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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



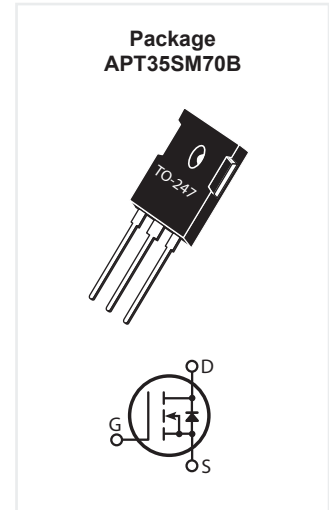
APT35SM70B

700V, 35A, 125mΩ

Silicon Carbide N-Channel Power MOSFET

DESCRIPTION

Silicon carbide (SiC) power MOSFET product line from Microsemi increase your performance over silicon MOSFET and silicon IGBT solutions while lowering your total cost of ownership for high-voltage applications.



FEATURES / TYPICAL APPLICATIONS

SiC MOSFET Features:

- Low on-resistance virtually independent on the ambient temperature
- Low capacitances and low gate charge
- Fast switching speed due to low internal gate resistance (ESR)
- Stable operation at high junction temperature, $T_j(\text{max}) = +175\text{C}$
- Fast and reliable body diode
- Superior avalanche ruggedness

SiC MOSFET Benefits:

- High efficiency to enable lighter/compact system
- Simple to drive and easy to parallel
- Improved thermal capabilities and lower switching losses
- Eliminates the need of external Free Wheeling Diode
- Lower system cost of ownership

Applications:

- PV inverter, converter and industrial motor drives
- Smart grid transmission & distribution
- Induction heating, and welding
- H/EV powertrain and EV charger
- Power supply and distribution

MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain Source Voltage	700	V
I_D	Continuous Drain Current @ $T_c = 25^\circ\text{C}$	35	A
	Continuous Drain Current @ $T_c = 100^\circ\text{C}$	25	
I_{DM}	Pulsed Drain Current ^①	80	
V_{GS}	Gate-Source Voltage	-10 to +25	V
P_D	Total Power Dissipation @ $T_c = 25^\circ\text{C}$	176	W
	Linear Derating Factor	1.18	W/°C

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance		0.75	0.85	°C/W
T_j	Operating Junction Temperature	-55		175	°C
T_{stg}	Storage Junction Temperature Range	-55		150	
T_L	Soldering Temperature for 10 Seconds (1.6mm from case)			260	
Torque	Mounting Torque (TO-247 Package), 6-32 or M3 screw			10	in·lbf
				1.1	N·m

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STATIC CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 1mA$	700			V
$R_{DS(on)}$	Drain-Source On Resistance ²	$V_{GS} = 20V, I_D = 10A$		125	145	m Ω
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 1mA$	1.7	2.5		V
$\Delta V_{GS(th)}/\Delta T_J$	Threshold Voltage Temperature Coefficient			-5.5		mV/ $^{\circ}C$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 700V$ $V_{GS} = 0V$		$T_J = 25^{\circ}C$	100	μA
				$T_J = 150^{\circ}C$	250	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = +20V / -10V$			± 100	nA
ESR	Equivalent Series Resistance	$f = 1MHz, 25mV, \text{Drain Short}$		2.2		Ω

$T_J = 25^{\circ}C$ unless otherwise specified

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit		
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DD} = 700V$ $f = 1MHz$		1035		pF		
C_{rss}	Reverse Transfer Capacitance		26					
C_{oss}	Output Capacitance		127					
Q_g	Total Gate Charge	$V_{GS} = 0/20V$		67		nC		
Q_{gs}	Gate-Source Charge	$V_{DD} = 466V$		11				
Q_{gd}	Gate-Drain Charge	$I_D = 10A$		19				
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 466V$ $V_{GS} = 0/20V$ $I_D = 10A$ $R_G = 3.0 \Omega$ ^③ $L = 115 \mu H$ $T_c = 25^{\circ}C$ Freewheeling Diode = APT10SCE65B		8		ns		
t_r	Current Rise Time			4				
$t_{d(off)}$	Turn-Off Delay Time			24				
t_f	Current Fall Time			18				
E_{on2}	Turn-On Switching Energy ^④				71		μJ	
E_{off}	Turn-Off Switching Energy				23			
$t_{d(on)}$	Turn-On Delay Time		$V_{DD} = 466V$ $V_{GS} = 0/20V$ $I_D = 10A$ $R_G = 3.0 \Omega$ ^③ $L = 115 \mu H$ $T_c = 150^{\circ}C$ Freewheeling Diode = APT10SCE65B		7			ns
t_r	Current Rise Time				4			
$t_{d(off)}$	Turn-Off Delay Time			27				
t_f	Current Fall Time			19				
E_{on2}	Turn-On Switching Energy ^④				67		μJ	
E_{off}	Turn-Off Switching Energy				28			

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	$I_{SD} = 10A, V_{GS} = 0V$		4.25		V
t_{rr}	Reverse Recovery Time	$I_{SD} = 10A, V_{DD} = 466V$ $di/dt = -1000A/\mu s$		35		ns
Q_{rr}	Reverse Recovery Charge			115		nC
I_{rrm}	Reverse Recovery Current			6.6		A

$T_J = 25^{\circ}C$ unless otherwise specified

- ① Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature
 ② Pulse test: Pulse Width < 380 μs , duty cycle < 2%.
 ③ R_G is total gate resistance including internal gate driver impedance.
 ④ E_{on2} includes energy of APT10SCE65B free wheeling diode.

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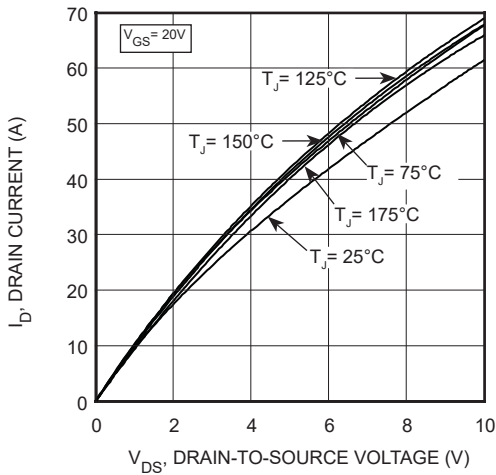


Figure 1, Output Characteristics

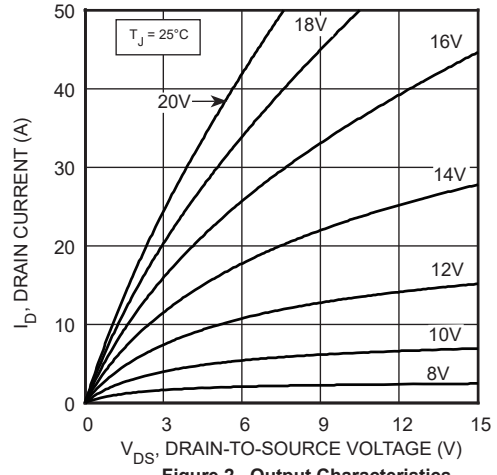


Figure 2, Output Characteristics

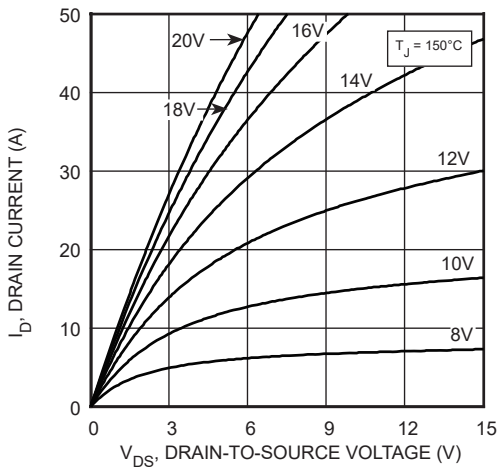


Figure 3, Output Characteristics

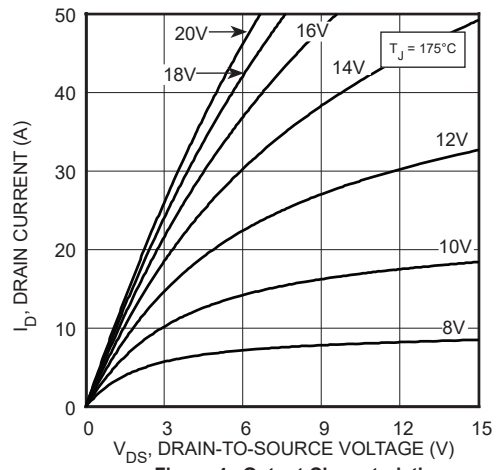


Figure 4, Output Characteristics

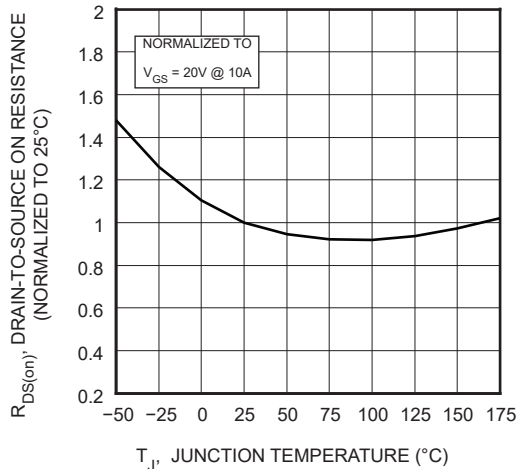


Figure 5, $R_{DS(on)}$ vs Junction Temperature

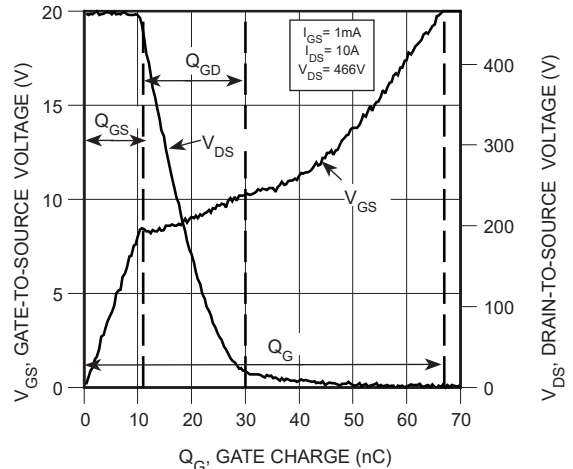


Figure 6, Gate Charge Characteristics

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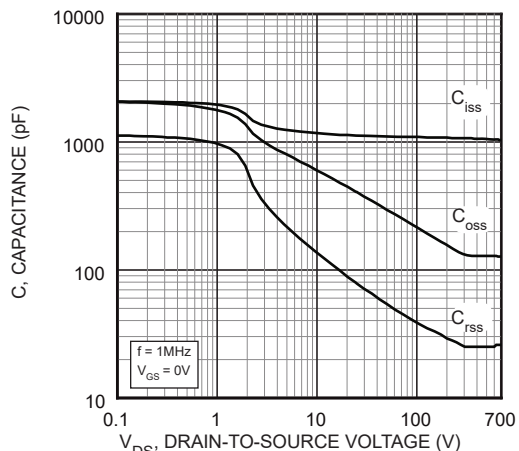


Figure 7, Capacitance vs Drain-to-Source Voltage

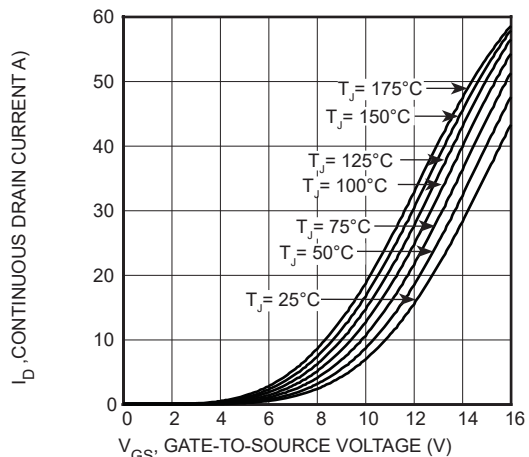


Figure 8, Output Characteristics I_D vs V_{GS} Temperature

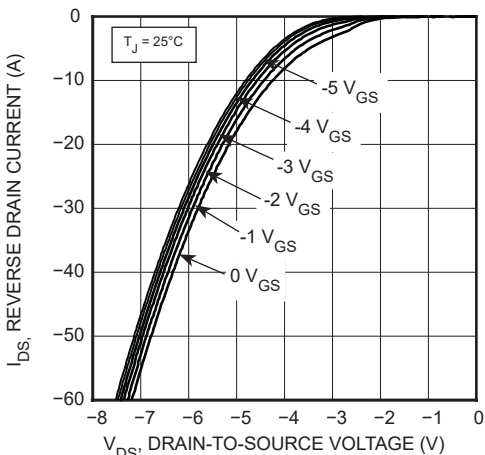


Figure 9, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

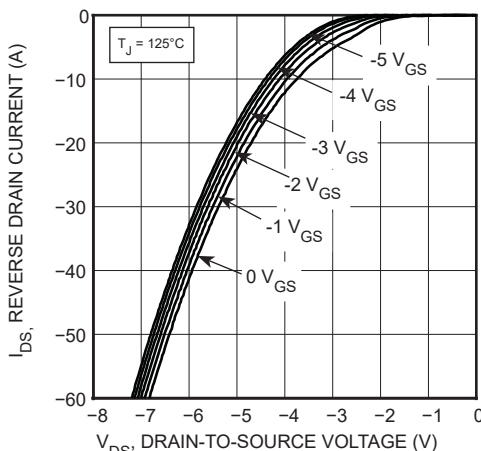


Figure 10, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

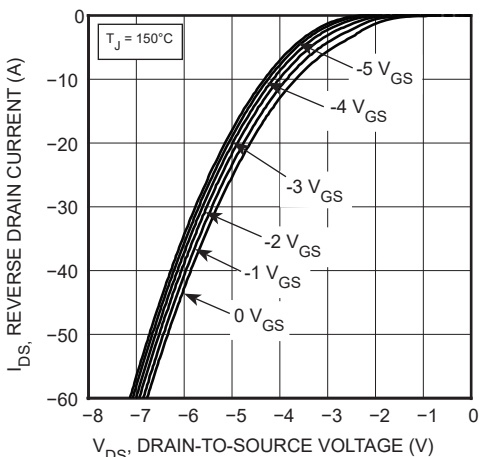


Figure 11, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

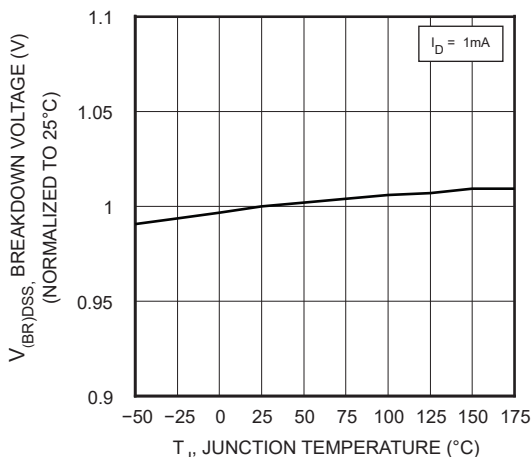


Figure 12, Breakdown Voltage vs Temperature

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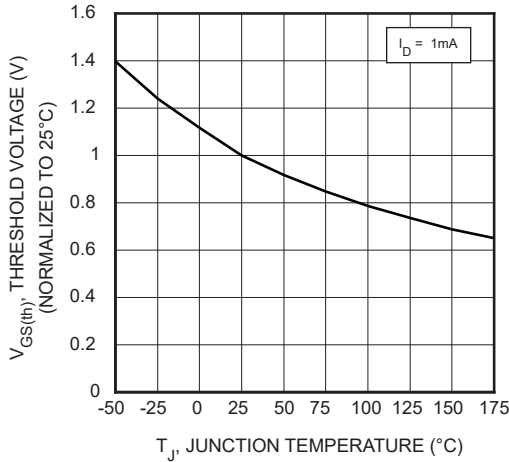


Figure 13, Threshold Voltage vs Temperature

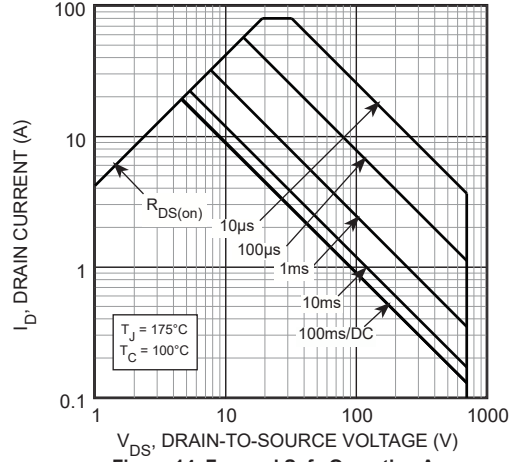


Figure 14, Forward Safe Operating Area

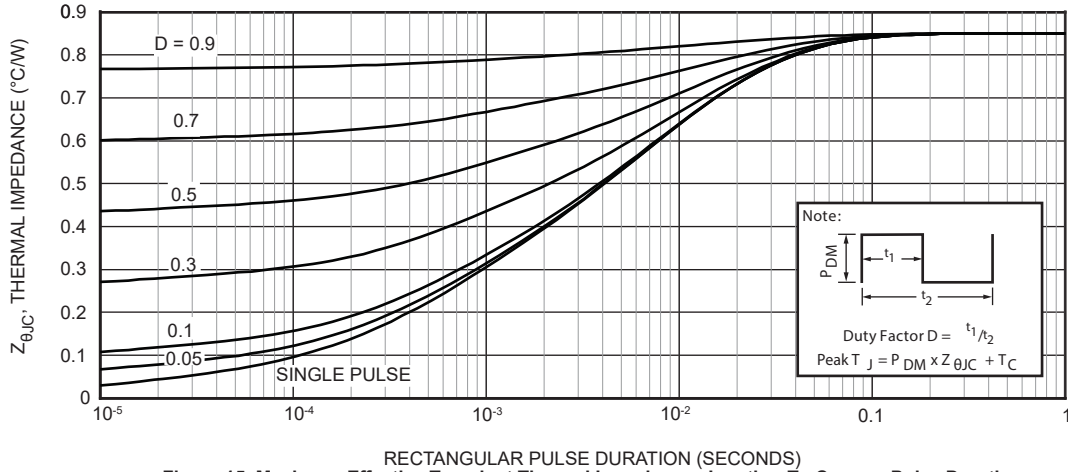
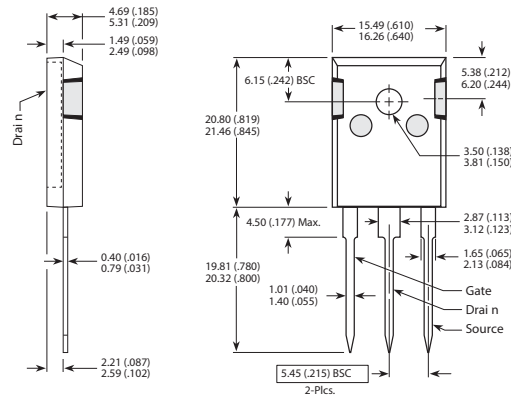


Figure 15, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

TO-247 (B) Package Outline



Dimensions in Millimeters (Inches)

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Microsemi Corporate Headquarters
One Enterprise, Aliso Viejo, CA 92656 USA
Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996
email: sales.support@microsemi.com
www.microsemi.com

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