Normally – OFF Silicon Carbide Super Junction Transistor

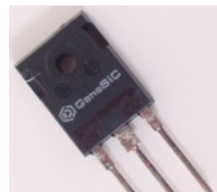
V_{DS}	=	1200 V
$V_{DS(ON)}$	=	1.4 V
I_D	=	20 A
$R_{DS(ON)}$	=	70 mΩ

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

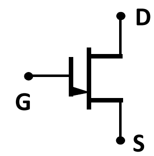
Package

- RoHS Compliant



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 °C	20	A
Gate Peak Current	I_{GM}		10	A
Reverse Gate – Source Voltage	V_{SG}		25	V
Reverse Drain – Source Voltage	V_{SD}		25	V
Power Dissipation	P_{tot}	T_C = 25 °C	5	W
Storage Temperature	T_{stg}		-55 to 175	°C

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
On Characteristics						
Drain – Source On Voltage	$V_{DS(ON)}$	I_D = 20 A, I_G = 400 mA, T_j = 25 °C		1.4		V
		I_D = 20 A, I_G = 800 mA, T_j = 125 °C		1.6		
		I_D = 20 A, I_G = 1600 mA, T_j = 175 °C		2.2		
Drain – Source On Resistance	$R_{DS(ON)}$	I_D = 20 A, I_G = 400 mA, T_j = 25 °C		70		mΩ
		I_D = 20 A, I_G = 800 mA, T_j = 125 °C		80		
		I_D = 20 A, I_G = 1600 mA, T_j = 175 °C		110		
Gate Forward Voltage	$V_{GS(FWD)}$	I_G = 500 mA, T_j = 25 °C		3.3		V
		I_G = 500 mA, T_j = 175 °C		3.1		
DC Current Gain	β	V_{DS} = 5 V, I_D = 20 A, T_j = 25 °C		TBD		
		V_{DS} = 5 V, I_D = 20 A, T_j = 175 °C		TBD		
Off Characteristics						
Drain Leakage Current	I_{DSS}	V_R = 1200 V, V_{GS} = 0 V, T_j = 25 °C		1.1		μA
		V_R = 1200 V, V_{GS} = 0 V, T_j = 125 °C		1.6		
		V_R = 1200 V, V_{GS} = 0 V, T_j = 175 °C		2.1		

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

Parameter	Symbol	Conditions	Values min.	Values typ.	Values max.	Unit
Switching Characteristics						
Turn On Delay Time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 20 A, $R_{G(on)}$ = $R_{G(off)}$ = 44 Ω, V_{GS} = -8/15 V, L = 1.1 mH, FWD = GB40SLT12, T_j = 25 °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		µJ
Turn-Off Energy Per Pulse	E_{off}			tbd		µJ
Total Switching Energy	E_{ts}			tbd		µJ
Turn On Delay Time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 20 A, $R_{G(on)}$ = $R_{G(off)}$ = 44 Ω, V_{GS} = -8/15 V, L = 1.1 mH, FWD = GB40SLT12, T_j = 175 °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		µJ
Turn-Off Energy Per Pulse	E_{off}			tbd		µJ
Total Switching Energy	E_{ts}			tbd		µJ
Thermal Characteristics						
Thermal resistance, junction - case	R_{thJC}			1.64		°C/W

TBD

Figure 1: Typical Output Characteristics at 25 °C

TBD

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

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

TBD

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 GA20JT12-247 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 GA20JT12-247 is available below.

Gate Drive Technique (Option #2)

The GA20JT12-247 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.

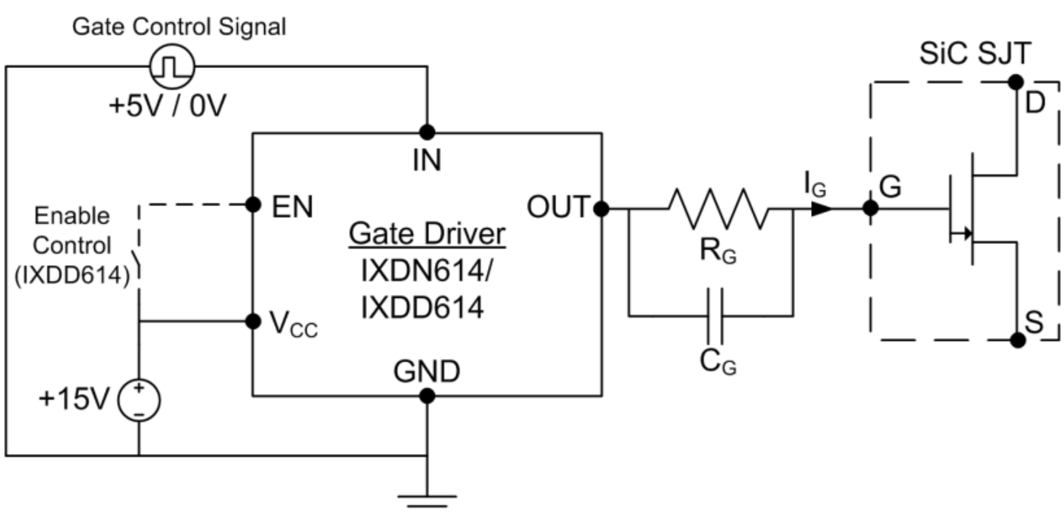
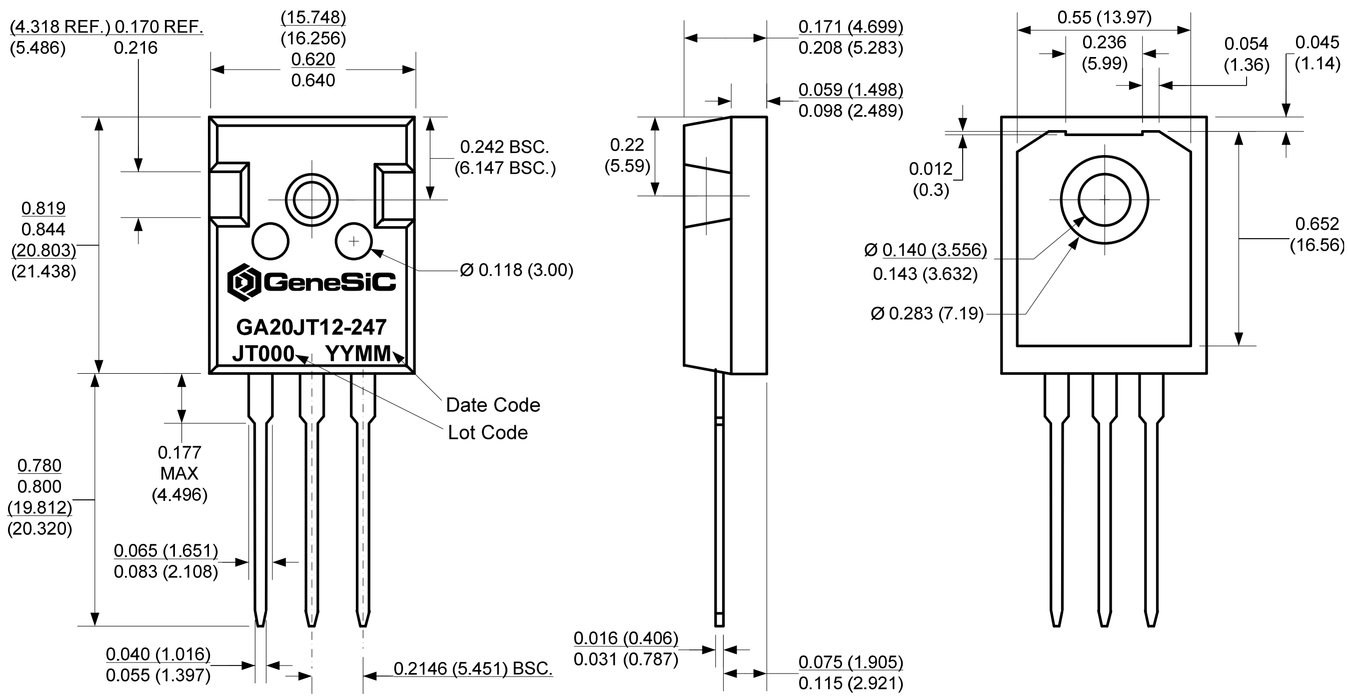


Figure 14: Recommended Gate Diver Configuration (Option #2)

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
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	I_{OUT}	Package Limited		4.5	14	A
Output Current, Continuous	I_{OUT}			0.5	4.0	A
Passive Gate Components						
Gate Resistance	R_G	$I_G \approx 0.5$ A	5	22		Ω
Gate Capacitance	C_G	$I_G \approx 0.5$ A		100		nF

Package Dimensions:

TO-247AB PACKAGE OUTLINE



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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