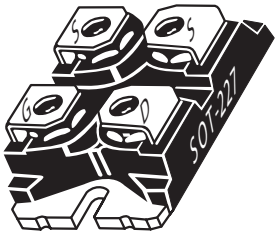
Microsemi

SiC Microsemi

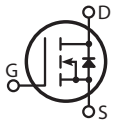
APT80SM120J

1200V, 51A, 40mΩ

Silicon Carbide N-Channel Power MOSFET



APT80SM120J



FEATURES

- Fast switching with low EMI/RFI
- Low Switching Energy
- Low $R_{DS(on)}$ Temperature Coefficient For Improved Efficiency
- Low gate charge
- RoHS compliant

TYPICAL APPLICATIONS

- PFC and other boost converter
- Buck converter
- Two switch forward (asymmetrical bridge)
- Single switch forward
- Flyback
- Inverters

Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain Source Voltage	1200	V
I_D	Continuous Drain Current @ T_C = 25°C	51	A
	Continuous Drain Current @ T_C = 100°C	36	
I_{DM}	Pulsed Drain Current①	190	
V_{GS}	Gate-Source Voltage	-10 to +25	V
P_D	Total Power Dissipation @ T_C = 25°C	273	W/°C
	Linear Derating Factor	1.82	

Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance		0.4	0.55	°C/W
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55		175	°C
Torque	Mounting Torque (SOT-227 Package), 6-32 or M3 screw			10	in·lbf
				1.1	N·m
W_T	Package Weight		1.03		oz
			29.2		g

Static Characteristics

T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
$V_{BR(DSS)}$	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 1mA		1200			V
$\Delta V_{BR(DSS)}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D = 1mA			-0.26		V/°C
$R_{DS(on)}$	Drain-Source On Resistance②	V_{GS} = 20V, I_D = 40A			40	55	mΩ
$V_{GS(th)}$	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				-4.3		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1200V, V_{GS} = 0V	T_J = 25°C			100	µA
			T_J = 150°C			250	
I_{GSS}	Gate-Source Leakage Current	V_{GS} = +20V / -10V				±100	nA
ESR	Equivalent Series Resistance	f = 1MHz, 25mV, Drain Short			0.76		Ω

Dynamic Characteristics T_J = 25°C unless otherwise specified **APT80SM120J**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DD} = 1000V f = 1MHz		4600		pF
C_{rss}	Reverse Transfer Capacitance			34		
C_{oss}	Output Capacitance			250		
E_{oss}	Typical Output Capacitance Stored Energy	V_{GS} = 0V, V_{DD} = 1000V f = 1MHz		133		µJ
$C_{o(er)}$	Effective Output Capacitance			266		pF
Q_g	Total Gate Charge	V_{GS} = 0/20V V_{DD}= 800V I_D = 40A		235		nC
Q_{gs}	Gate-Source Charge			40		
Q_{gd}	Gate-Drain Charge			50		
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 800V V_{GS} = 0/20V I_D = 40A R_G = 0.7 Ω ③ L = 115 µH T_c = 25°C		14		ns
t_r	Current Rise Time			10		
$t_{d(off)}$	Turn-Off Delay Time			42		
t_f	Current Fall Time			21		
E_{on2}	Turn-On Switching Energy④			765		µJ
E_{off}	Turn-Off Switching Energy			145		
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 800V V_{GS} = 0/20V I_D = 40A R_G = 0.7 Ω ③ L = 115 µH T_c = 150°C		12		ns
t_r	Current Rise Time			10		
$t_{d(off)}$	Turn-Off Delay Time			47		
t_f	Current Fall Time			23		
E_{on2}	Turn-On Switching Energy④			740		µJ
E_{off}	Turn-Off Switching Energy			170		

Source-Drain Diode Characteristics T_J = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	I_{SD} = 40A, T_J = 25°C, V_{GS} = 0V		3.75		V
t_{rr}	Reverse Recovery Time	I_{SD} = 40A, V_{DD} = 800V dI/dt = -100A/µs, T_J = 25°C		245		ns
Q_{rr}	Reverse Recovery Charge			250		nC
I_{rrm}	Reverse Recovery Current			2.7		A

① Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

② Pulse test: Pulse Width < 380µs, duty cycle < 2%.

③ R_G is total external gate resistance including internal gate driver impedance.

④ Free wheeling diode APT20SCD120B.

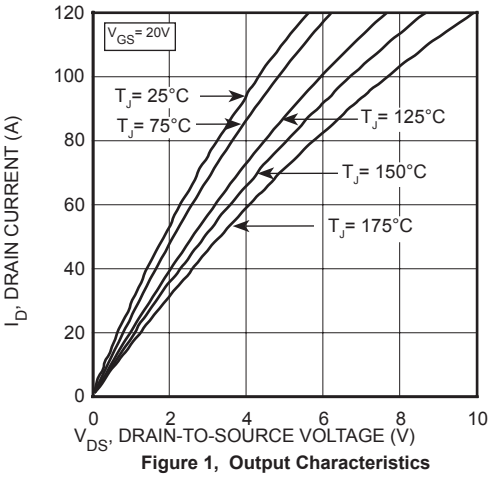


Figure 1, Output Characteristics

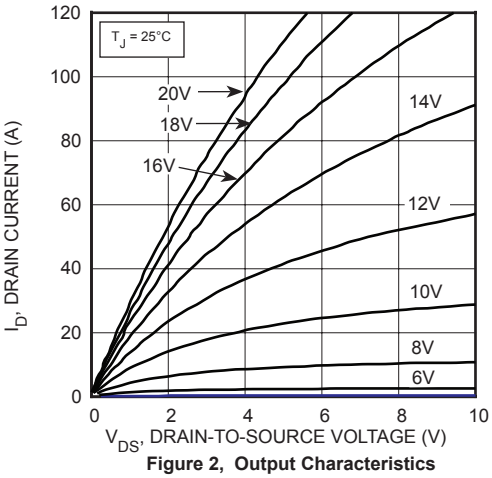


Figure 2, Output Characteristics

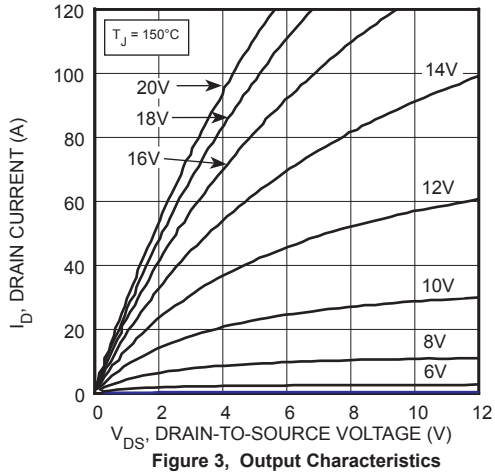


Figure 3, Output Characteristics

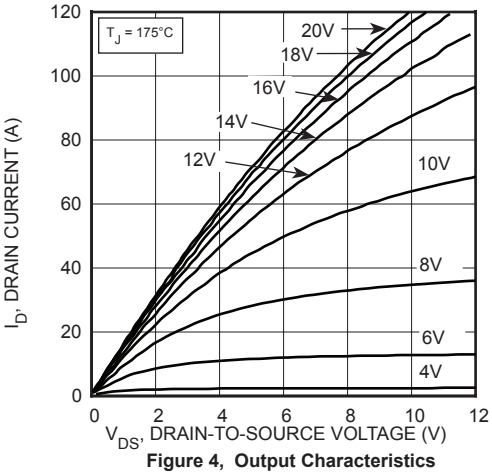


Figure 4, Output Characteristics

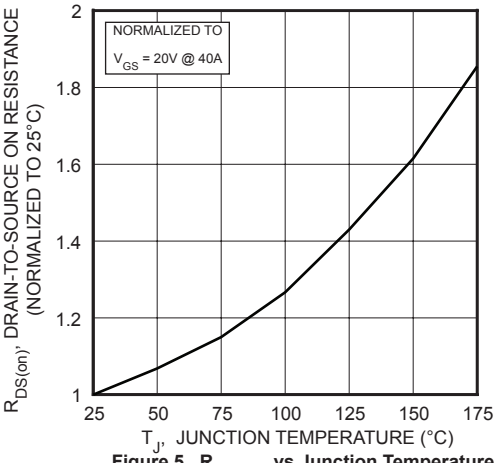


Figure 5, $R_{DS(ON)}$ vs Junction Temperature

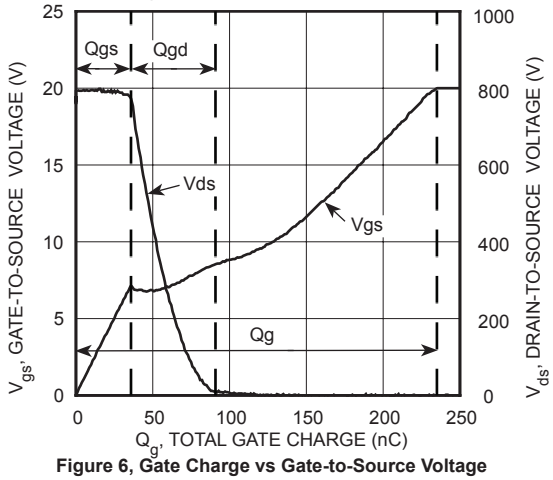


Figure 6, Gate Charge vs Gate-to-Source Voltage

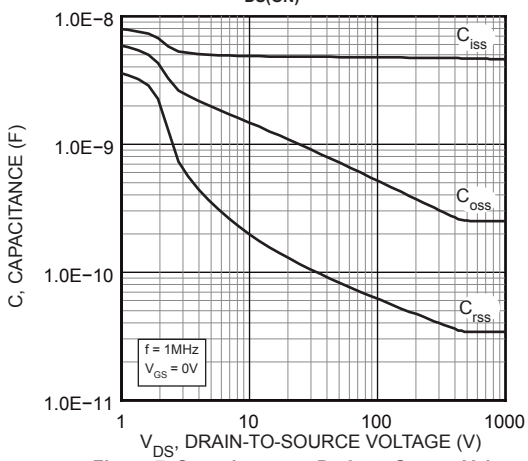


Figure 7, Capacitance vs Drain-to-Source Voltage

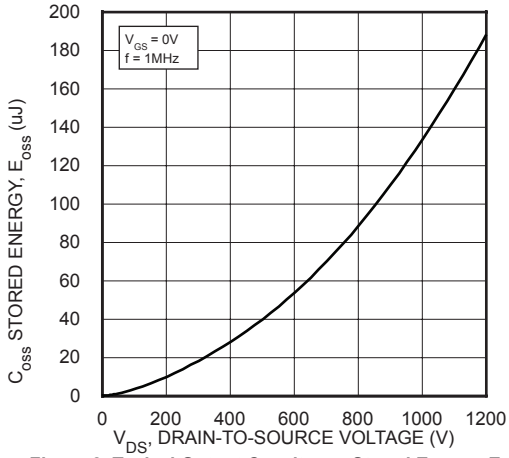


Figure 8, Typical Output Cpacitance Stored Energy, E_{oss}

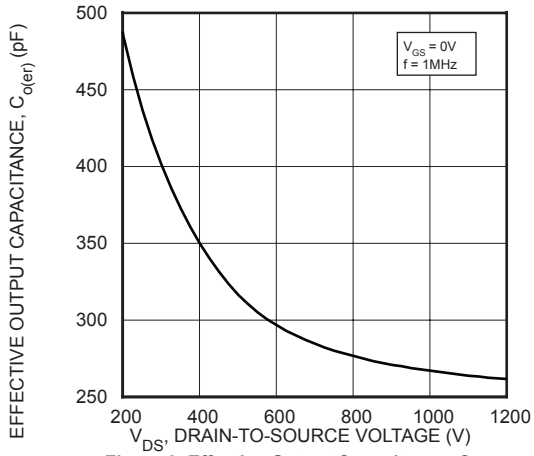


Figure 9, Effective Output Capacitance, $C_{o(er)}$

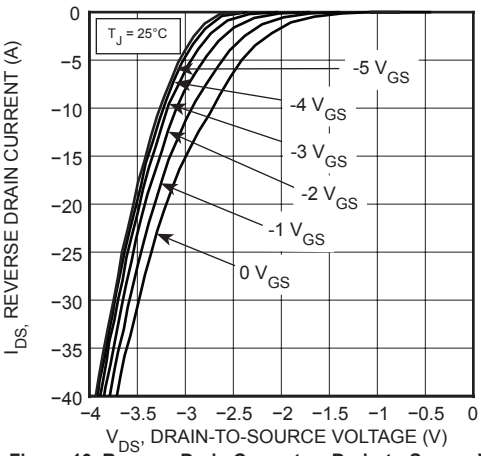


Figure 10, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

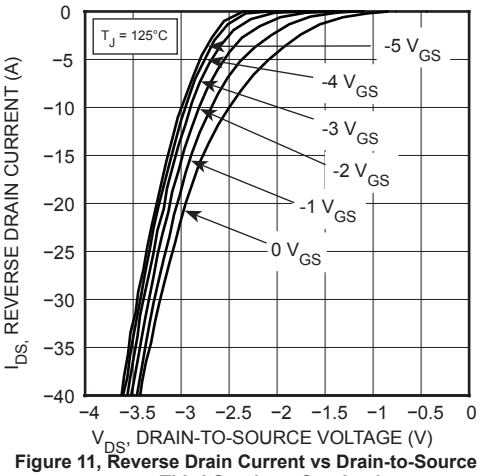


Figure 11, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

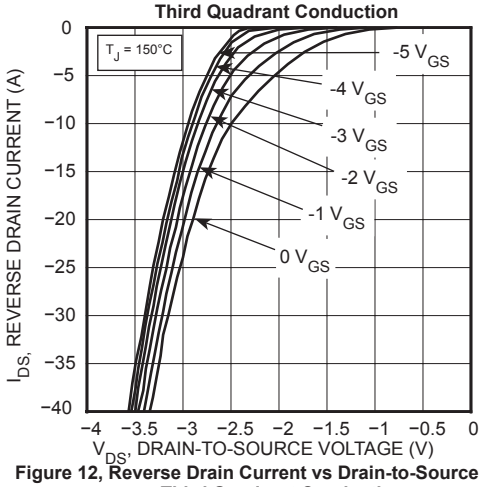


Figure 12, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

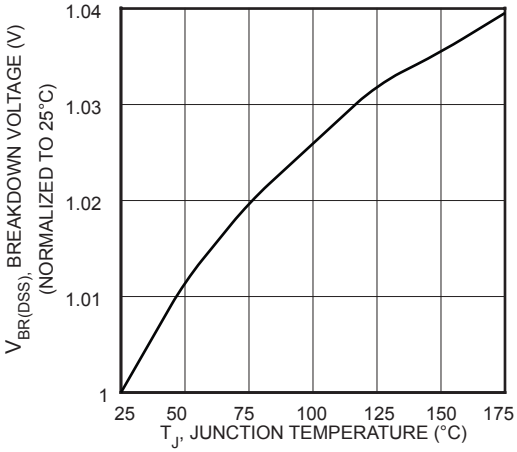


Figure 13, Breakdown Voltage vs Temperature

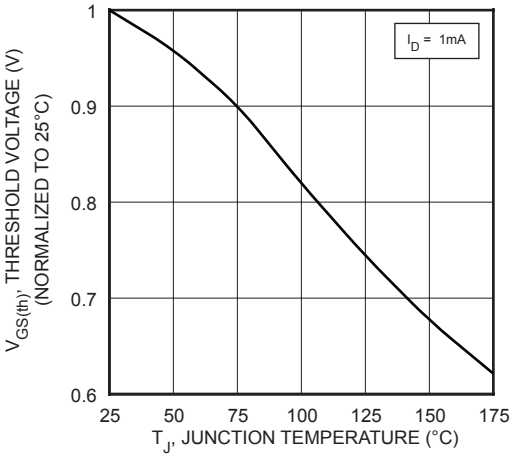


Figure 14, Threshold Voltage vs Temperature

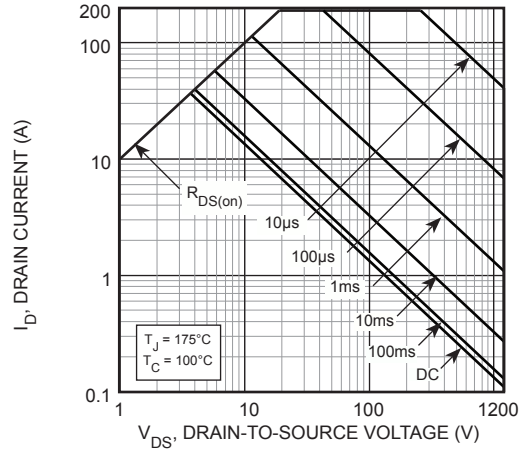


Figure 15, Forward Safe Operating Area

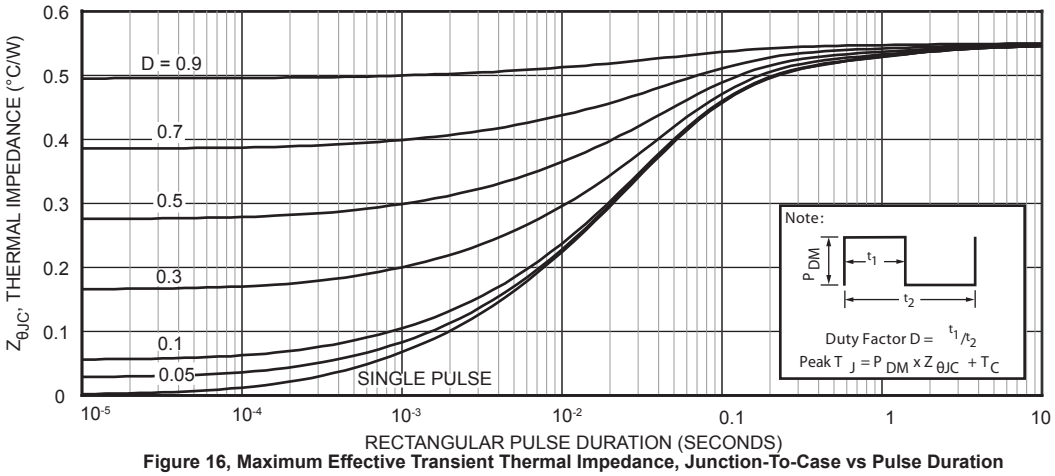
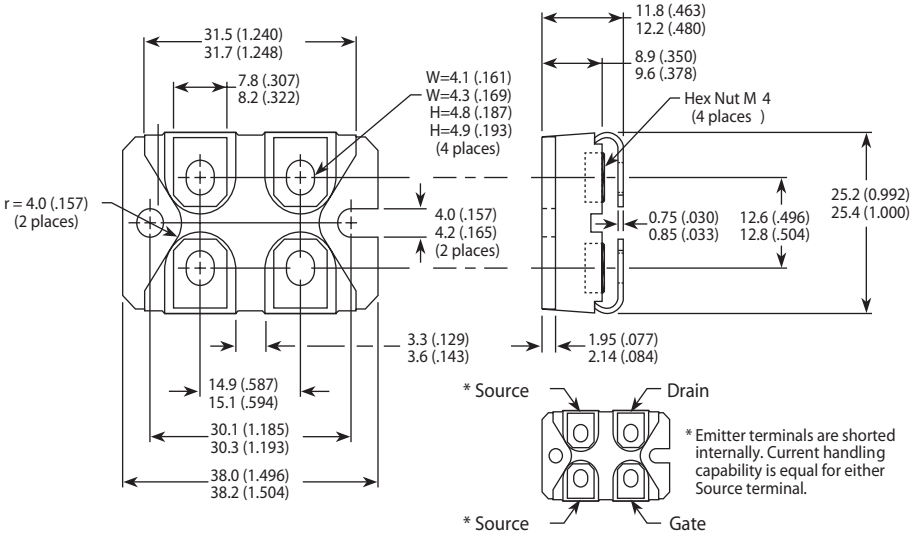


Figure 16, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters (Inches)

Disclaimer:

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