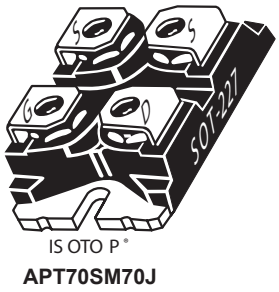
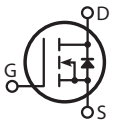
Silicon Carbide N-Channel Power MOSFET





FEATURES

- Ultra Low sensitivity of $R_{DS(on)}$ to temperature
- Fast switching with low EMI/RFI
- Low Switching Energy
- Low $R_{DS(on)}$ Temperature Coefficient For Improved Efficiency
- Ultra Low Gate Resistance
- 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	700	V
I_D	Continuous Drain Current @ T_C = 25°C	49	A
	Continuous Drain Current @ T_C = 100°C	34	
I_{DM}	Pulsed Drain Current①	154	
V_{GS}	Gate-Source Voltage	-10 to +25	V
P_D	Total Power Dissipation @ T_C = 25°C	165	W
	Linear Derating Factor	1.1	W/°C

Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance		0.63	0.91	°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		700			V
$\Delta V_{BR(DSS)}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D = 1mA			0.027		V/°C
$R_{DS(on)}$	Drain-Source On Resistance②	V_{GS} = 20V, I_D = 32.5A			53	70	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				-4.69		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 700V, 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			1.12		Ω

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Dynamic Characteristics T_J = 25°C unless otherwise specified APT70SM70J

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DD} = 700V f = 1MHz		1950		pF
C_{rss}	Reverse Transfer Capacitance			50		
C_{oss}	Output Capacitance			230		
E_{oss}	Output Capacitance Stored Energy	V_{GS} = 0V, V_{DD} = 700V f = 1MHz		60		µJ
$C_{o(er)}$	Effective Output Capacitance			245		pF
Q_g	Total Gate Charge	V_{GS} = 0/20V V_{DD}= 466V I_D = 32.5A		125		nC
Q_{gs}	Gate-Source Charge			21		
Q_{gd}	Gate-Drain Charge			35		
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 466V V_{GS} = 0/20V I_D = 32.5A R_G = 3.0 Ω ③ L = 115 µH T_c = 25°C Freewheeling Diode = APT20SCE65B		12		ns
t_r	Current Rise Time			14		
$t_{d(off)}$	Turn-Off Delay Time			33		
t_f	Current Fall Time			23		
E_{on2}	Turn-On Switching Energy			645		µJ
E_{off}	Turn-Off Switching Energy			170		
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 466V V_{GS} = 0/20V I_D = 32.5A R_G = 3.0 Ω ③ L = 115 µH T_c = 150°C Freewheeling Diode = APT20SCE65B		10		ns
t_r	Current Rise Time			13		
$t_{d(off)}$	Turn-Off Delay Time			37		
t_f	Current Fall Time			27		
E_{on2}	Turn-On Switching Energy			540		µJ
E_{off}	Turn-Off Switching Energy			225		

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} = 32.5A, V_{GS} = 0V		4.25		V
T_{rr}	Reverse Recovery Time	I_{SD} = 32.5A, V_{DD} = 466V dI/dt = -1000A/µs		45		ns
Q_{rr}	Reverse Recovery Charge			250		nC
I_{rrm}	Reverse Recovery Current			10		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 not including internal gate driver impedance.

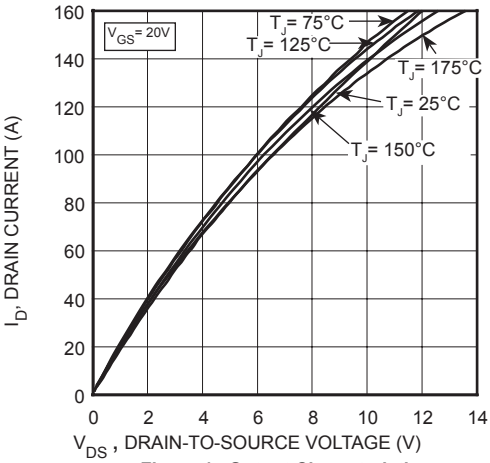


Figure 1, Output Characteristics

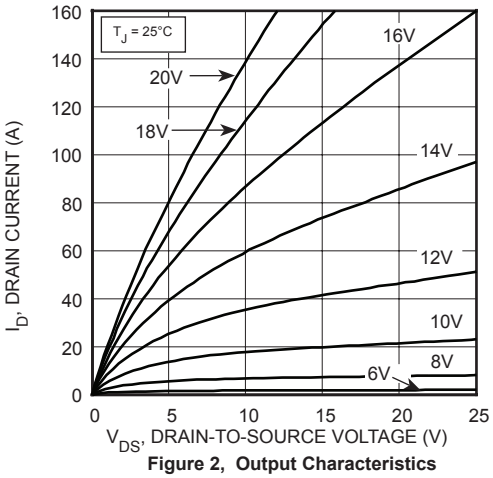


Figure 2, Output Characteristics

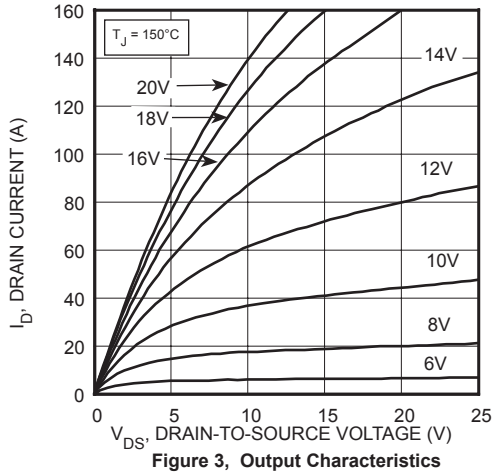


Figure 3, Output Characteristics

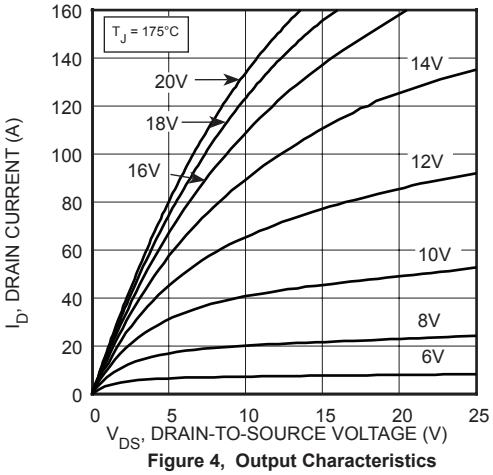


Figure 4, Output Characteristics

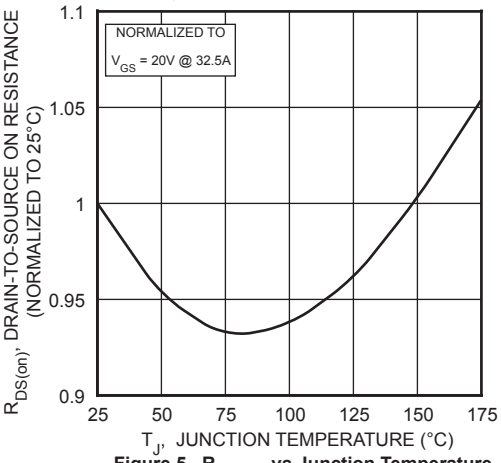


Figure 5, $R_{DS(on)}$ vs Junction Temperature

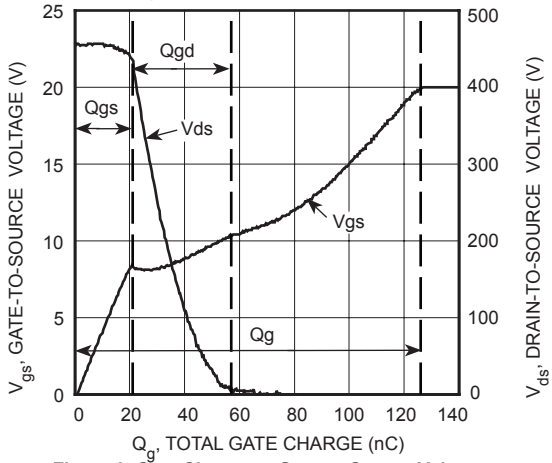


Figure 6, Gate Charge vs Gate-to-Source Voltage

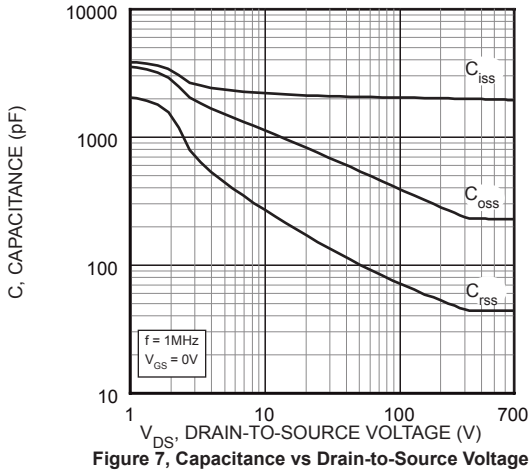


Figure 7, Capacitance vs Drain-to-Source Voltage

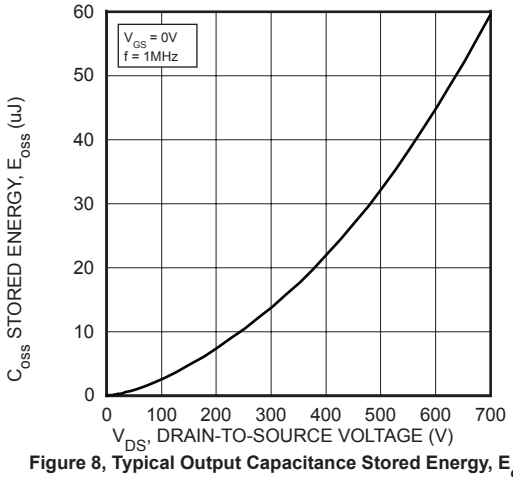


Figure 8, Typical Output Capacitance Stored Energy, E_{oss}

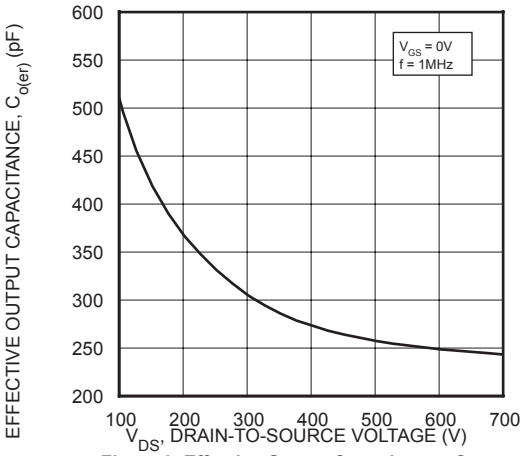


Figure 9, Effective Output Capacitance, $C_{o(er)}$

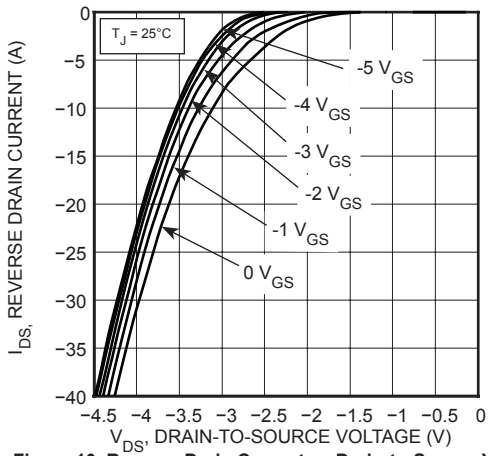


Figure 10, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

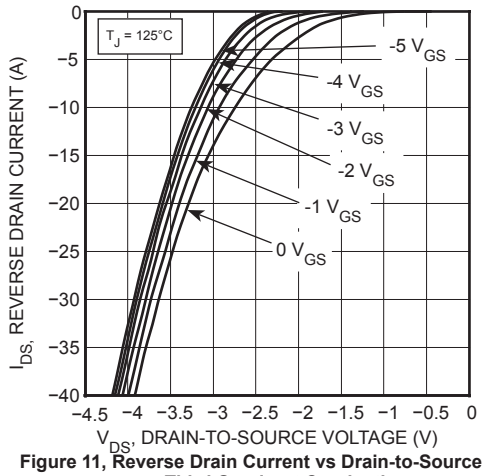


Figure 11, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

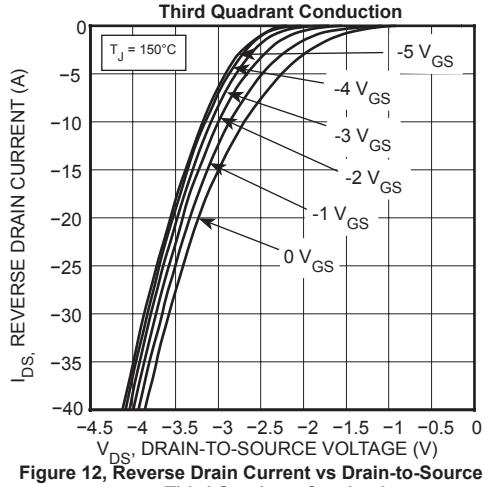


Figure 12, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

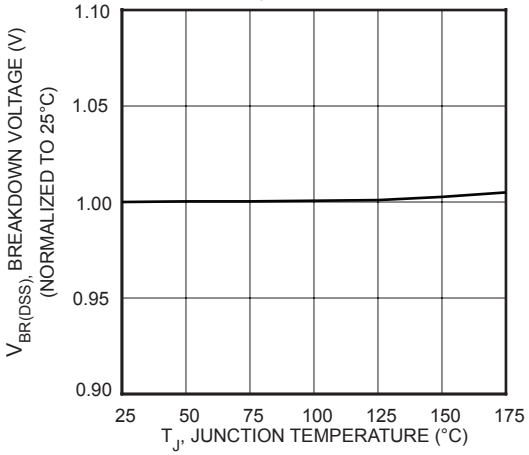


Figure 13, Breakdown Voltage vs Temperature

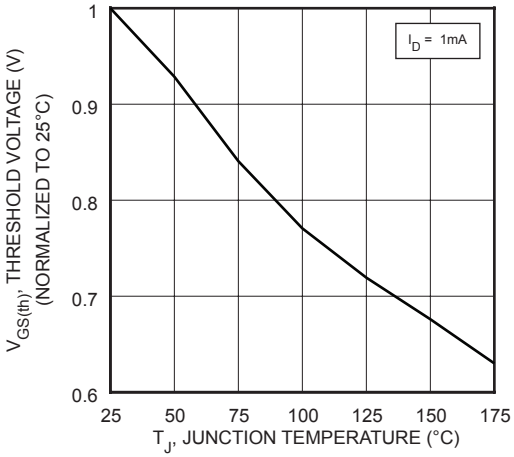


Figure 14, Threshold Voltage vs Temperature

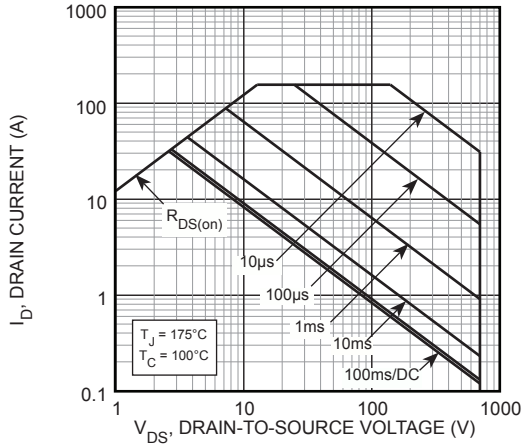


Figure 15, Forward Safe Operating Area

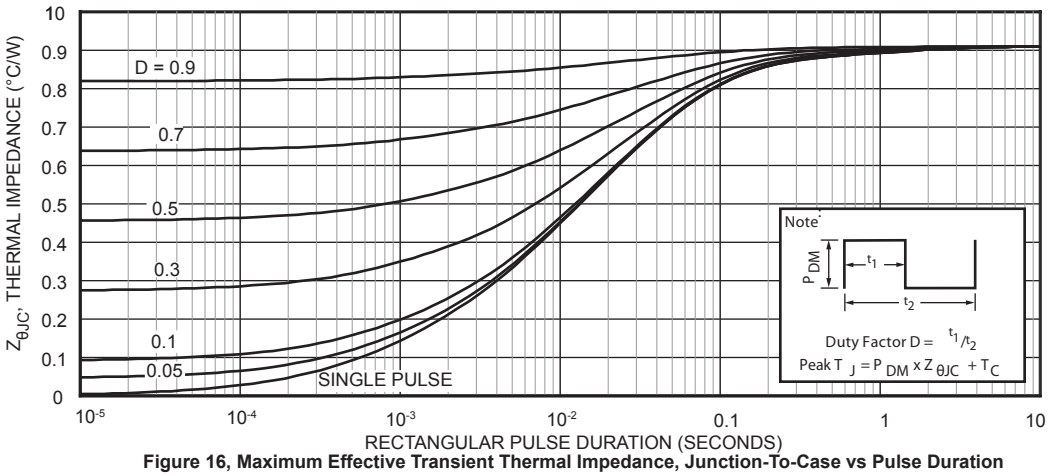
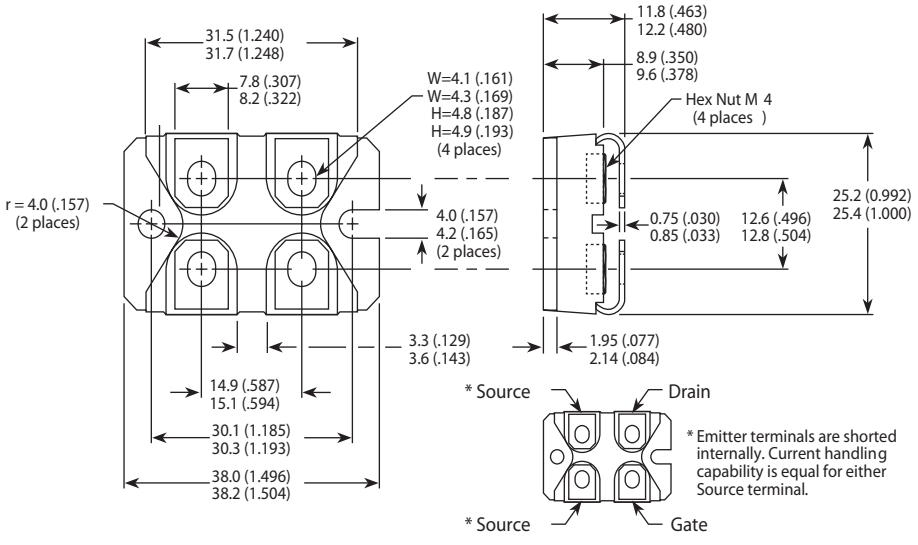


Figure 16, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters (Inches)

Disclaimer:

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