

## Normally – OFF Silicon Carbide Junction Transistor

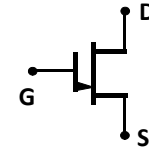
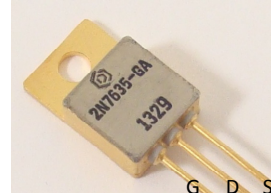
$V_{DS}$	=	<b>650 V</b>
$V_{DS(ON)}$	=	<b>1.7 V</b>
$I_D$	=	<b>4 A</b>
$R_{DS(ON)}$	=	<b>425 mΩ</b>

### Features

- 250 °C maximum operating temperature
- Temperature independent switching performance
- Electrically isolated base-plate
- 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 – 257 (Isolated Base-plate Hermetic Package)

### 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 at $T_j = 250\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Values	Unit
Drain – Source Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$	650	V
Continuous Drain Current	$I_D$	$T_C = 165\text{ °C}$	4	A
Gate Peak Current	$I_{GM}$		5	A
Reverse Gate – Source Voltage	$V_{GS}$		30	V
Reverse Drain – Source Voltage	$V_{DS}$		40	V
Power Dissipation	$P_{tot}$	$T_C = 25\text{ °C}$	7	W
Operating and Storage Temperature	$T_j, T_{stg}$		-55 to 250	°C

### Electrical Characteristics at $T_j = 250\text{ °C}$ , unless otherwise specified

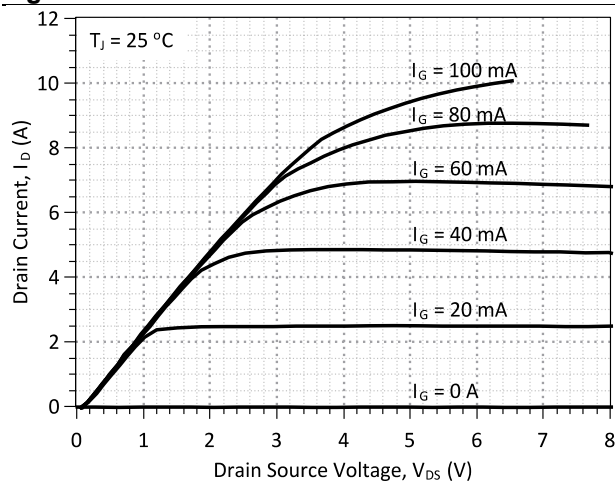
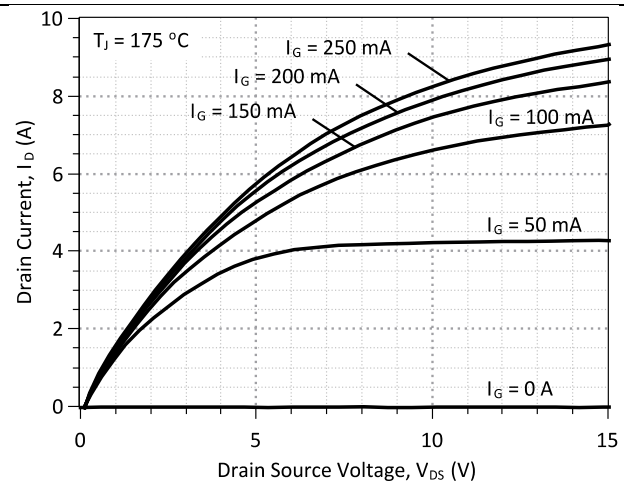
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>On Characteristics</b>						
Drain – Source On Voltage	$V_{DS(ON)}$	$I_D = 4\text{ A}, I_G = 100\text{ mA}, T_j = 25\text{ °C}$		1.7	2.2	V
		$I_D = 4\text{ A}, I_G = 250\text{ mA}, T_j = 175\text{ °C}$		3.2	4.0	
		$I_D = 4\text{ A}, I_G = 250\text{ mA}, T_j = 250\text{ °C}$		4.7	5.5	
Drain – Source On Resistance	$R_{DS(ON)}$	$I_D = 4\text{ A}, I_G = 100\text{ mA}, T_j = 25\text{ °C}$		425		mΩ
		$I_D = 4\text{ A}, I_G = 250\text{ mA}, T_j = 175\text{ °C}$		800		
		$I_D = 4\text{ A}, I_G = 250\text{ mA}, T_j = 250\text{ °C}$		1180		
Gate Forward Voltage	$V_{GS(FWD)}$	$I_G = 500\text{ mA}, T_j = 25\text{ °C}$ $I_G = 500\text{ mA}, T_j = 250\text{ °C}$		3.3 3.2		V
DC Current Gain	$\beta$	$V_{DS} = 5\text{ V}, I_D = 5\text{ A}, T_j = 25\text{ °C}$	90	110		
		$V_{DS} = 5\text{ V}, I_D = 5\text{ A}, T_j = 250\text{ °C}$	60	80		

### Off Characteristics

Drain Leakage Current	$I_{DSS}$	$V_R = 650\text{ V}, V_{GS} = 0\text{ V}, T_j = 25\text{ °C}$	0.1	10	$\mu\text{A}$
		$V_R = 650\text{ V}, V_{GS} = 0\text{ V}, T_j = 175\text{ °C}$	1	50	
		$V_R = 650\text{ V}, V_{GS} = 0\text{ V}, T_j = 250\text{ °C}$	10	100	

**Electrical Characteristics at  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 35\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, T_{vj} = 25\text{ }^\circ\text{C}$		324		pF
Output Capacitance	$C_{oss}$			45		pF
Reverse Transfer Capacitance	$C_{rss}$			45		pF
<b>Switching Characteristics</b>						
Turn On Delay Time	$t_{d(on)}$	$V_{DD} = 400\text{ V}, I_D = 5\text{ A},$ $R_{G(on)} = R_{G(off)} = 44\text{ }\Omega,$ $V_{GS} = -8/15\text{ V}, T_j = 175\text{ }^\circ\text{C}$ Refer to Figure 10 for gate drive current waveforms		5		ns
Rise Time	$t_r$			15		ns
Turn Off Delay Time	$t_{d(off)}$			74		ns
Fall Time	$t_f$			14		ns
Turn-On Energy Per Pulse	$E_{on}$			24		$\mu\text{J}$
Turn-Off Energy Per Pulse	$E_{off}$		7		$\mu\text{J}$	
Total Switching Energy	$E_{ts}$		31		$\mu\text{J}$	
Turn On Delay Time	$t_{d(on)}$	$V_{DD} = 400\text{ V}, I_D = 5\text{ A},$ $R_{G(on)} = R_{G(off)} = 44\text{ }\Omega,$ $V_{GS} = -8/15\text{ V}, T_j = 250\text{ }^\circ\text{C}$ Refer to Figure 10 for gate drive current waveforms		9		ns
Rise Time	$t_r$			24		ns
Turn Off Delay Time	$t_{d(off)}$			114		ns
Fall Time	$t_f$			17		ns
Turn-On Energy Per Pulse	$E_{on}$			54		$\mu\text{J}$
Turn-Off Energy Per Pulse	$E_{off}$		10		$\mu\text{J}$	
Total Switching Energy	$E_{ts}$		64		$\mu\text{J}$	
<b>Thermal Characteristics</b>						
Thermal resistance, junction - case	$R_{th(jc)}$			4.2		$^\circ\text{C/W}$

**Figures**

**Figure 1: Typical Output Characteristics at 25 °C**

**Figure 2: Typical Output Characteristics at 175 °C**

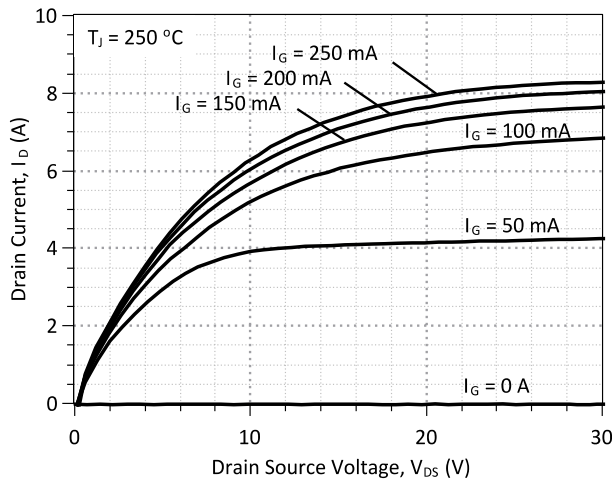


Figure 3: Typical Output Characteristics at 250 °C

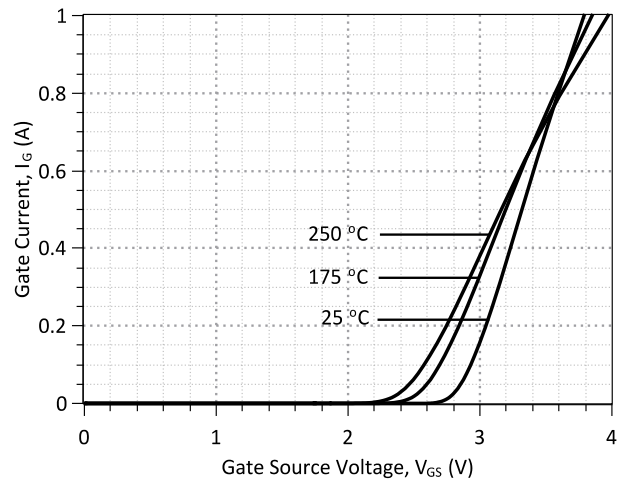


Figure 4: Typical Gate Source I-V Characteristics vs. Temperature

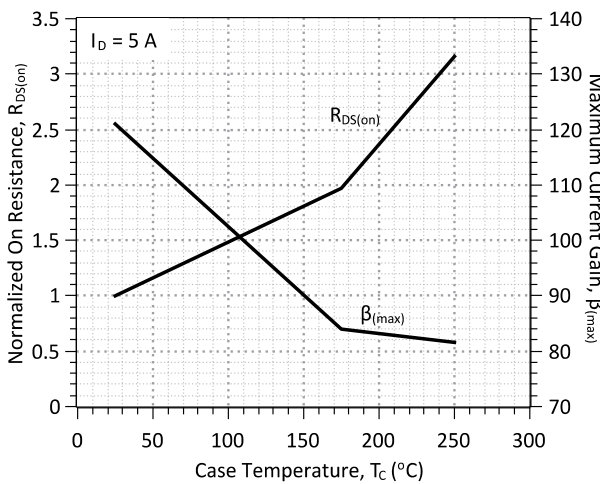


Figure 5: Normalized On-Resistance and Current Gain vs. Temperature

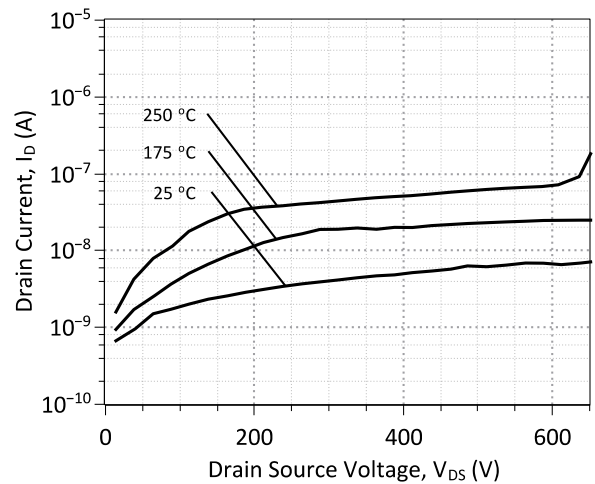


Figure 6: Typical Blocking Characteristics

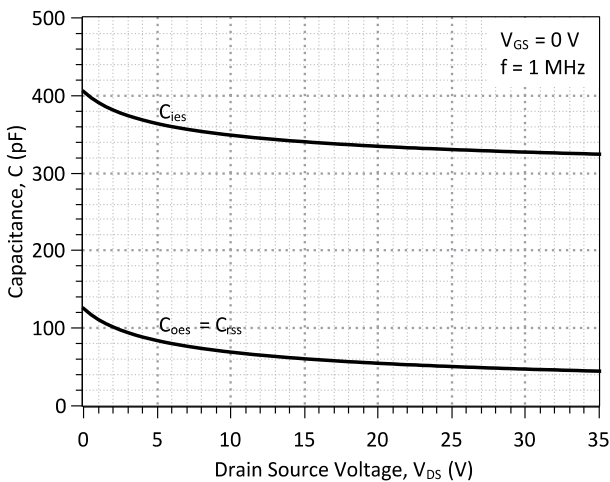


Figure 7: Typical Capacitance vs Drain-Source Voltage

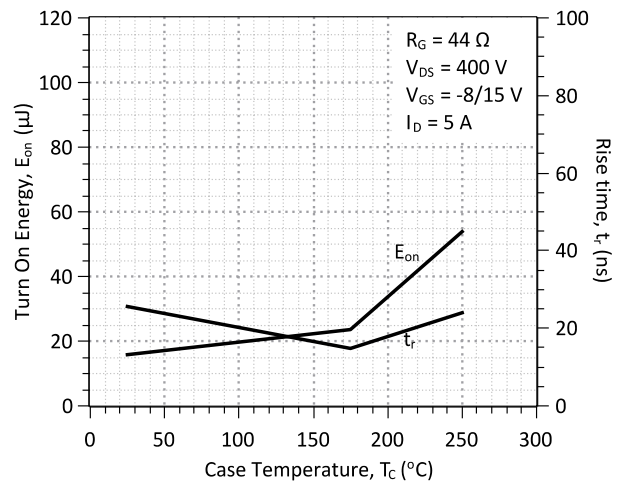
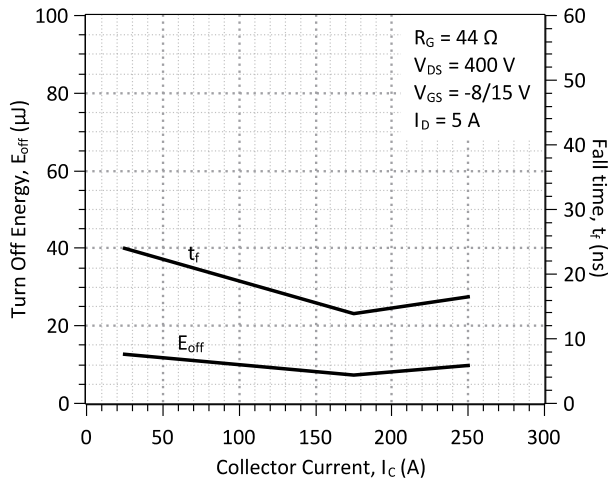
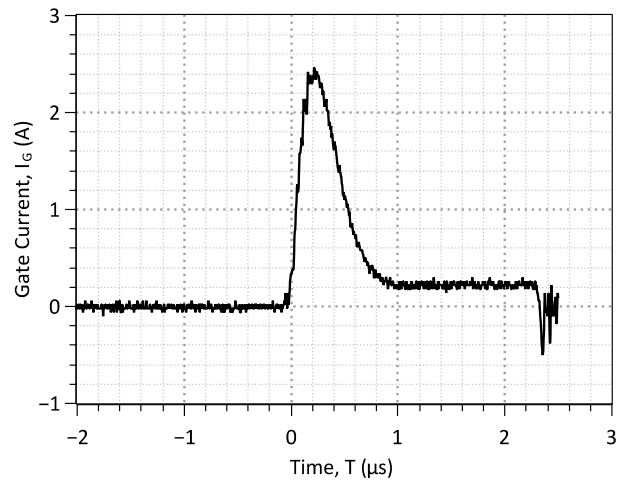


Figure 8: Typical Turn On Energy Losses and Switching Times vs. Temperature

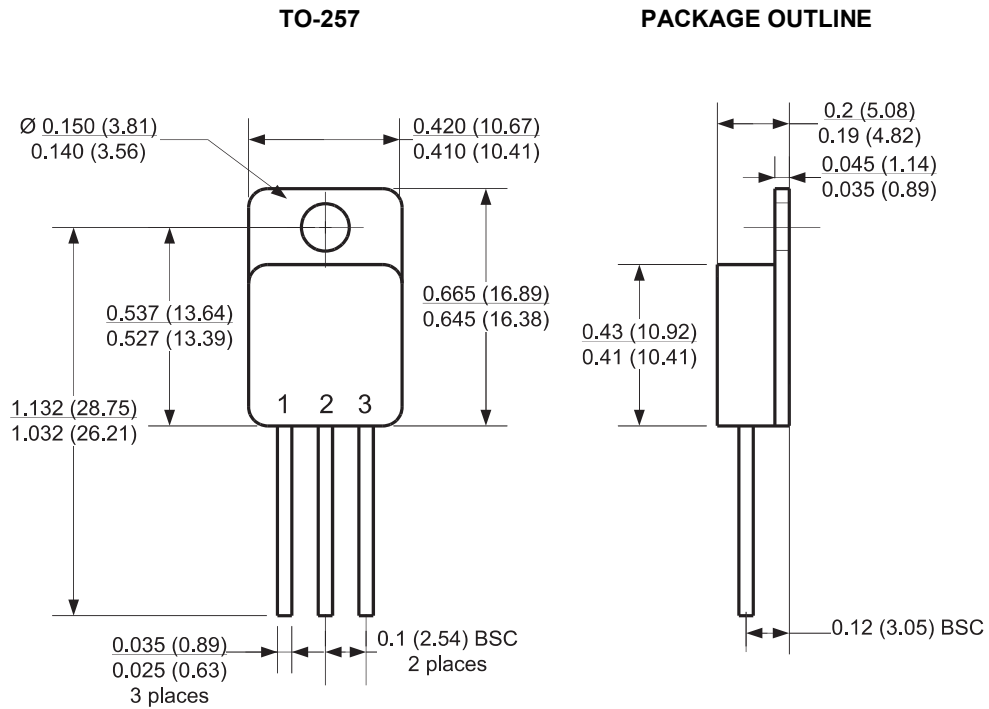


**Figure 9: Typical Turn Off Energy Losses and Switching Times vs. Temperature**



**Figure 10: Typical Gate-Source Switching Waveforms**

**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
2013/11/18	1	Updated Electrical Characteristics	
2012/08/24	0	Initial release	

Published by

GeneSiC Semiconductor, Inc.  
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## SPICE Model Parameters

This is a secure document. Copy this code from the SPICE model PDF file on our website into a SPICE software program for simulation of the 2N7635-GA.

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*      MODEL OF GeneSiC Semiconductor Inc.
*
*      $Revision:   1.0           $
*      $Date:      06-SEP-2013   $
*
*      GeneSiC Semiconductor Inc.
*      43670 Trade Center Place Ste. 155
*      Dulles, VA 20166
*
*      COPYRIGHT (C) 2013 GeneSiC Semiconductor Inc.
*      ALL RIGHTS RESERVED
*
*      These models are provided "AS IS, WHERE IS, AND WITH NO WARRANTY
*      OF ANY KIND EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED
*      TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
*      PARTICULAR PURPOSE."
*      Models accurate up to 2 times rated drain current.
*
.model 2N7635 NPN
+ IS      1.22E-47
+ ISE     3.91E-27
+ EG      3.23
+ BF      110
+ BR      0.55
+ IKF     999
+ NF      1
+ NE      2.022
+ RB      0.26
+ RE      0.231
+ RC      0.16
+ CJC     1.37E-10
+ VJC     3.173990516
+ MJC     0.436428533
+ CJE     3.36E-10
+ VJE     2.944816511
+ MJE     0.493905327
+ XTI     3
+ XTB     -0.45
+ TRC1    1.50E-02
+ VCEO    650
+ ICRATING 4
+ MFG     GeneSiC_Semiconductor
*
*      End of 2N7635-GA SPICE Model
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