

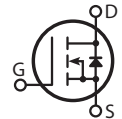
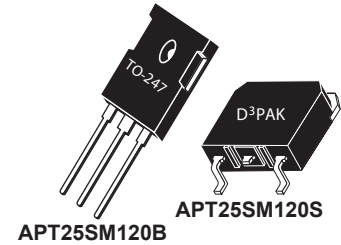
Silicon Carbide N-Channel Power MOSFET

FEATURES

- 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	1200	V
I_D	Continuous Drain Current @ $T_c = 25^\circ\text{C}$	25	A
	Continuous Drain Current @ $T_c = 100^\circ\text{C}$	17	
I_{DM}	Pulsed Drain Current ^①	58	
V_{GS}	Gate-Source Voltage	-10 to +25	V
P_D	Total Power Dissipation @ $T_c = 25^\circ\text{C}$	175	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		0.55	0.85	°C/W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55		175	°C
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

Static Characteristics

$T_J = 25^\circ\text{C}$ 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 $25^\circ\text{C}, I_D = 1mA$		0.25		V/°C
$R_{DS(on)}$	Drain-Source On Resistance ^②	$V_{GS} = 20V, I_D = 10A$		140	175	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			-4.6		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200V$ $V_{GS} = 0V$	$T_J = 25^\circ\text{C}$		100	μA
			$T_J = 150^\circ\text{C}$		250	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = +20V / -10V$			±100	nA
ESR	Equivalent Series Resistance	$f = 1MHz, 25mV, \text{Drain Short}$		1.5		Ω

Dynamic Characteristics
T_J = 25°C unless otherwise specified
APT25SM120B_S

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DD} = 1200V f = 1MHz		1260		pF
C _{rss}	Reverse Transfer Capacitance			15		
C _{oss}	Output Capacitance			65		
E _{oss}	Output Capacitance Stored Energy	V _{GS} = 0V, V _{DD} = 800V f = 1MHz		25		μJ
C _{o(er)}	Effective Output Capacitance			75		pF
Q _g	Total Gate Charge	V _{GS} = 0/20V V _{DD} = 800V I _D = 10A		72		nC
Q _{gs}	Gate-Source Charge			12		
Q _{gd}	Gate-Drain Charge			22		
t _{d(on)}	Turn-On Delay Time	V _{DD} = 800V V _{GS} = 0/20V I _D = 10A R _G = 2.5 Ω ^③ L = 115 μH T _c = 25°C Freewheeling Diode = APT10SCE120B		5		ns
t _r	Current Rise Time			4		
t _{d(off)}	Turn-Off Delay Time			19		
t _f	Current Fall Time			23		
E _{on2}	Turn-On Switching Energy			225		
E _{off}	Turn-Off Switching Energy		55			
t _{d(on)}	Turn-On Delay Time	V _{DD} = 800V V _{GS} = 0/20V I _D = 10A R _G = 2.5 Ω ^③ L = 115 μH T _c = 150°C Freewheeling Diode = APT10SCE120B		4		ns
t _r	Current Rise Time			4		
t _{d(off)}	Turn-Off Delay Time			22		
t _f	Current Fall Time			23		
E _{on2}	Turn-On Switching Energy			220		
E _{off}	Turn-Off Switching Energy		55			

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} = 10A, V _{GS} = 0V		4.1		V	
T _{rr}	Reverse Recovery Time	I _{SD} = 10A, V _{DD} = 800V di/dt = -1000A/μs		40		ns	
Q _{rr}	Reverse Recovery Charge				130		nC
I _{rrm}	Reverse Recovery Current				7.3		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.

TYPICAL PERFORMANCE CURVES

APT25SM120B_S

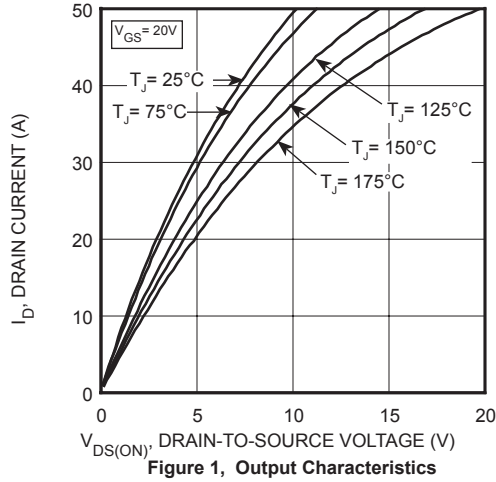


Figure 1, Output Characteristics

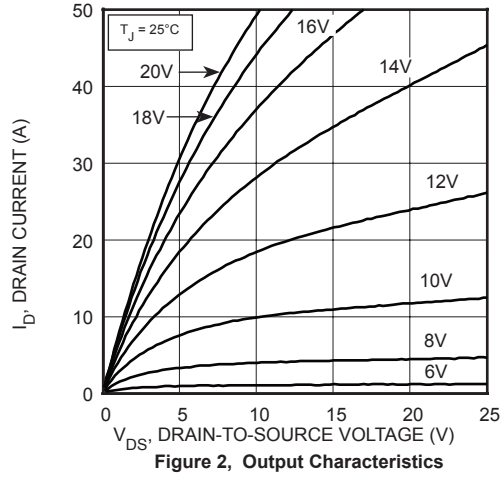


Figure 2, Output Characteristics

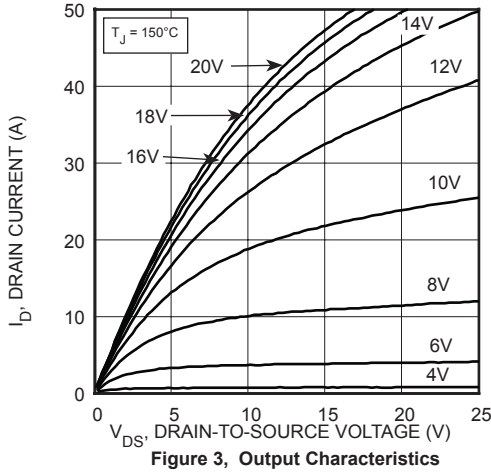


Figure 3, Output Characteristics

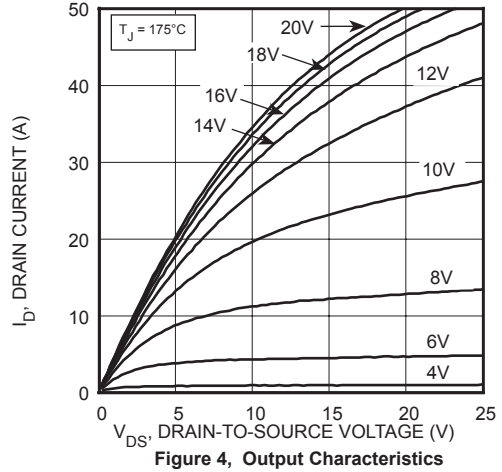


Figure 4, Output Characteristics

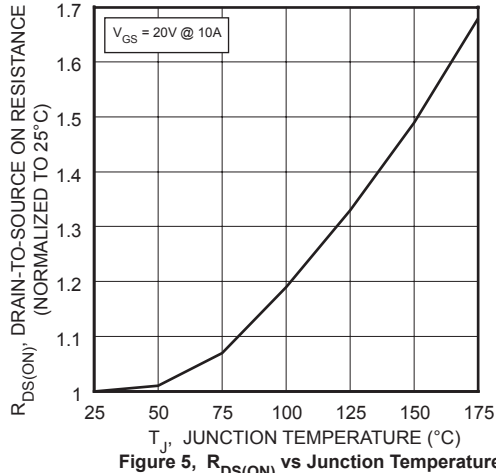


Figure 5, $R_{DS(ON)}$ vs Junction Temperature

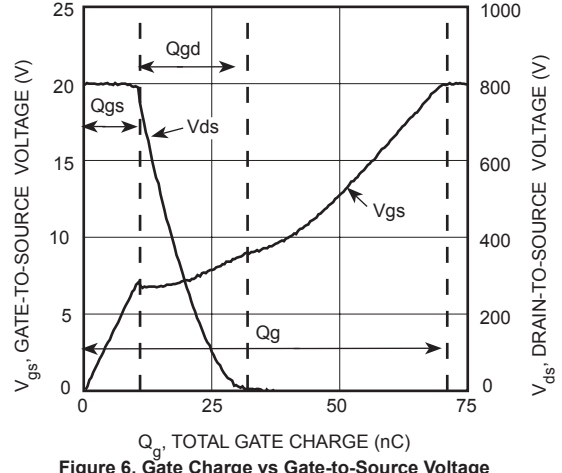


Figure 6, Gate Charge vs Gate-to-Source Voltage

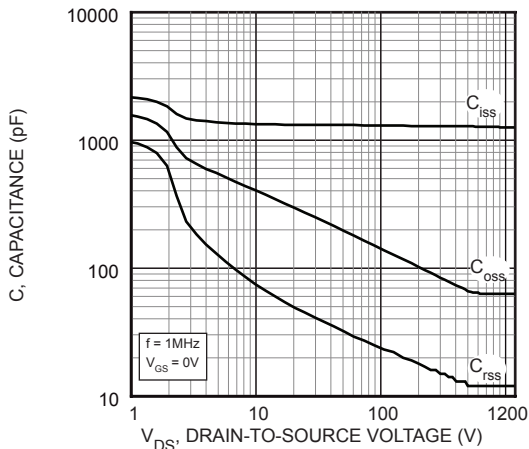


Figure 7, Capacitance vs Drain-to-Source Voltage

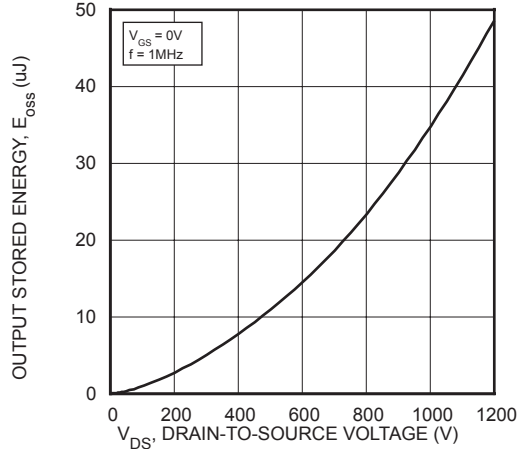


Figure 8, Typical Output Stored Energy, E_{OSS}

TYPICAL PERFORMANCE CURVES

APT25SM120B_S

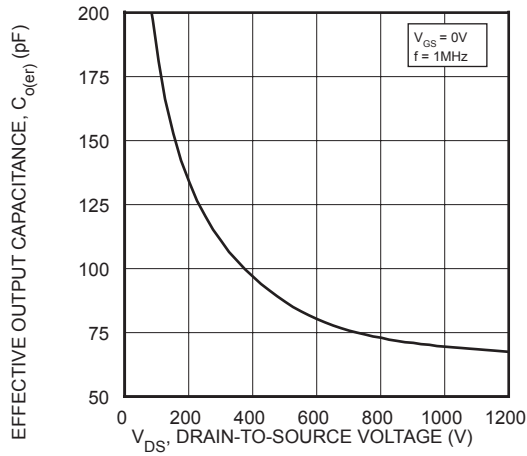


Figure 9, Effective Output Capacitance, $C_{oe(r)}$

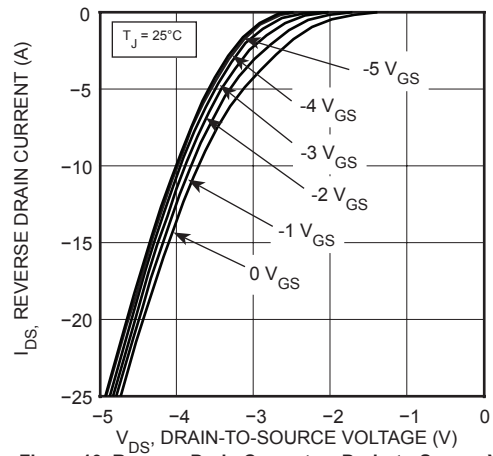


Figure 10, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

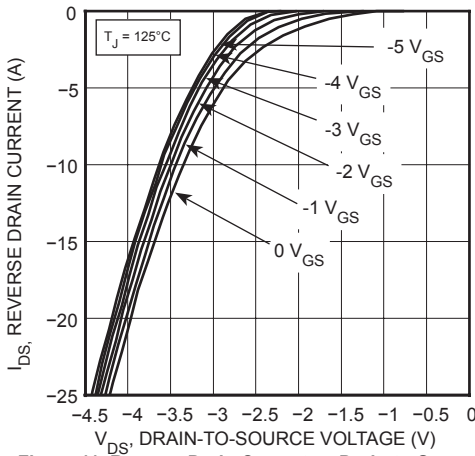


Figure 11, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

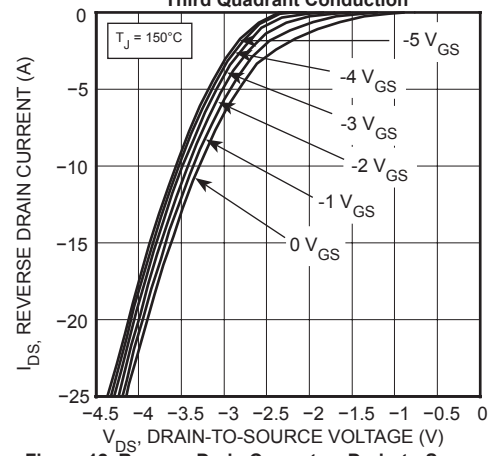


Figure 12, Reverse Drain Current vs Drain-to-Source Voltage Third Quadrant Conduction

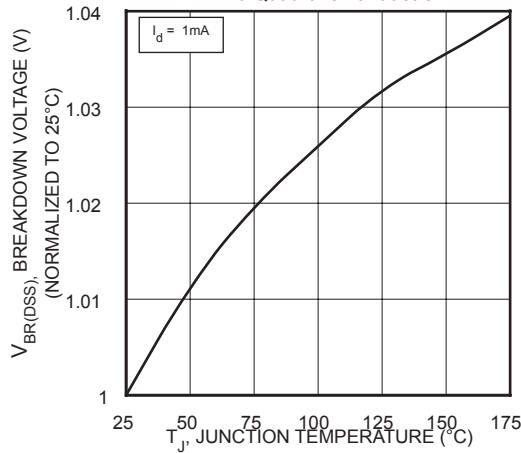


Figure 13, Breakdown Voltage vs Temperature

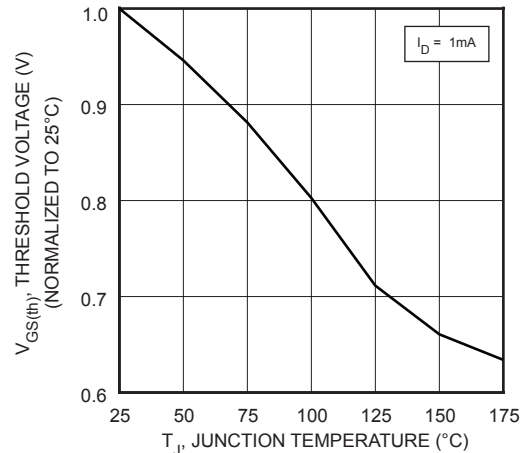


Figure 14, Threshold Voltage vs Temperature

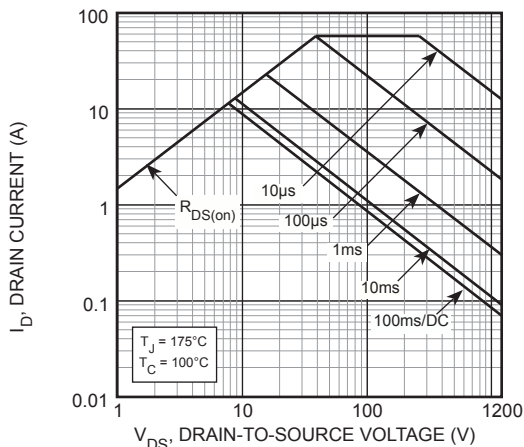
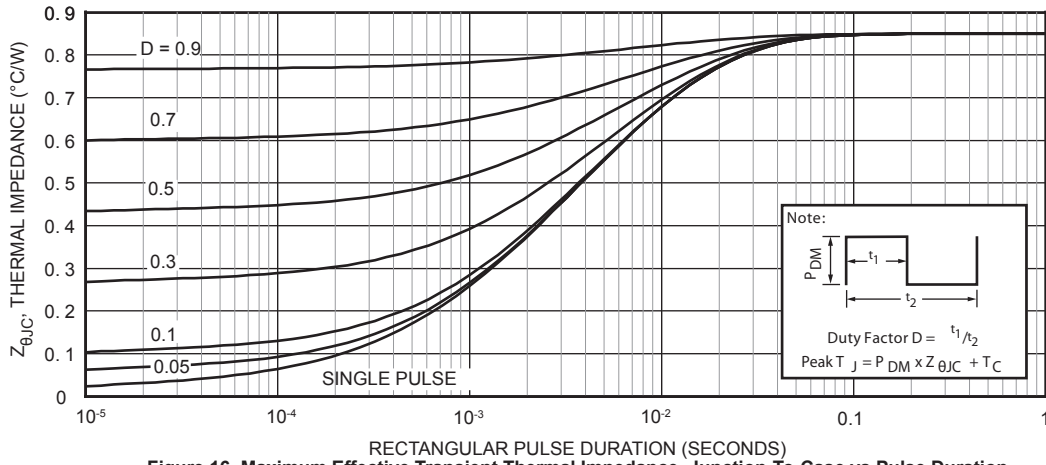
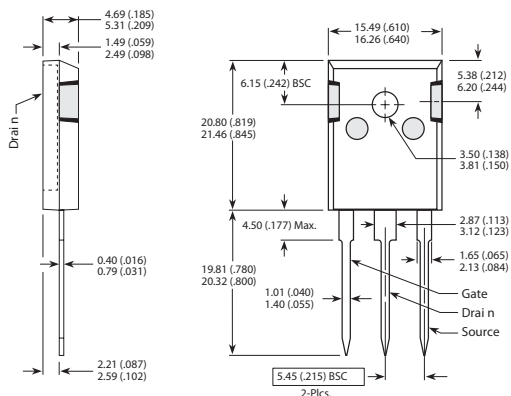


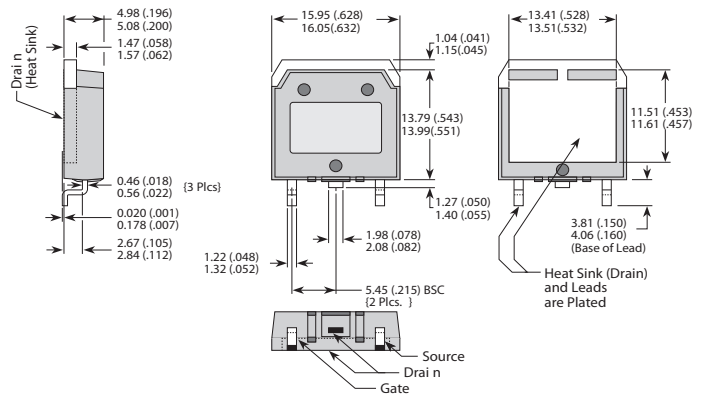
Figure 15, Forward Safe Operating Area



TO-247 (B) Package Outline



D³PAK (S) Package Outline



Dimensions in Millimeters (Inches)

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