

## Normally – OFF Silicon Carbide Super Junction Transistor

$V_{DS}$	=	<b>1200 V</b>
$V_{DS(ON)}$	=	<b>1.4 V</b>
$I_D$	=	<b>5 A</b>
$R_{DS(ON)}$	=	<b>280 mΩ</b>

### Features

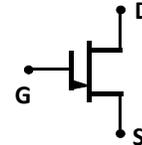
- 175 °C maximum operating temperature
- Temperature independent switching performance
- Gate oxide free SiC switch
- Suitable for connecting an anti-parallel diode
- Positive temperature coefficient for easy paralleling
- Low gate charge
- Low intrinsic capacitance

### Package

- RoHS Compliant



G D S



**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	$V_{DS}$	$V_{GS} = 0 V$	1200	V
Continuous Drain Current	$I_D$	$T_{C,MAX} = 95\text{ °C}$	5	A
Gate Peak Current	$I_{GM}$		5	A
Reverse Gate – Source Voltage	$V_{SG}$		25	V
Reverse Drain – Source Voltage	$V_{SD}$		25	V
Power Dissipation	$P_{tot}$	$T_C = 25\text{ °C}$	5	W
Storage Temperature	$T_{stg}$		-55 to 175	°C

### Electrical Characteristics at $T_j = 175\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>On Characteristics</b>						
Drain – Source On Voltage	$V_{DS(ON)}$	$I_D = 5 A, I_G = 100 mA, T_j = 25\text{ °C}$		1.4		V
		$I_D = 5 A, I_G = 200 mA, T_j = 125\text{ °C}$		1.6		
		$I_D = 5 A, I_G = 400 mA, T_j = 175\text{ °C}$		2.2		
Drain – Source On Resistance	$R_{DS(ON)}$	$I_D = 5 A, I_G = 100 mA, T_j = 25\text{ °C}$		280		mΩ
		$I_D = 5 A, I_G = 200 mA, T_j = 125\text{ °C}$		320		
		$I_D = 5 A, I_G = 400 mA, T_j = 175\text{ °C}$		440		
Gate Forward Voltage	$V_{GS(FWD)}$	$I_G = 500 mA, T_j = 25\text{ °C}$ $I_G = 500 mA, T_j = 175\text{ °C}$		3.3 3.1		V
DC Current Gain	$\beta$	$V_{DS} = 5 V, I_D = 5 A, T_j = 25\text{ °C}$ $V_{DS} = 5 V, I_D = 5 A, T_j = 175\text{ °C}$		TBD TBD		
<b>Off Characteristics</b>						
Drain Leakage Current	$I_{DSS}$	$V_R = 1200 V, V_{GS} = 0 V, T_j = 25\text{ °C}$ $V_R = 1200 V, V_{GS} = 0 V, T_j = 125\text{ °C}$ $V_R = 1200 V, V_{GS} = 0 V, T_j = 175\text{ °C}$		210 310 420		nA

**Electrical Characteristics at  $T_j = 175\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Values			Unit	
			min.	typ.	max.		
<b>Switching Characteristics</b>							
Turn On Delay Time	$t_{d(on)}$	$V_{DD} = 800\text{ V}$ , $I_D = 5\text{ A}$ , $R_{G(on)} = R_{G(off)} = 44\ \Omega$ , $V_{GS} = -8/15\text{ V}$ , $L = 1.1\text{ mH}$ , FWD = GB10SLT12, $T_j = 25\text{ }^\circ\text{C}$ Refer to Figure 11 for gate current waveform		tbd		ns	
Rise Time	$t_r$			tbd		ns	
Turn Off Delay Time	$t_{d(off)}$			tbd		ns	
Fall Time	$t_f$			tbd		ns	
Turn-On Energy Per Pulse	$E_{on}$			tbd		$\mu\text{J}$	
Turn-Off Energy Per Pulse	$E_{off}$			tbd		$\mu\text{J}$	
Total Switching Energy	$E_{ts}$			tbd		$\mu\text{J}$	
Turn On Delay Time	$t_{d(on)}$		$V_{DD} = 800\text{ V}$ , $I_D = 5\text{ A}$ , $R_{G(on)} = R_{G(off)} = 44\ \Omega$ , $V_{GS} = -8/15\text{ V}$ , $L = 1.1\text{ mH}$ , FWD = GB10SLT12, $T_j = 175\text{ }^\circ\text{C}$ Refer to Figure 11 for gate current waveform		tbd		
Rise Time	$t_r$				tbd		ns
Turn Off Delay Time	$t_{d(off)}$				tbd		ns
Fall Time	$t_f$			tbd		ns	
Turn-On Energy Per Pulse	$E_{on}$			tbd		$\mu\text{J}$	
Turn-Off Energy Per Pulse	$E_{off}$			tbd		$\mu\text{J}$	
Total Switching Energy	$E_{ts}$			tbd		$\mu\text{J}$	

**Thermal Characteristics**

Thermal resistance, junction - case	$R_{thJC}$	1.64	$^\circ\text{C/W}$
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TBD

TBD

Figure 1: Typical Output Characteristics at 25 °C

Figure 2: Typical Output Characteristics at 125 °C

TBD

Figure 3: Typical Output Characteristics at 175 °C

TBD

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

TBD

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

TBD

Figure 6: Typical Blocking Characteristics

TBD

Figure 7: Typical Hard-switched Turn On Waveforms

TBD

Figure 8: Typical Hard-switched Turn Off Waveforms

TBD

TBD

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

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

TBD

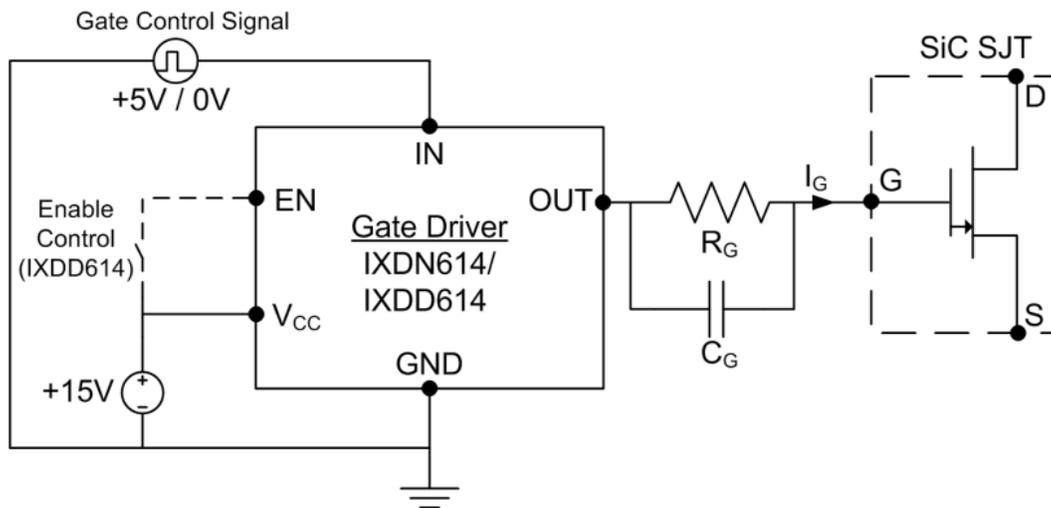
**Figure 11: Typical Gate Current Waveform**

**Gate Drive Technique (Option #1)**

To drive the GA05JT12-247 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 GA05JT12-247 is available below.

**Gate Drive Technique (Option #2)**

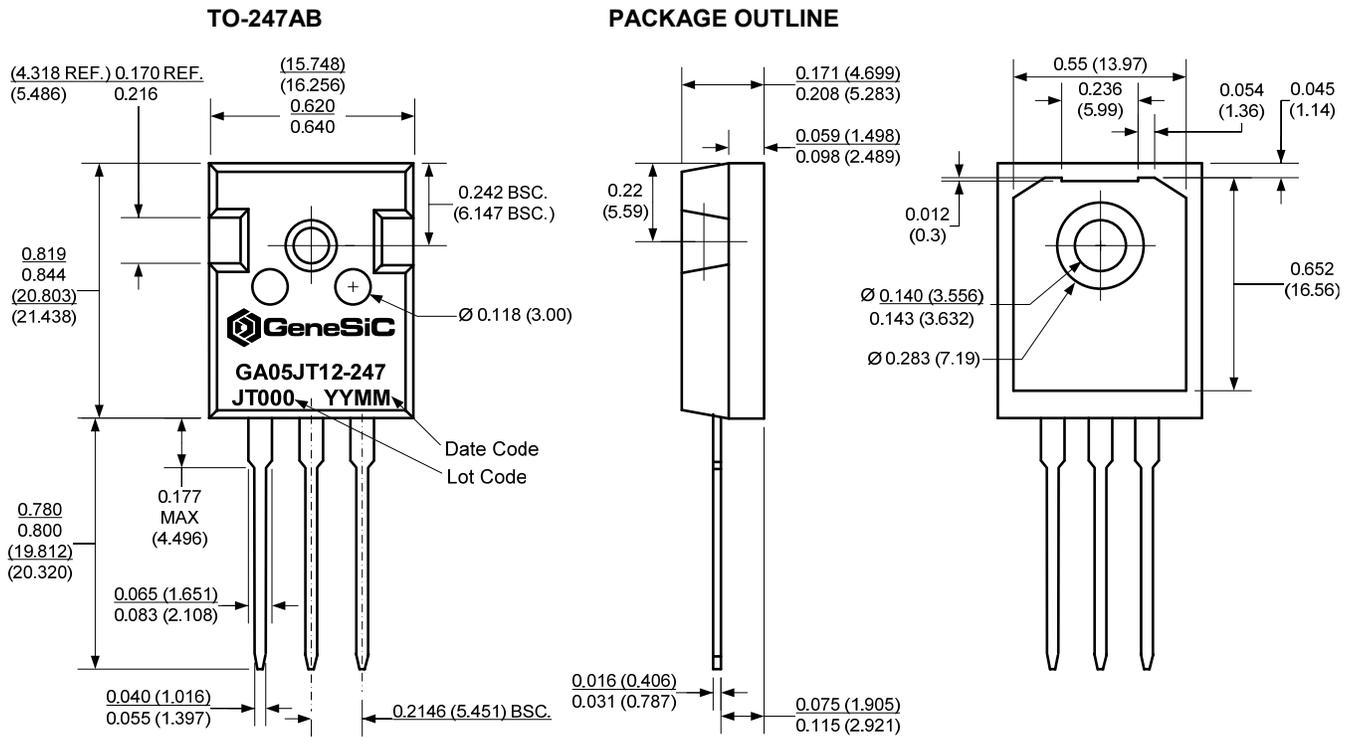
The GA05JT12-247 can be effectively driven using the IXYS IXDN614 / IXDD614 non-inverting gate driver IC or a comparable product. A typical gate driver configuration along with component values using this driver is offered below. Additional information is available from the manufacturer at [www.ixys.com](http://www.ixys.com).



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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Gate Driver Pins (IXDD614/IXDN614)</b>						
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	$I_{OUT}$	Package Limited		4.5	14	A
Output Current, Continuous	$I_{OUT}$			0.5	4.0	A
<b>Passive Gate Components</b>						
Gate Resistance	$R_G$	$I_G \approx 0.5$ A	5	22		$\Omega$
Gate Capacitance	$C_G$	$I_G \approx 0.5$ 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
2013/01/15	0	Initial release	

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