

## Normally – OFF Silicon Carbide Super Junction Transistor

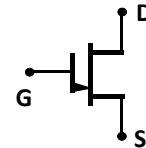
<b>V<sub>DS</sub></b>	<b>=</b>	<b>650 V</b>
<b>V<sub>DS(ON)</sub></b>	<b>=</b>	<b>1.4 V</b>
<b>I<sub>D</sub></b>	<b>=</b>	<b>8 A</b>
<b>R<sub>DS(ON)</sub></b>	<b>=</b>	<b>170 mΩ</b>

### 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<sub>j</sub> = 250 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values	Unit
Drain – Source Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V	650	V
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> = 158 °C	8	A
Gate Peak Current	I <sub>GM</sub>		5	A
Reverse Gate – Source Voltage	V <sub>GS</sub>		200	V
Reverse Drain – Source Voltage	V <sub>DS</sub>		40	V
Power Dissipation	P <sub>tot</sub>	T <sub>C</sub> = 25 °C	11	W
Operating and Storage Temperature	T <sub>j</sub> , T <sub>stg</sub>		-55 to 250	°C

### Electrical Characteristics at T<sub>j</sub> = 250 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values		
			min.	typ.	max.
<b>On Characteristics</b>					
Drain – Source On Voltage	V <sub>DS(ON)</sub>	I <sub>D</sub> = 8 A, I <sub>G</sub> = 250 mA, T <sub>j</sub> = 25 °C I <sub>D</sub> = 8 A, I <sub>G</sub> = 500 mA, T <sub>j</sub> = 175 °C I <sub>D</sub> = 8 A, I <sub>G</sub> = 500 mA, T <sub>j</sub> = 250 °C	1.4 2.6 3.9		V
Drain – Source On Resistance	R <sub>DS(ON)</sub>	I <sub>D</sub> = 8 A, I <sub>G</sub> = 250 mA, T <sub>j</sub> = 25 °C I <sub>D</sub> = 8 A, I <sub>G</sub> = 500 mA, T <sub>j</sub> = 175 °C I <sub>D</sub> = 8 A, I <sub>G</sub> = 500 mA, T <sub>j</sub> = 250 °C	170 330 550		mΩ
Gate Forward Voltage	V <sub>GS(FWD)</sub>	I <sub>G</sub> = 500 mA, T <sub>j</sub> = 25 °C I <sub>G</sub> = 500 mA, T <sub>j</sub> = 250 °C	3 2.7		V
DC Current Gain	β	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 10 A, T <sub>j</sub> = 25 °C V <sub>DS</sub> = 5 V, I <sub>D</sub> = 10 A, T <sub>j</sub> = 250 °C	120 80		

### Off Characteristics

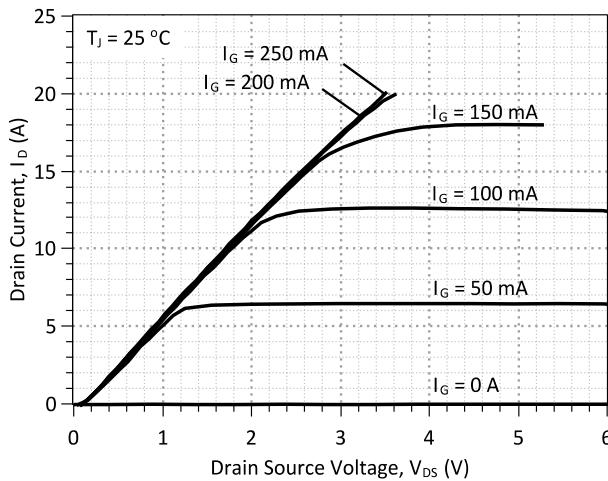
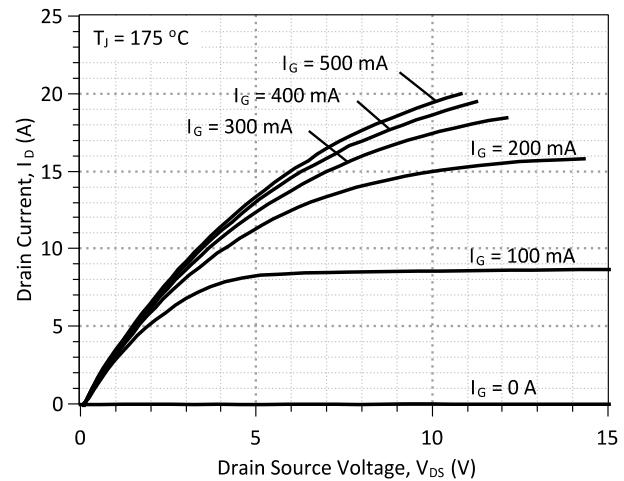
Drain Leakage Current	I <sub>DSS</sub>	V <sub>R</sub> = 650 V, V <sub>GS</sub> = 0 V, T <sub>j</sub> = 25 °C V <sub>R</sub> = 650 V, V <sub>GS</sub> = 0 V, T <sub>j</sub> = 175 °C V <sub>R</sub> = 650 V, V <sub>GS</sub> = 0 V, T <sub>j</sub> = 250 °C	2.5 4 10		μA
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**Electrical Characteristics at  $T_J = 250^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Values		
			min.	typ.	max.
<b>Dynamic Characteristics</b>					
Input Capacitance	$C_{iss}$	$V_{DS} = 35\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, T_J = 25^\circ\text{C}$	720		pF
Output Capacitance	$C_{oss}$		88		pF
Reverse Transfer Capacitance	$C_{rss}$		88		pF
<b>Switching Characteristics</b>					
Turn On Delay Time	$t_{d(on)}$	$V_{DD} = 400\text{ V}, I_D = 10\text{ A},$ $R_{G(on)} = R_{G(off)} = 32\text{ }\Omega,$ $V_{GS} = -8/15\text{ V}, T_J = 175^\circ\text{C}$ Refer to Figure 10 for gate drive current waveforms	11		ns
Rise Time	$t_r$		28		ns
Turn Off Delay Time	$t_{d(off)}$		76		ns
Fall Time	$t_f$		38		ns
Turn-On Energy Per Pulse	$E_{on}$		34		$\mu\text{J}$
Turn-Off Energy Per Pulse	$E_{off}$		64		$\mu\text{J}$
Total Switching Energy	$E_{ts}$		98		$\mu\text{J}$
Turn On Delay Time	$t_{d(on)}$		12		ns
Rise Time	$t_r$	$V_{DD} = 400\text{ V}, I_D = 10\text{ A},$ $R_{G(on)} = R_{G(off)} = 32\text{ }\Omega,$ $V_{GS} = -8/15\text{ V}, T_J = 250^\circ\text{C}$ Refer to Figure 10 for gate drive current waveforms	30		ns
Turn Off Delay Time	$t_{d(off)}$		73		ns
Fall Time	$t_f$		58		ns
Turn-On Energy Per Pulse	$E_{on}$		43		$\mu\text{J}$
Turn-Off Energy Per Pulse	$E_{off}$		82		$\mu\text{J}$
Total Switching Energy	$E_{ts}$		125		$\mu\text{J}$

**Thermal Characteristics**

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

**Figure 2: Typical Output Characteristics at  $175^\circ\text{C}$**

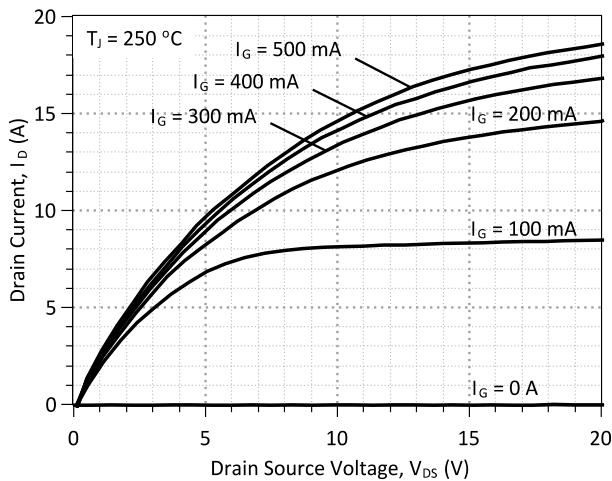


Figure 3: Typical Output Characteristics at 250 °C

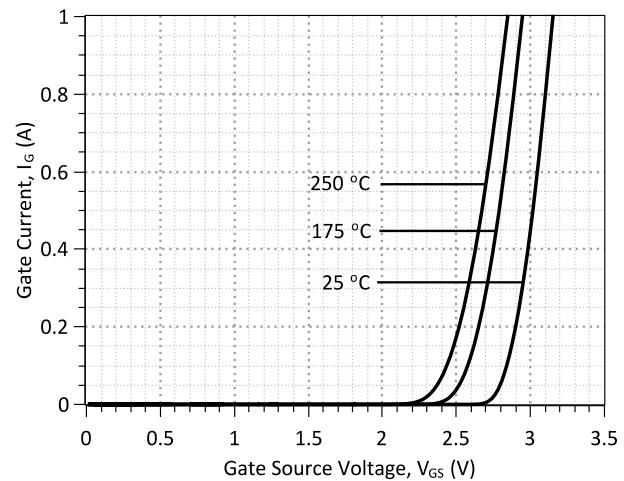


Figure 4: Typical Gate Source I-V Characteristics vs. Temperature

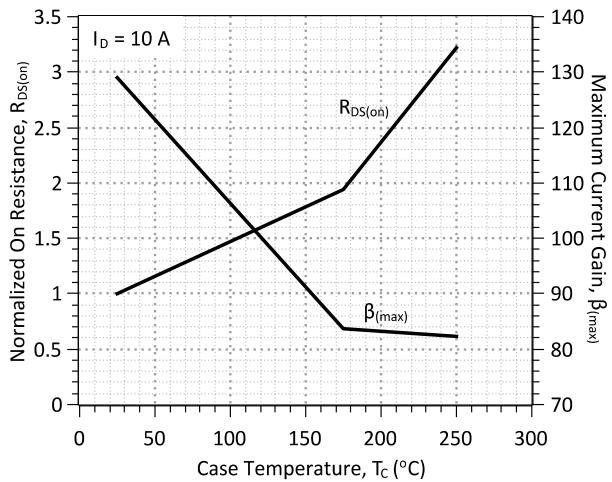


Figure 5: Normalized On-Resistance and Current Gain vs. Temperature

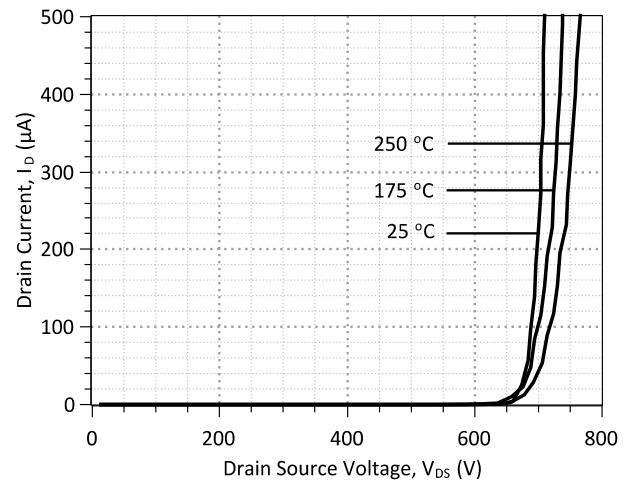


Figure 6: Typical Blocking Characteristics

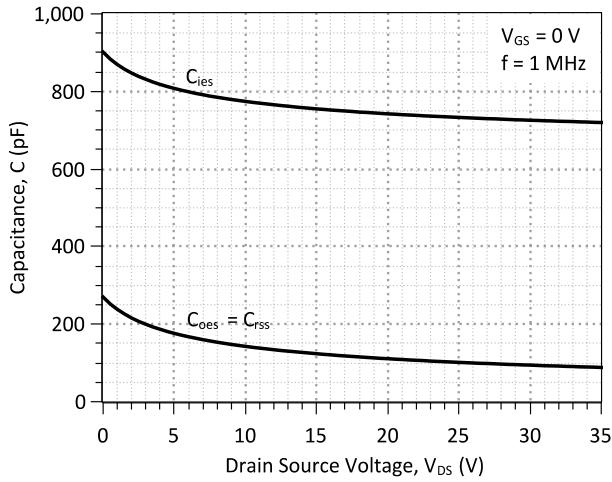


Figure 7: Typical Capacitance vs Drain-Source Voltage

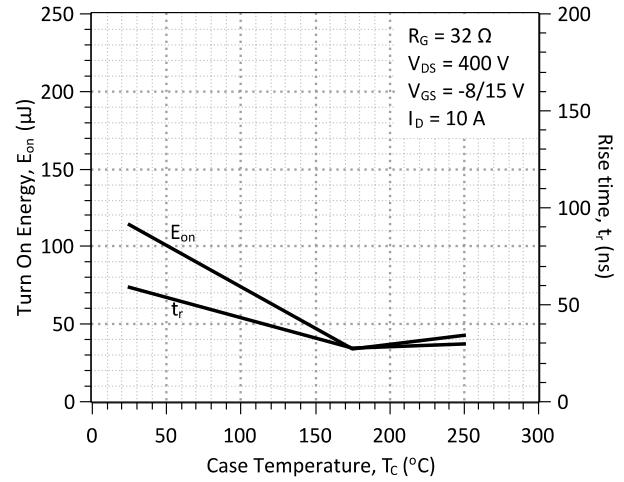
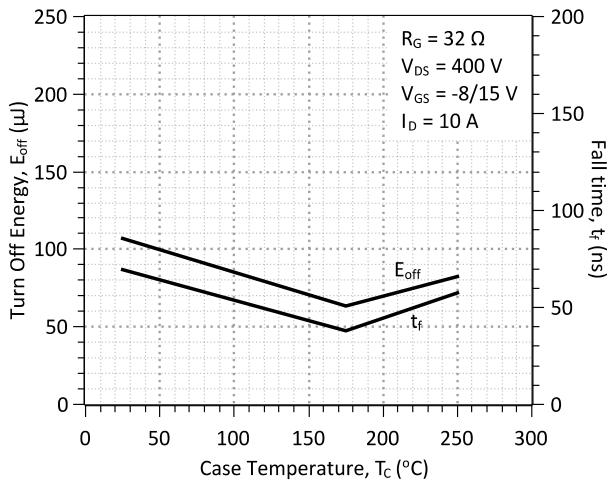
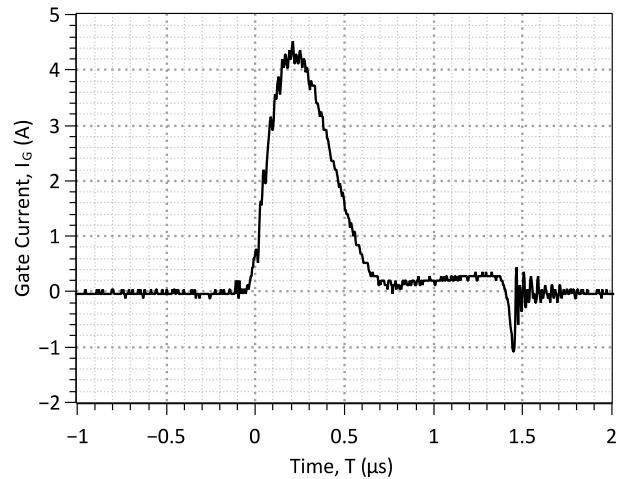


Figure 8: Typical Turn On Energy Losses and Switching Times vs. Temperature



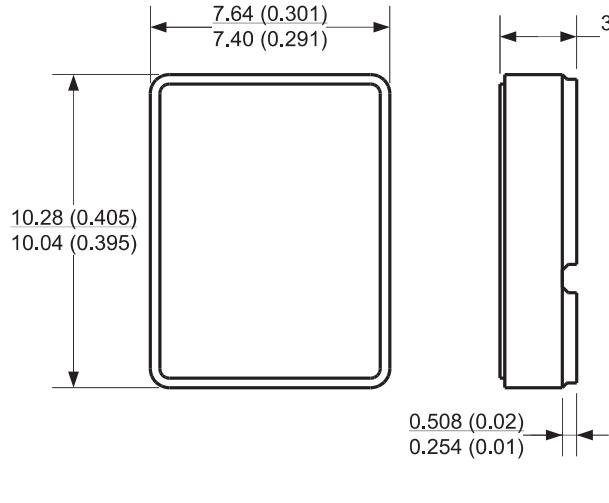
**Figure 9: Typical Turn Off Energy Losses and Switching Times vs. Temperature**



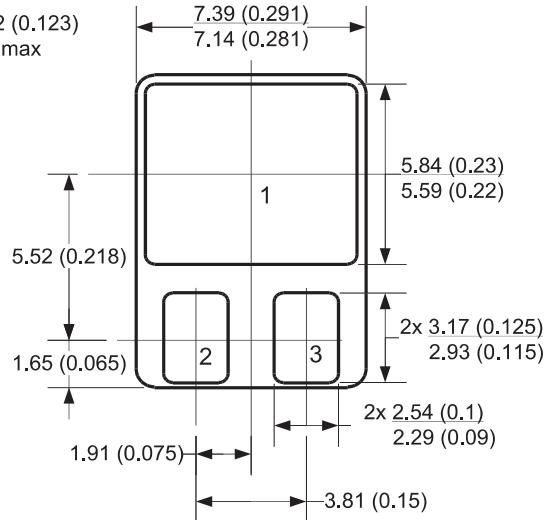
**Figure 10: Typical Gate-Source Switching Waveforms**

## Package Dimensions:

SMD-0.5/TO-276



## PACKAGE OUTLINE



## NOTE

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

<b>Revision History</b>			
Date	Revision	Comments	Supersedes
2012/08/24	0	Initial release	

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