

Normally – OFF Silicon Carbide Super Junction Transistor

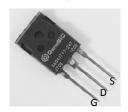
V _{DS}	=	1700 V
$V_{DS(ON)}$	=	2.0 V
I_D	=	4 A
R _{DS(ON)}	=	500 mΩ

Features

- 175 °C maximum operating temperature
- Temperature independent switching performance
- Gate oxide free SiC switch
- Suitable for connecting an anti-parallel diode
- · Positive temperature coefficient for easy paralleling
- · Low gate charge
- · Low intrinsic capacitance

Package

• RoHS Compliant





TO-247AB

Advantages

- · Low switching losses
- · Higher efficiency
- High temperature operation
- · High short circuit withstand capability

Applications

- Down Hole Oil Drilling, Geothermal Instrumentation
- Hybrid Electric Vehicles (HEV)
- Solar Inverters
- Switched-Mode Power Supply (SMPS)
- Power Factor Correction (PFC)
- · Induction Heating
- Uninterruptible Power Supply (UPS)
- Motor Drives

Maximum Ratings unless otherwise specified

Parameter	Symbol	Conditions	Values	Unit
Drain – Source Voltage	V_{DS}	V _{GS} = 0 V	1700	V
Continuous Drain Current	I _D	T _{C,MAX} = 95 °C	4	Α
Gate Peak Current	I _{GM}		5	Α
Reverse Gate – Source Voltage	V_{SG}		60	V
Reverse Drain – Source Voltage	$V_{ extsf{SD}}$		50	V
Power Dissipation	P _{tot}	T _C = 25 °C	91	W
Storage Temperature	T _{stg}		-55 to 175	°C

Electrical Characteristics at T_i = 175 °C, unless otherwise specified

Donomotor	Comple al	Conditions	Values			1114
Parameter	Symbol	Conditions	min.	typ.	max.	Unit
On Characteristics						
		I _D = 4 A, I _G = 250 mA, T _j = 25 °C		2.0		
Drain – Source On Voltage	$V_{DS(ON)}$	$I_D = 4 \text{ A}, I_G = 500 \text{ mA}, T_j = 125 ^{\circ}\text{C}$		3.3		V
_		$I_D = 4 \text{ A}, I_G = 500 \text{ mA}, T_j = 175 °C$		4.5		
		$I_D = 4 \text{ A}, I_G = 250 \text{ mA}, T_j = 25 ^{\circ}\text{C}$		500		
Drain – Source On Resistance	R _{DS(ON)}	$I_D = 4 \text{ A}, I_G = 500 \text{ mA}, T_j = 125 ^{\circ}\text{C}$		800		mΩ
	,	$I_D = 4 \text{ A}, I_G = 500 \text{ mA}, T_j = 175 °C$		1100		
Cata Farward Voltage	1/	$I_G = 500 \text{ mA}, T_j = 25 ^{\circ}\text{C}$		3.3		V
Gate Forward Voltage	$V_{GS(FWD)}$	I_G = 500 mA, T_j = 175 °C		3.2		V
DC Current Gain	ρ	$V_{DS} = 5 \text{ V}, I_{D} = 4 \text{ A}, T_{i} = 25 ^{\circ}\text{C}$		60		
	β	$V_{DS} = 5 \text{ V}, I_{D} = 4 \text{ A}, T_{j} = 175 \text{ °C}$		35		
Off Characteristics						
		V _R = 1700 V, V _{GS} = 0 V, T _i = 25 °C		0.5		
Drain Leakage Current	I _{DSS}	$V_R = 1700 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 125 \text{ °C}$		1.0		μΑ
		$V_R = 1700 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 175 ^{\circ}\text{C}$		2.0		



Electrical Characteristics at T_j = 175 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			11:4
		Conditions	min.	typ.	max.	Unit
Switching Characteristics						
Turn On Delay Time	t _{d(on)}			35		ns
Rise Time	t _r	$V_{DD} = 1100 \text{ V}, I_D = 4 \text{ A},$		28		ns
Turn Off Delay Time	$t_{d(off)}$	$R_{G(on)} = R_{G(off)} = 44 \Omega,$ $V_{GS} = -8/15 \text{ V, L} = 1.1 \text{ mH,}$		60		ns
Fall Time	t _f	FWD = GB05SLT12,		50		ns
Turn-On Energy Per Pulse	E _{on}	T _j = 25 °C		323		μJ
Turn-Off Energy Per Pulse	E _{off}	Refer to Figure 11 for gate current		60		μJ
Total Switching Energy	E _{ts}	waveform		383		μJ
Turn On Delay Time	t _{d(on)}			30		ns
Rise Time	t _r	V_{DD} = 1100 V, I_{D} = 4 A, $R_{G(on)}$ = $R_{G(off)}$ = 44 Ω , V_{GS} = -8/15 V, L = 1.1 mH,		14		ns
Turn Off Delay Time	$t_{d(off)}$			73		ns
Fall Time	t _f	FWD = GB05SLT12.		58		ns
Turn-On Energy Per Pulse	E _{on}	T _i = 175 °C		172		μJ
Turn-Off Energy Per Pulse	E _{off}	Refer to Figure 11 for gate current		73		μJ
Total Switching Energy	E _{ts}	waveform		245		μJ
Thermal Characteristics						
Thermal resistance, junction - case	R_{thJC}			1.64		°C/W

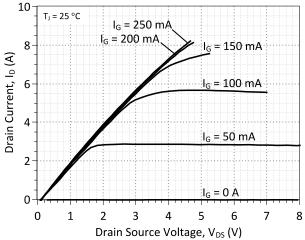


Figure 1: Typical Output Characteristics at 25 °C

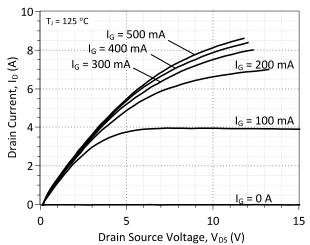


Figure 2: Typical Output Characteristics at 125 °C

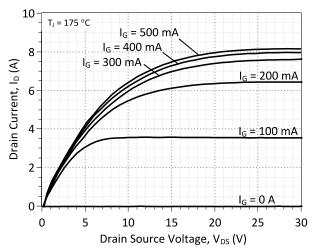


Figure 3: Typical Output Characteristics at 175 °C

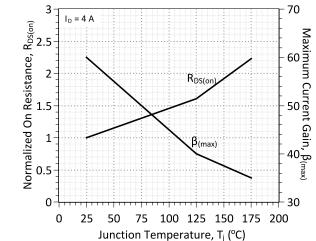


Figure 5: Normalized On-Resistance and Current Gain vs. Temperature

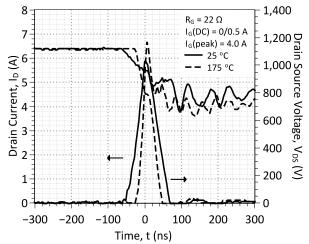


Figure 7: Typical Hard-switched Turn On Waveforms

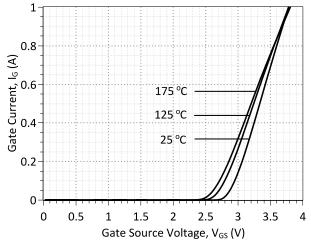


Figure 4: Typical Gate Source I-V Characteristics vs. Temperature

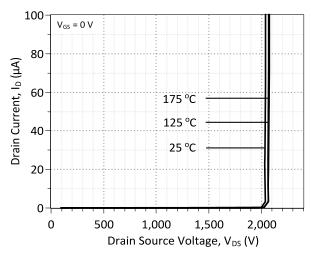


Figure 6: Typical Blocking Characteristics

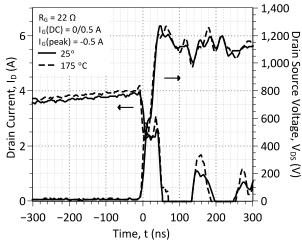


Figure 8: Typical Hard-switched Turn Off Waveforms

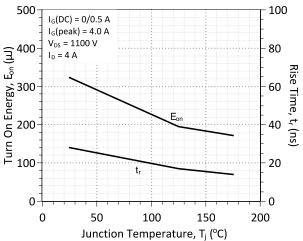


Figure 9: Typical Turn On Energy Losses and Switching Times vs. Temperature

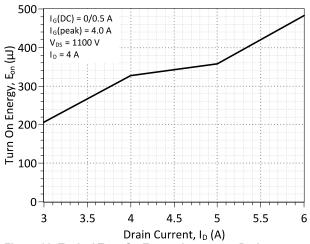


Figure 11: Typical Turn On Energy Losses vs. Drain Current

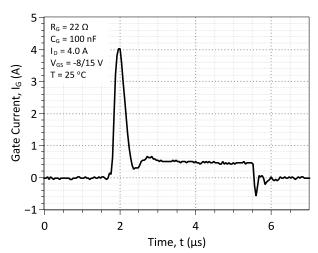


Figure 13: Typical Gate Current Waveform

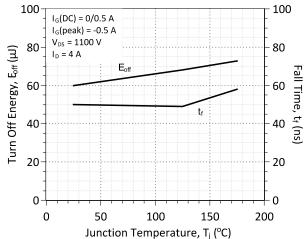


Figure 10: Typical Turn Off Energy Losses and Switching Times vs. Temperature

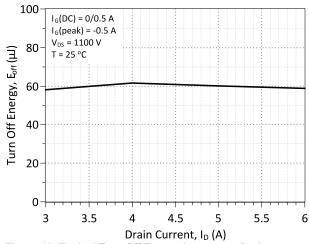


Figure 12: Typical Turn Off Energy Losses vs. Drain Current



Gate Drive Technique (Option #1)

To drive the GA04JT17-247 with the lowest gate drive losses, a custom-designed, dual voltage source gate drive configuration is recommended [for example, see Figure 5(a) in J. Rabkowski et al. IEEE Trans. Power Electronics 27(5), 2633-2642 (2012)]. More details on using this optimized gate drive technique will be made available shortly. An effective simple alternative for ultra-fast switching of the GA04JT17-247 is available below.

Gate Drive Technique (Option #2)

The GA04JT17-247 can be effectively driven using the IXYS IXDN614 / IXDD614 non-inverting gate driver IC or a comparable product. A typical gate driver configuration along with component values using this driver is offered below. Additional information is available from the manufacturer at www.ixys.com.

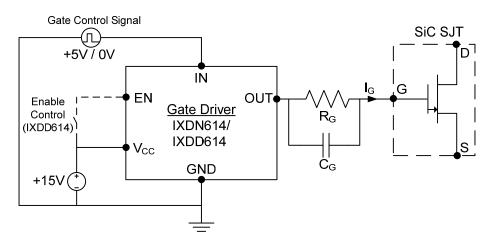
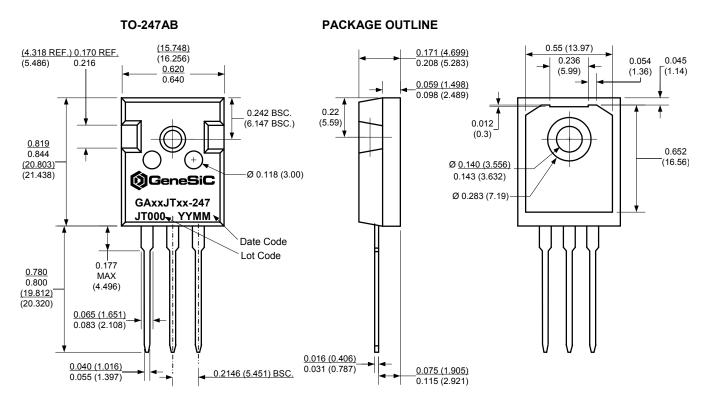


Figure 14: Recommended Gate Diver Configuration (Option #2)

Parameter	Comple al	Symbol Conditions	Values			
	Symbol		min.	typ.	max.	Unit
Gate Driver Pins (IXDD614/IXDN614))					
Supply Voltage	V _{CC}		-0.3	15	40	V
Gate Control Input Signal, Low	IN		-5.0	0	0.8	V
Gate Control Input Signal, High	IN		3.0	5.0	V _{CC} +0.3	V
Enable, Low	EN	IXDD614 Only			1/3*V _{CC}	V
Enable, High	EN	IXDD614 Only	2/3*V _{CC}			V
Output Voltage, Low	V_{OUT}				0.025	V
Output Voltage, High	V_{OUT}		V _{CC} -0.025			V
Output Current, Peak	l _{out}	Package Limited		4.5	14	Α
Output Current, Continuous	I _{out}			0.5	4.0	Α
Passive Gate Components						
Gate Resistance	R_{G}	I _G ≈ 0.5 A	5	22		Ω
Gate Capacitance	C_G	I _G ≈ 0.5 A		100		nF



Package Dimensions:



NOTE

- 1. CONTROLLED DIMENSION IS INCH. DIMENSION IN BRACKET IS MILLIMETER.
- 2. DIMENSIONS DO NOT INCLUDE END FLASH, MOLD FLASH, MATERIAL PROTRUSIONS

Revision History					
Date Revision		Comments	Supersedes		
2013/02/21	cs				
2012/12/03 0		Initial release			

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