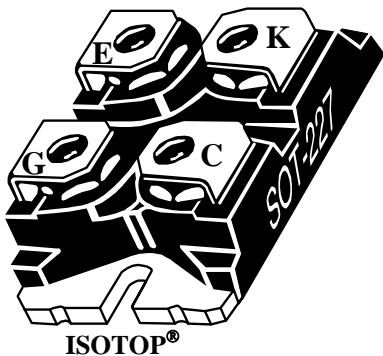
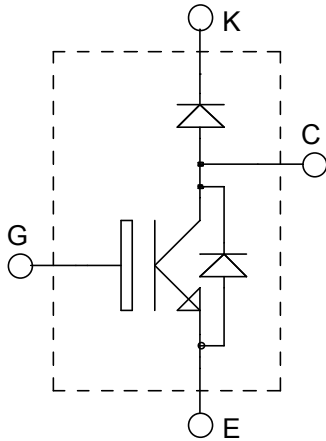


**ISOTOP<sup>®</sup> Boost chopper  
NPT IGBT  
SiC chopper diode**

**V<sub>CES</sub> = 600V**  
**I<sub>C</sub> = 30A @ T<sub>c</sub> = 90°C**



### Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction
- Brake switch

### Features

- **Non Punch Through (NPT) Fast IGBT**
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Low leakage current
  - RBSOA and SCSOA rated
- **Chopper SiC Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- ISOTOP<sup>®</sup> Package (SOT-227)
- Very low stray inductance
- High level of integration

### Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive T<sub>C</sub> of V<sub>CEsat</sub>
- RoHS Compliant

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage	600	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	45
		T <sub>C</sub> = 90°C	30
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	100
V <sub>GE</sub>	Gate - Emitter Voltage	±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	154
RBSOA	Reverse Bias Safe Operating Area	T <sub>J</sub> = 125°C	60A@500V

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$			250	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$			500	
$V_{CE(on)}$	Collector Emitter on Voltage	$V_{GE} = 15\text{V}$ $I_C = 30\text{A}$	$T_j = 25^\circ\text{C}$	1.7	2.0	2.45	V
			$T_j = 125^\circ\text{C}$		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1\text{mA}$	4		6	V	
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			400	nA	

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		1350		pF
$C_{oes}$	Output Capacitance			193		
$C_{res}$	Reverse Transfer Capacitance			120		
$Q_g$	Total gate Charge	$V_{GE} = 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 30\text{A}$		99		nC
$Q_{ge}$	Gate – Emitter Charge			10		
$Q_{gc}$	Gate – Collector Charge			60		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 30\text{A}$ $R_G = 6.8\Omega$		30		ns
$T_r$	Rise Time			12		
$T_{d(off)}$	Turn-off Delay Time			80		
$T_f$	Fall Time			15		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 30\text{A}$ $R_G = 6.8\Omega$		32		ns
$T_r$	Rise Time			12		
$T_{d(off)}$	Turn-off Delay Time			90		
$T_f$	Fall Time			21		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 30\text{A}$ $R_G = 6.8\Omega$	$T_j = 125^\circ\text{C}$		0.2	mJ
$E_{off}$	Turn-off Switching Energy				0.8	
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15\text{V}; V_{Bus} = 360\text{V}$ $t_p \leq 10\mu\text{s}; T_j = 125^\circ\text{C}$		135		A

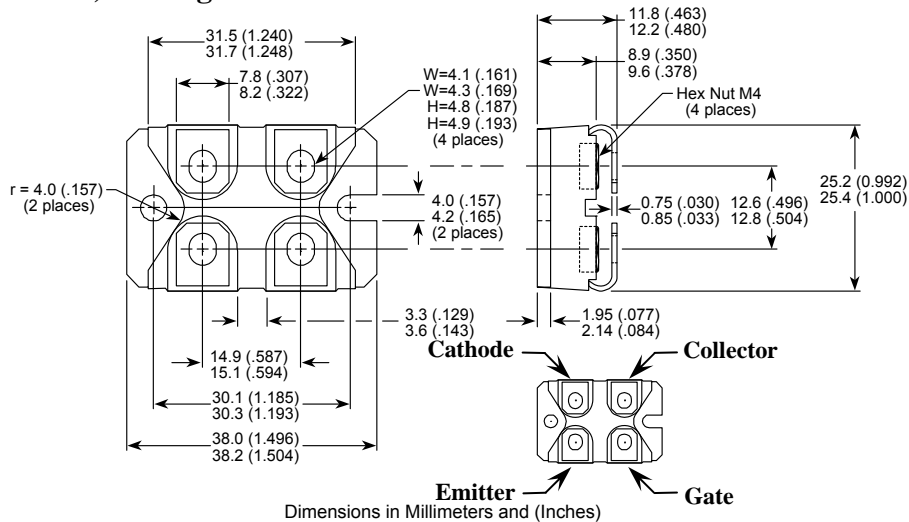
**Chopper SiC diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V	
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		50	200	$\mu\text{A}$
			$T_j = 175^\circ\text{C}$		100	2000	
$I_F$	DC Forward Current			10		A	
$V_F$	Diode Forward Voltage	$I_F = 10\text{A}$	$T_j = 25^\circ\text{C}$	1.6	1.8	V	
			$T_j = 175^\circ\text{C}$	2	2.4		
$Q_C$	Total Capacitive Charge	$I_F = 10\text{A}, V_R = 300\text{V}$ $di/dt = 500\text{A}/\mu\text{s}$		14		nC	
C	Total Capacitance	$f = 1\text{MHz}, V_R = 200\text{V}$		65		pF	
		$f = 1\text{MHz}, V_R = 400\text{V}$		50			

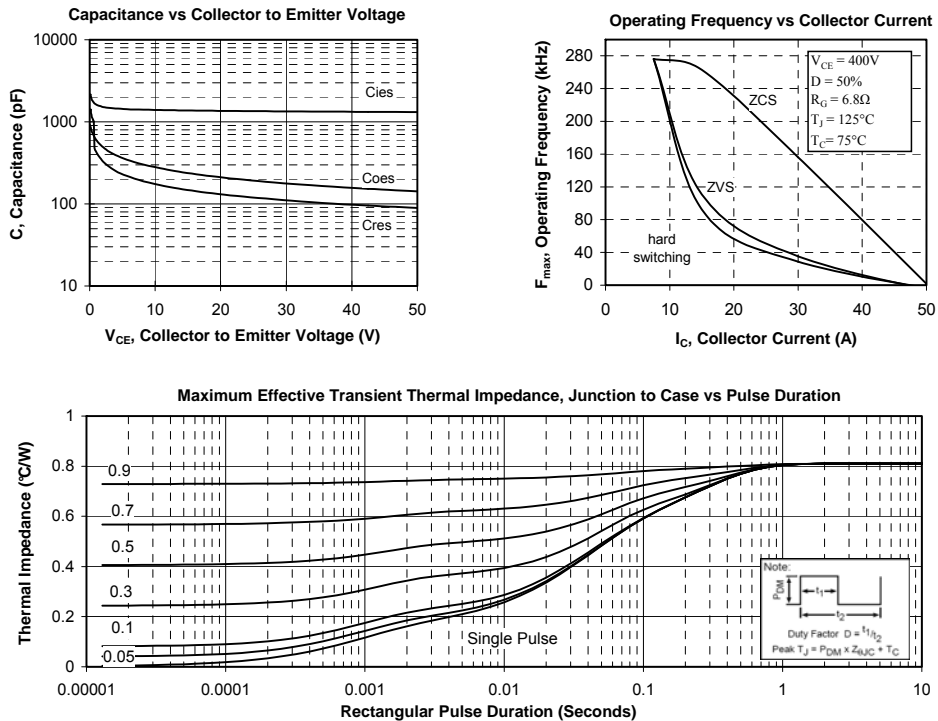
## Thermal and package characteristics

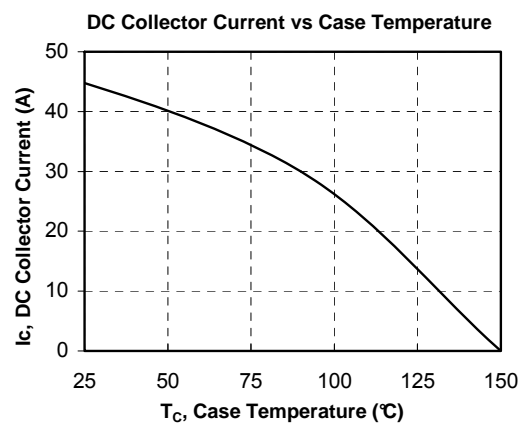
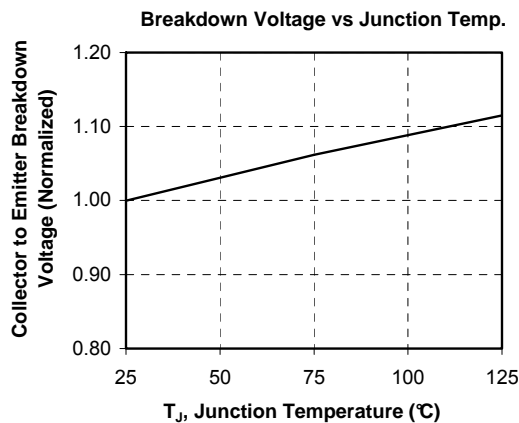
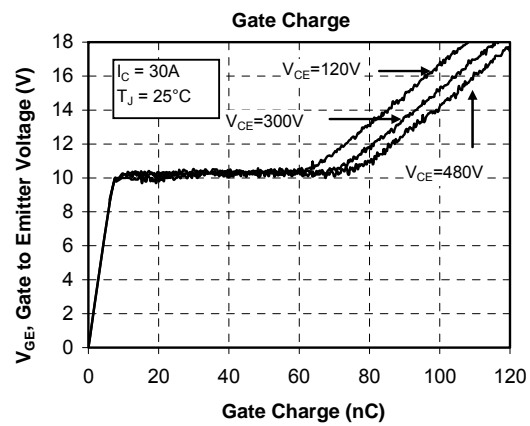
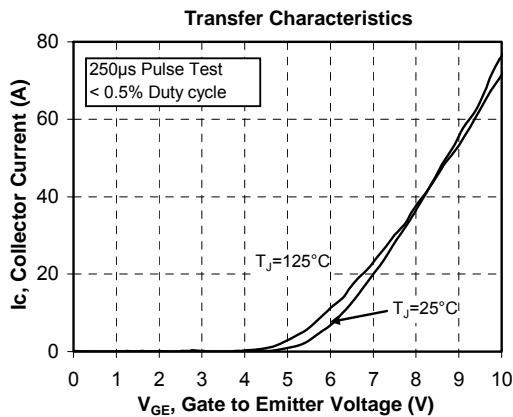
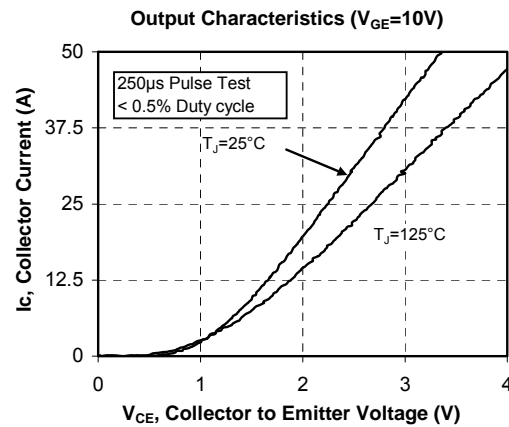
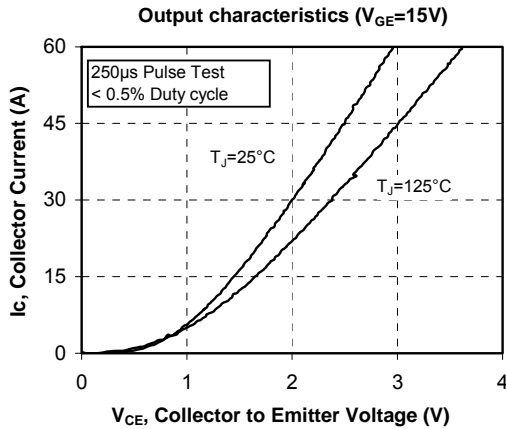
Symbol	Characteristic	Min	Typ	Max	Unit
$R_{thJC}$	Junction to Case Thermal Resistance	IGBT		0.81	°C/W
		SiC chopper Diode		2.25	
$R_{thJA}$	Junction to Ambient (IGBT & Diode)			20	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol}<1$ mA, 50/60Hz	2500			V
$T_J, T_{STG}$	Storage Temperature Range	-55		150	°C
$T_L$	Max Lead Temp for Soldering: 0.063" from case for 10 sec			300	
Torque	Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine)			1.5	N.m
Wt	Package Weight		29.2		g

## SOT-227 (ISOTOP®) Package Outline

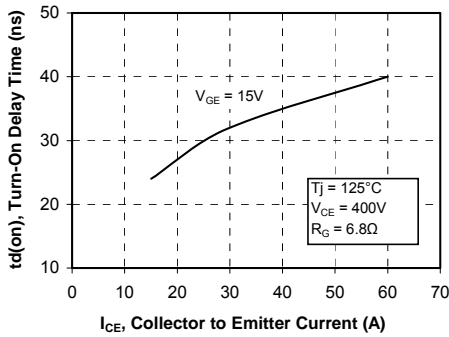


## Typical IGBT Performance Curve

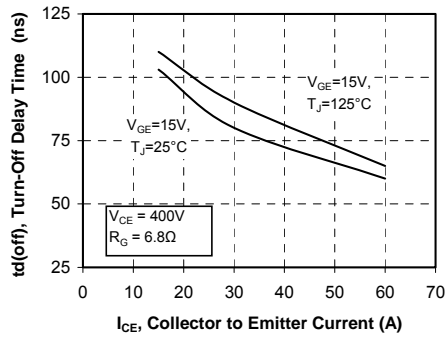




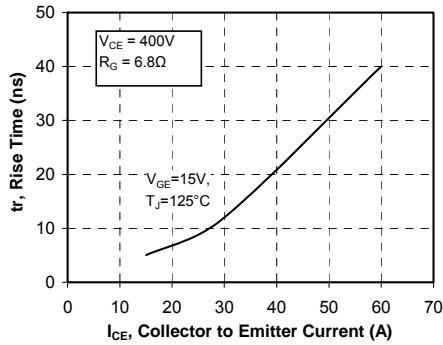
Turn-On Delay Time vs Collector Current



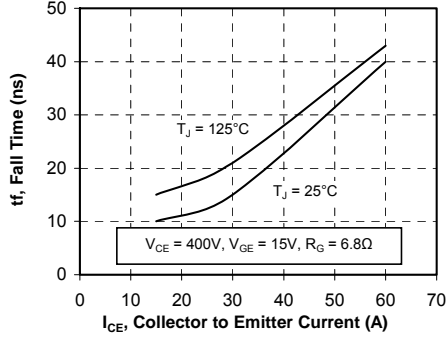
Turn-Off Delay Time vs Collector Current



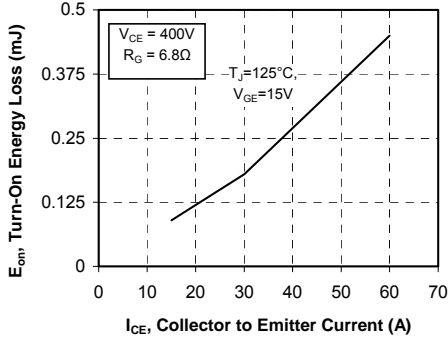
Current Rise Time vs Collector Current



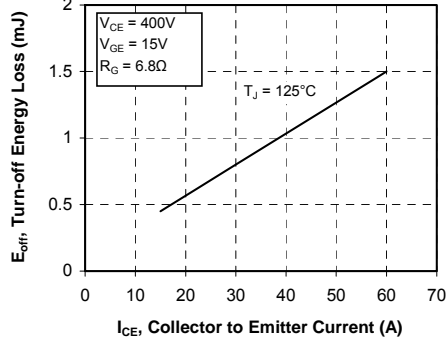
Current Fall Time vs Collector Current



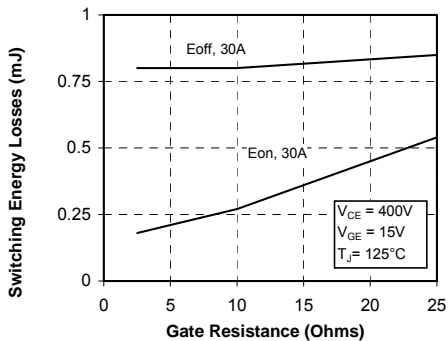
Turn-On Energy Loss vs Collector Current



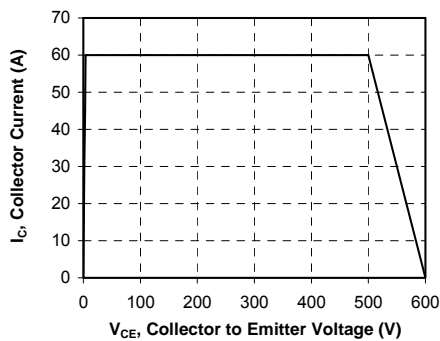
Turn-Off Energy Loss vs Collector Current



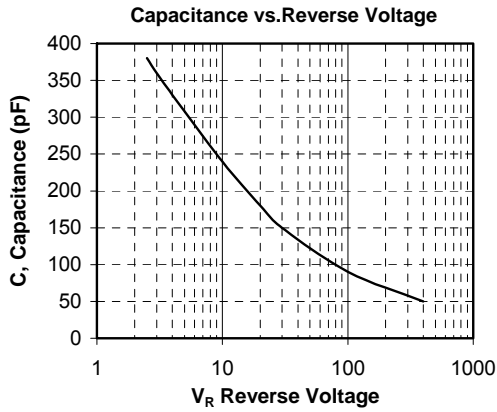
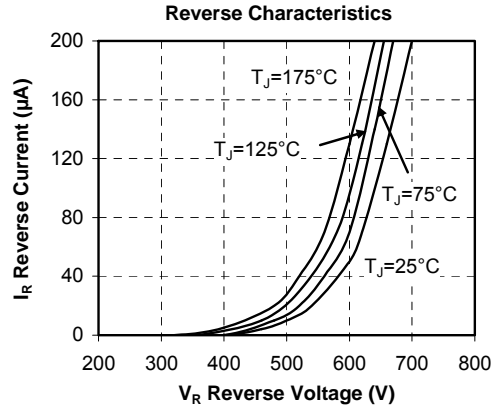
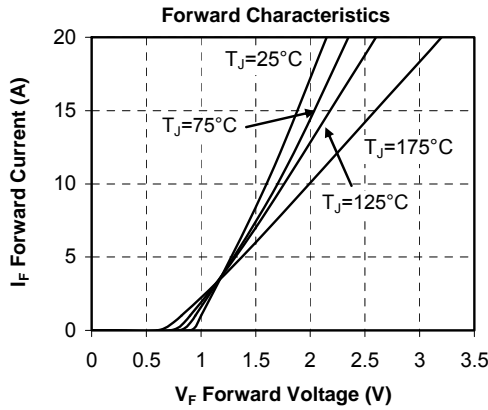
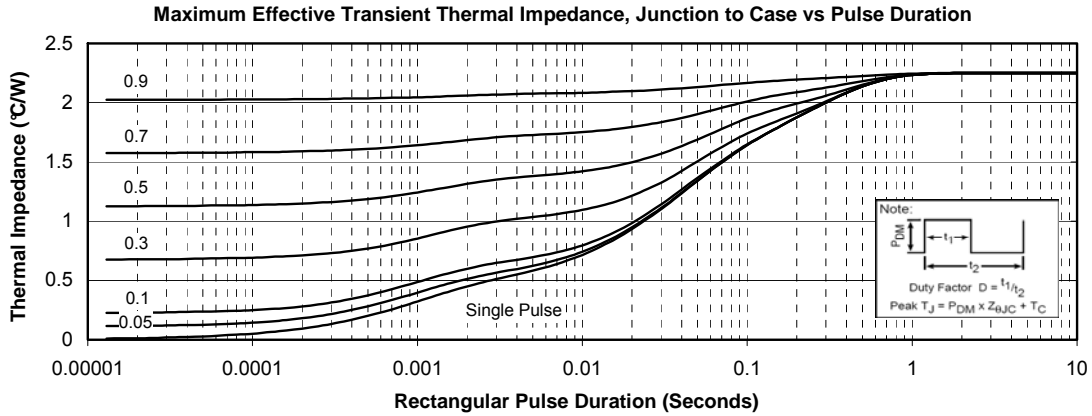
Switching Energy Losses vs Gate Resistance



Reverse Bias Safe Operating Area



## Typical SiC chopper diode Performance Curve



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Microsemi reserves the right to change, without notice, the specifications and information contained herein

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 6,939,743 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.