

Normally – OFF Silicon Carbide Junction Transistor

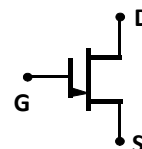
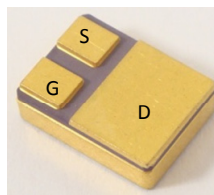
V_{DS}	=	650 V
$V_{DS(ON)}$	=	1.7 V
I_D	=	4 A
$R_{DS(ON)}$	=	425 mΩ

Features

- 250 °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



SMD0.5 / TO – 276 (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.	

On Characteristics

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	$V_{GS(FWD)}$	$I_G = 500\text{ mA}, T_j = 25\text{ °C}$		3.3		V
		$I_G = 500\text{ mA}, T_j = 250\text{ °C}$		3.2		
DC Current Gain	β	$V_{DS} = 5\text{ V}, I_D = 5\text{ A}, T_j = 25\text{ °C}$	90	110		
		$V_{DS} = 5\text{ V}, I_D = 5\text{ A}, T_j = 250\text{ °C}$	60	80		

Off Characteristics

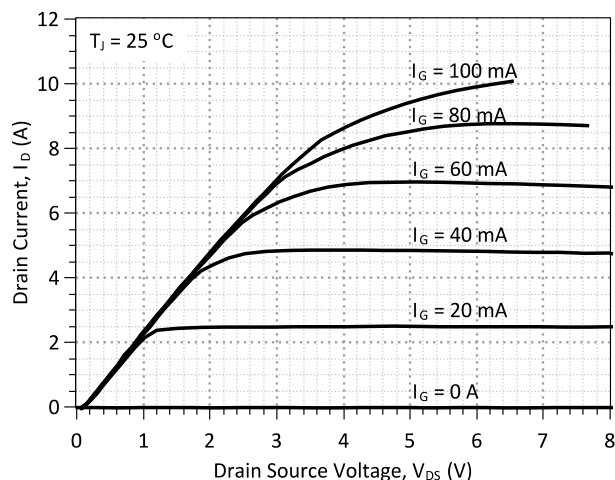
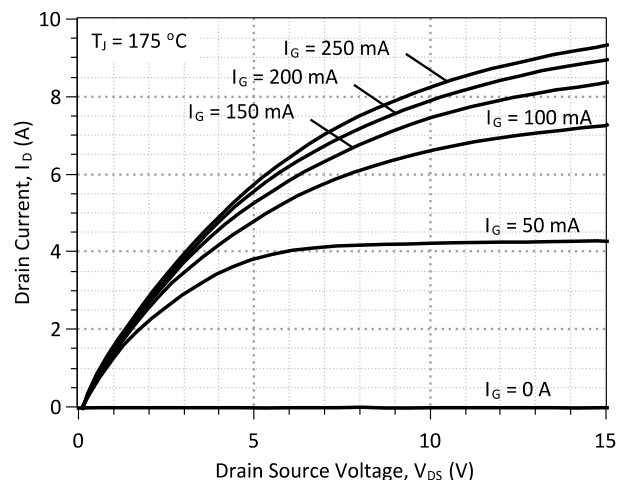
Drain Leakage Current	I_{DSS}	$V_R = 650\text{ V}, V_{GS} = 0\text{ V}, T_j = 25\text{ °C}$		0.1	10	μA
		$V_R = 650\text{ V}, V_{GS} = 0\text{ V}, T_j = 175\text{ °C}$		1	50	
		$V_R = 650\text{ V}, V_{GS} = 0\text{ V}, T_j = 250\text{ °C}$		10	100	

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
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
Switching Characteristics						
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		μJ
Turn-Off Energy Per Pulse	E_{off}	$V_{DD} = 400\text{ V}$, $I_D = 5\text{ A}$, $R_{G(on)} = R_{G(off)} = 44\text{ }\Omega$, $V_{GS} = -8/15\text{ V}$, $T_J = 250\text{ }^{\circ}\text{C}$ Refer to Figure 10 for gate drive current waveforms		7		μJ
Total Switching Energy	E_{ts}			31		μJ
Turn On Delay Time	$t_{d(on)}$			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		μJ
Turn-Off Energy Per Pulse	E_{off}			10		μJ
Total Switching Energy	E_{ts}			64		μJ

Thermal Characteristics

Thermal resistance, junction - case	R_{thJC}	1.6	$^\circ\text{C/W}$
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Figure 1: Typical Output Characteristics at 25°C

Figure 2: Typical Output Characteristics at 175°C

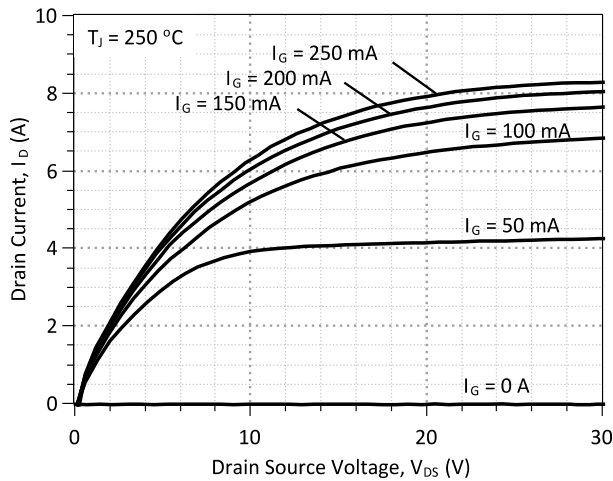


Figure 3: Typical Output Characteristics at 250 °C

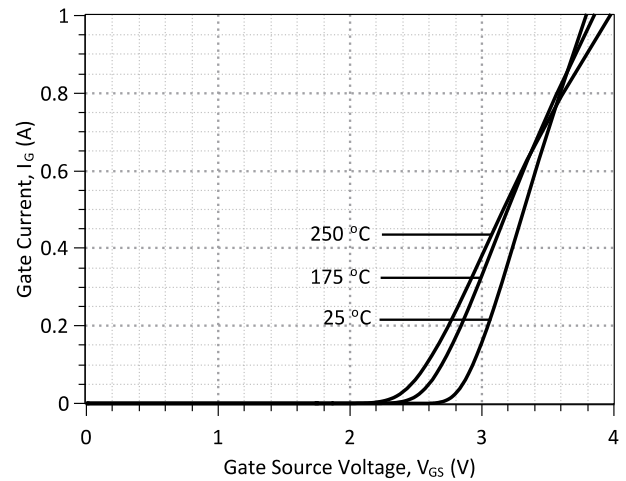


Figure 4: Typical Gate Source I-V Characteristics vs. Temperature

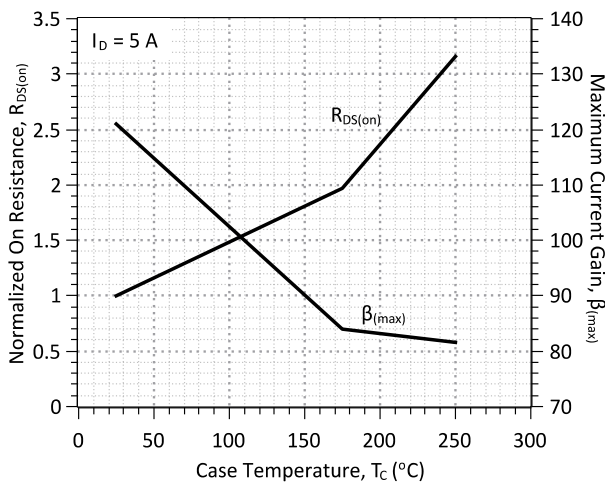


Figure 5: Normalized On-Resistance and Current Gain vs. Temperature

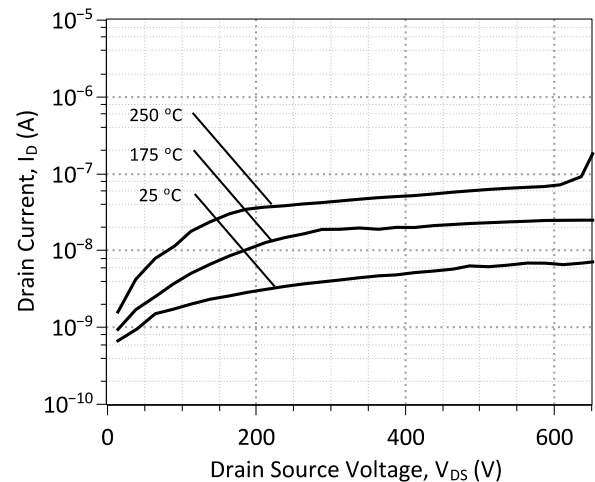


Figure 6: Typical Blocking Characteristics

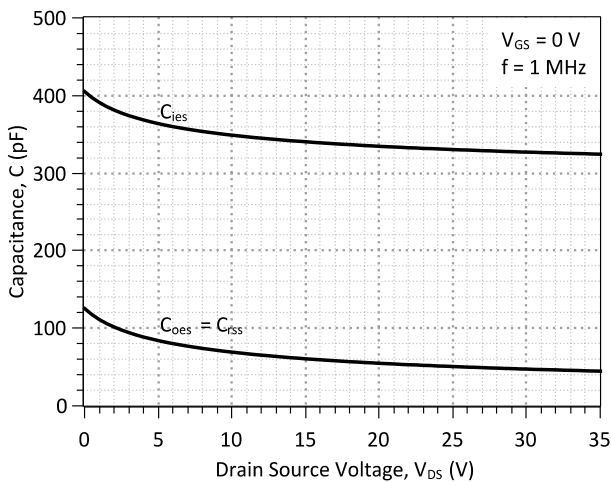


Figure 7: Typical Capacitance vs Drain-Source Voltage

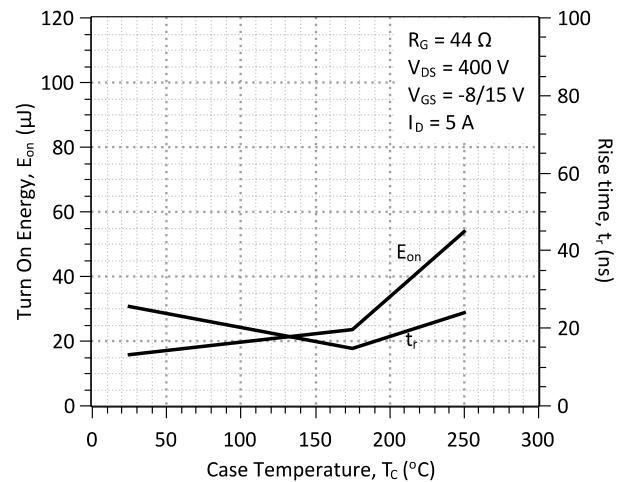


Figure 8: Typical Turn On Energy Losses and Switching Times vs. Temperature

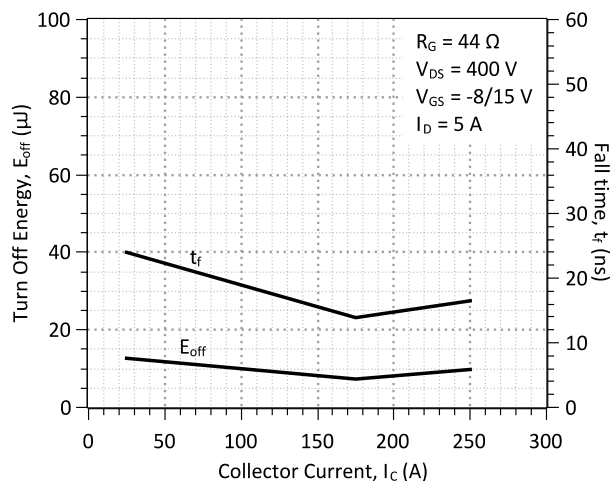


Figure 9: Typical Turn Off Energy Losses and Switching Times vs. Temperature

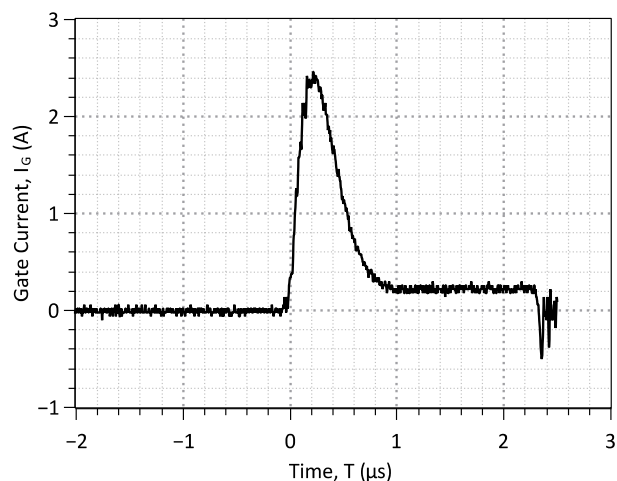
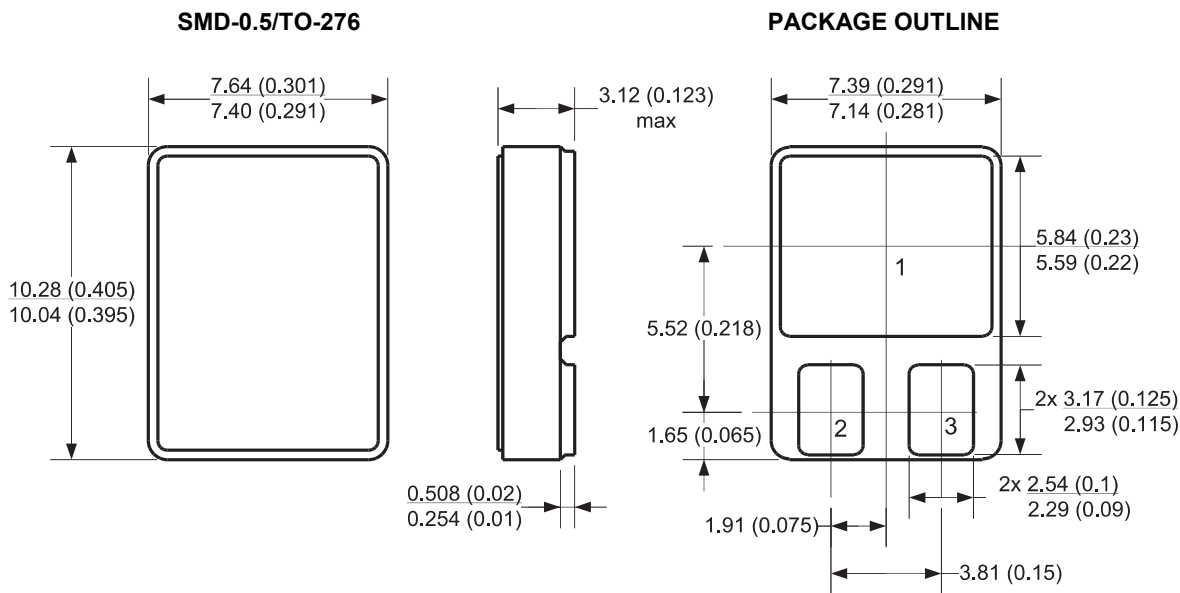


Figure 10: Typical Gate-Source Switching Waveforms

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	

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SPICE Model Parameters

Copy the following code into a SPICE software program for simulation of the 2N7636-GA device.

```
*      MODEL OF GeneSiC Semiconductor Inc.
*
*      $Revision:   1.0           $
*      $Date:      06-SEP-2013    $
*
*      GeneSiC Semiconductor Inc.
*      43670 Trade Center Place Ste. 155
*      Dulles, VA 20166
*      http://www.genesicsemi.com/index.php/hit-sic/sjt
*
*      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 2N7636 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 2N7636-GA SPICE Model
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