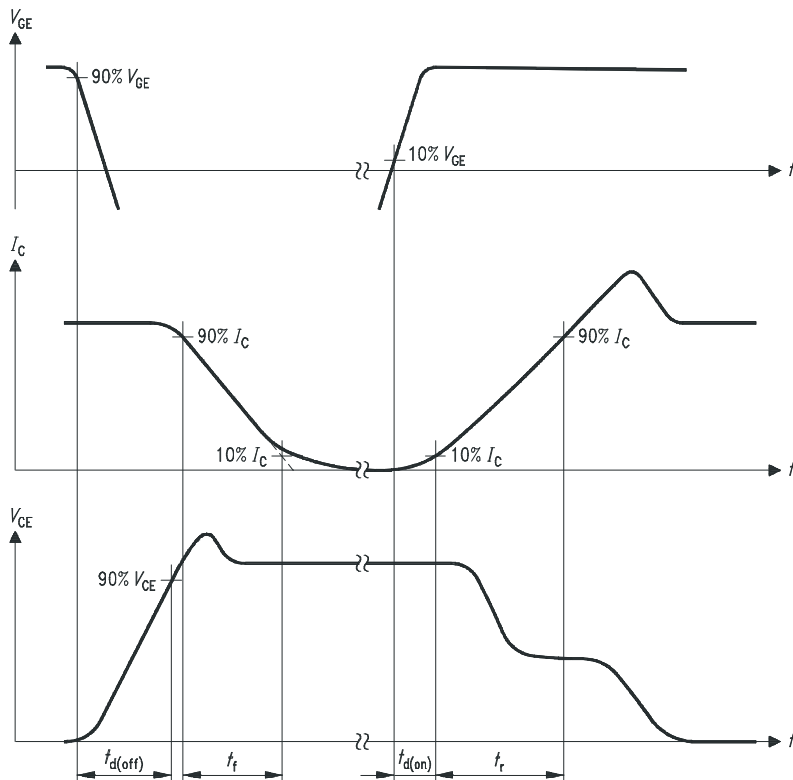


Figure A. Definition of switching times

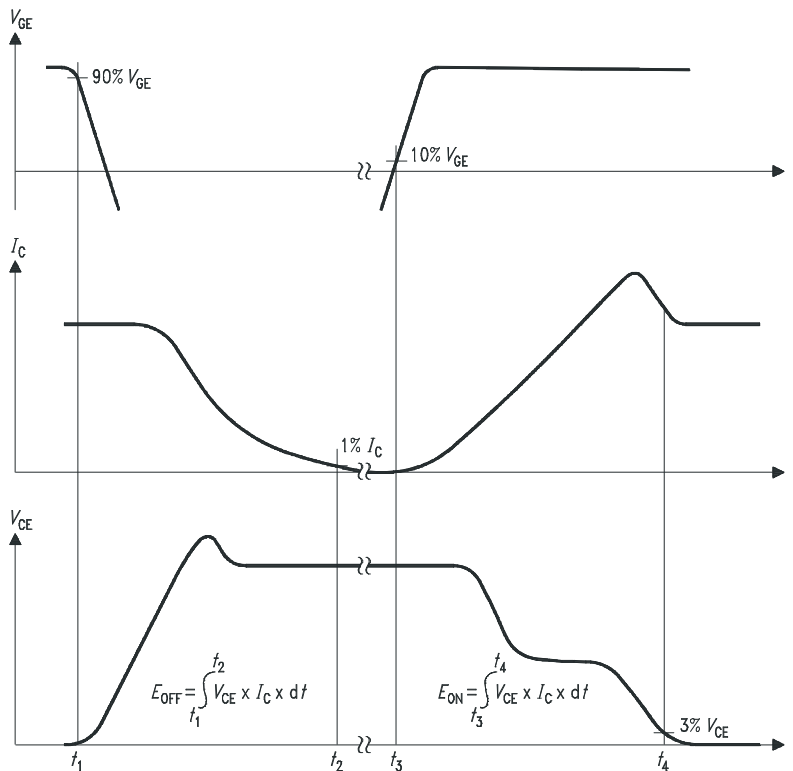


Figure B. Definition of switching losses

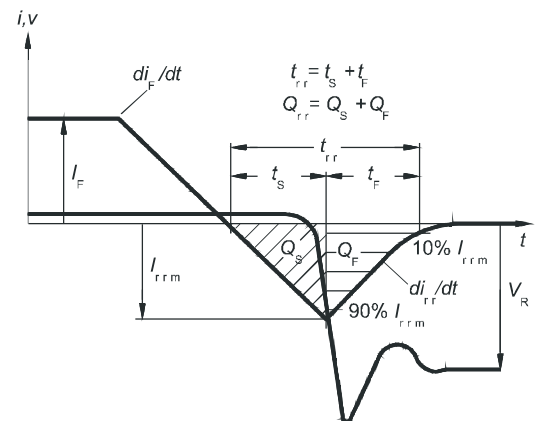


Figure C. Definition of diodes switching characteristics

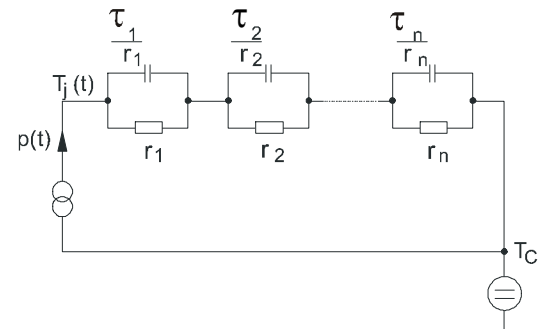


Figure D. Thermal equivalent circuit

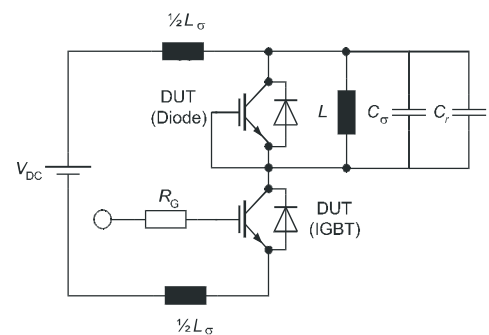


Figure E. Dynamic test circuit

Parasitic inductance  $L_\sigma$ ,  
Parasitic capacitor  $C_\sigma$ ,  
Relief capacitor  $C_r$   
(only for ZVT switching)

**Revision History**

IDW30E60

**Revision: 2011-11-10, Rev. 1.1**

Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 1.1      | 2011-11-10 | Preliminary data sheet                       |

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