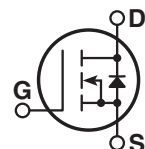
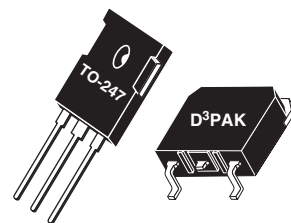




Super Junction MOSFET

- Ultra Low $R_{DS(ON)}$
- Low Miller Capacitance
- Ultra Low Gate Charge, Q_g
- Avalanche Energy Rated
- Extreme dv/dt Rated
- Popular TO-247 or Surface Mount D³ package.



MAXIMUM RATINGS

All Ratings per die: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT38N60B_SC6	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	38	Amps
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	24	
I_{DM}	Pulsed Drain Current ¹	112	
V_{GS}	Gate-Source Voltage Continuous	± 20	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	278	Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
T_L	Lead Temperature: 0.063" from Case for 10 Sec.	260	
dv/dt	Drain-Source Voltage slope ($V_{DS} = 480\text{V}$, $I_D = 38\text{A}$, $T_J = 125^\circ\text{C}$)	15	V/ns
I_{AR}	Avalanche Current ²	6.6	Amps
E_{AR}	Repetitive Avalanche Energy ² ($I_D = 6.6\text{A}$, $V_{DD} = 50\text{V}$)	1.2	mJ
E_{AS}	Single Pulse Avalanche Energy ($I_D = 6.6\text{A}$, $V_{DD} = 50\text{V}$)	796	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{(DSS)}$	Drain-Source Breakdown Voltage ($V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ³ ($V_{GS} = 10\text{V}$, $I_D = 18\text{A}$)			0.099	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$)			25	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$, $T_C = 150^\circ\text{C}$)			100	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$)			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 1.2\text{mA}$)	2.5	3	3.5	Volts



CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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DYNAMIC CHARACTERISTICS

APT38N60B_SC6

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		2826		pF
C_{oss}	Output Capacitance			2428		
C_{rss}	Reverse Transfer Capacitance			261		
Q_g	Total Gate Charge ⁴	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 38A @ 25^\circ C$		112		nC
Q_{gs}	Gate-Source Charge			18		
Q_{gd}	Gate-Drain ("Miller") Charge			58		
$t_{d(on)}$	Turn-on Delay Time	INDUCTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 400V$ $I_D = 38A @ 25^\circ C$ $R_G = 4.3\Omega$		14		ns
t_r	Rise Time			29		
$t_{d(off)}$	Turn-off Delay Time			118		
t_f	Fall Time			69		
E_{on}	Turn-on Switching Energy ⁵	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 38A, R_G = 4.3\Omega$		710		μJ
E_{off}	Turn-off Switching Energy			550		
E_{on}	Turn-on Switching Energy ⁵	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 38A, R_G = 4.3\Omega$		1100		
E_{off}	Turn-off Switching Energy			625		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			33	Amps
I_{SM}	Pulsed Source Current ¹ (Body Diode)			112	
V_{SD}	Diode Forward Voltage ³ ($V_{GS} = 0V, I_S = -38A$)			1.3	Volts
dv/dt	Peak Diode Recovery dv/dt ⁶			8	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -38A, di/dt = 100A/\mu s$)	$T_J = 25^\circ C$	667		ns
Q_{rr}	Reverse Recovery Charge ($I_S = -38A, di/dt = 100A/\mu s$)	$T_J = 25^\circ C$	18		μC
I_{RRM}	Peak Recovery Current ($I_S = -38A, di/dt = 100A/\mu s$)	$T_J = 25^\circ C$	49		Amps

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.45	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			40	

1 Repetitive Rating: Pulse width limited by maximum junction temperature

2 Repetitive avalanche causes additional power losses that can be calculated as

$$P_{AV} = E_{AR} \cdot f, \text{ Pulse width } tp \text{ limited by } T_J \text{ max.}$$

3 Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%

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

4 See MIL-STD-750 Method 3471

5 Eon includes diode reverse recovery.

6 Maximum 125°C diode commutation speed = di/dt 600A/ μs

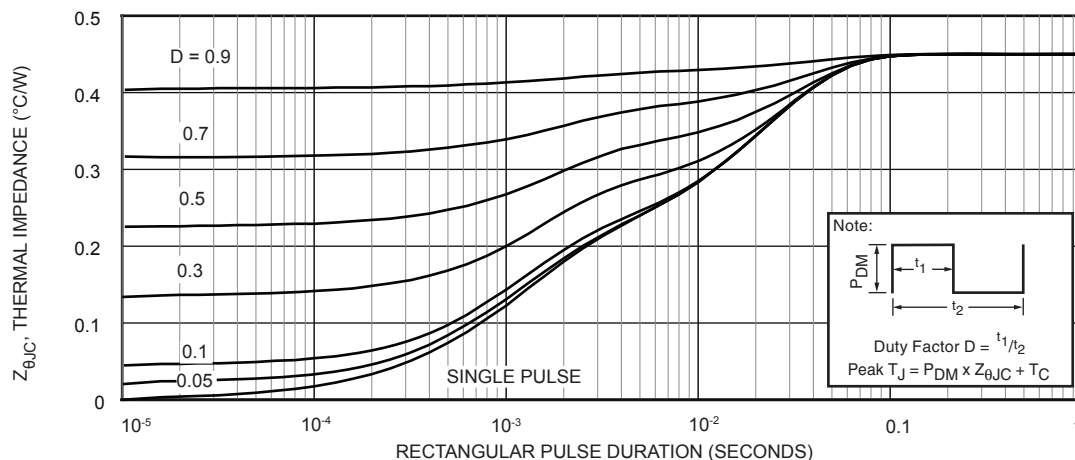


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

Typical Performance Curves

APT38N60B_SC6

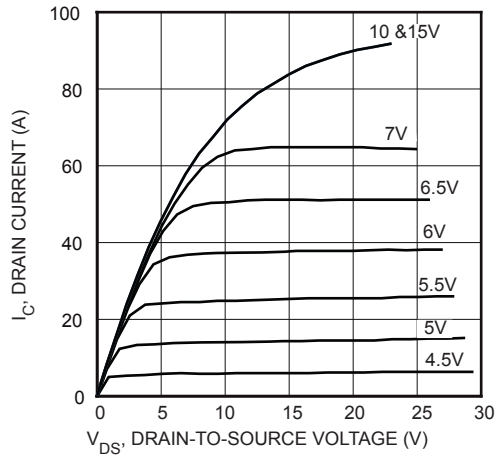


FIGURE 2, Low Voltage Output Characteristics

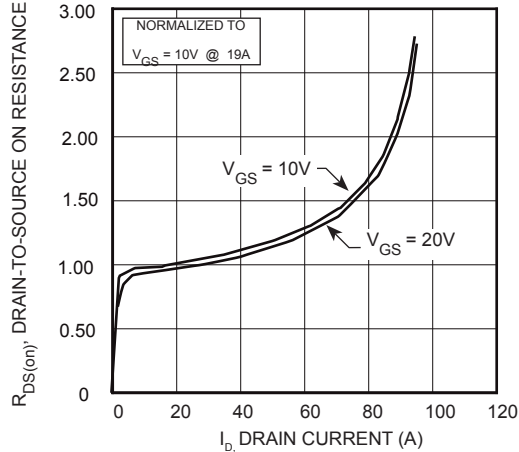


FIGURE 4, $R_{DS(ON)}$ vs Drain Current

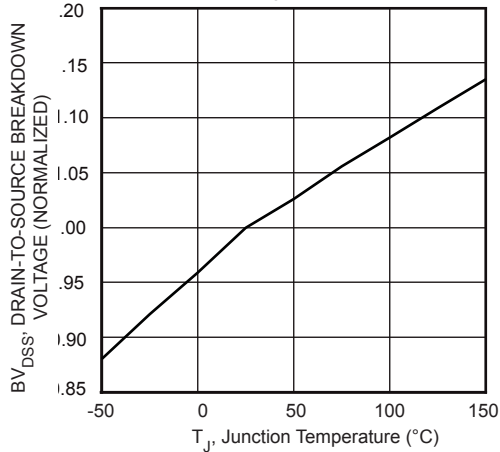


FIGURE 6, Breakdown Voltage vs Temperature

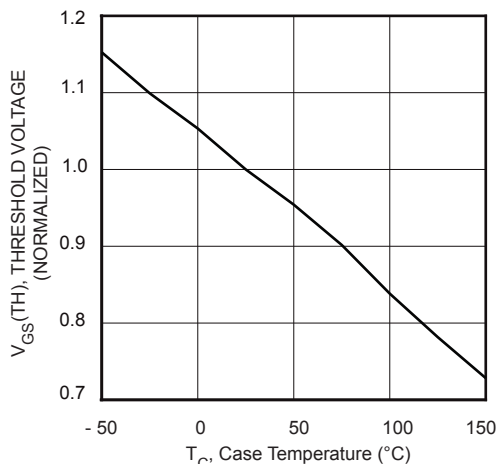


FIGURE 8, Threshold Voltage vs Temperature

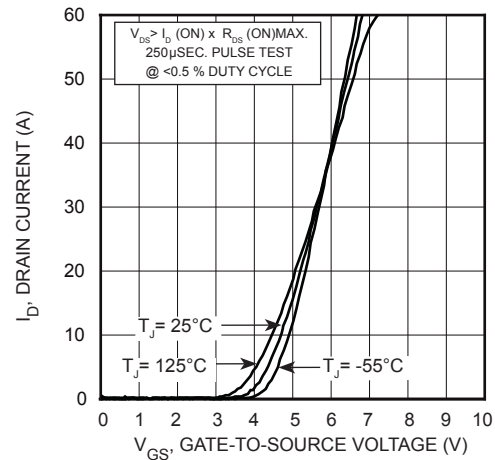


FIGURE 3, Transfer Characteristics

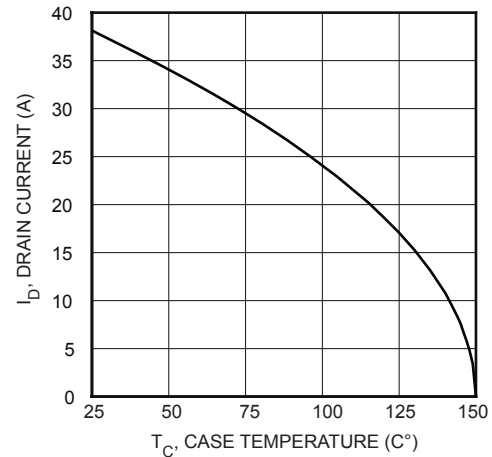


FIGURE 5, Maximum Drain Current vs Case Temperature

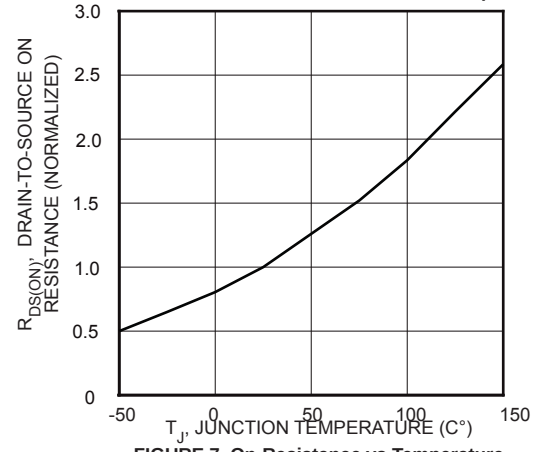


FIGURE 7, On-Resistance vs Temperature

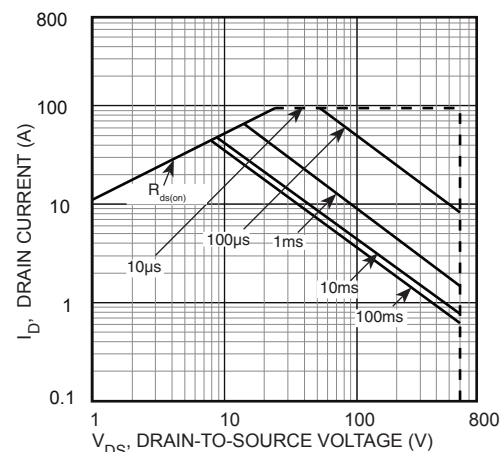


FIGURE 9, Maximum Safe Operating Area

Typical Performance Curves

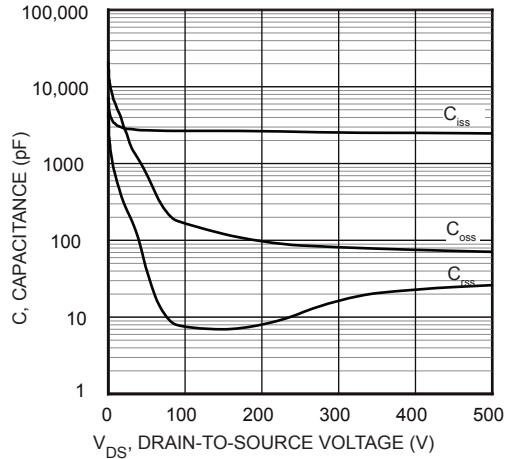


FIGURE 10, Capacitance vs Drain-To-Source Voltage

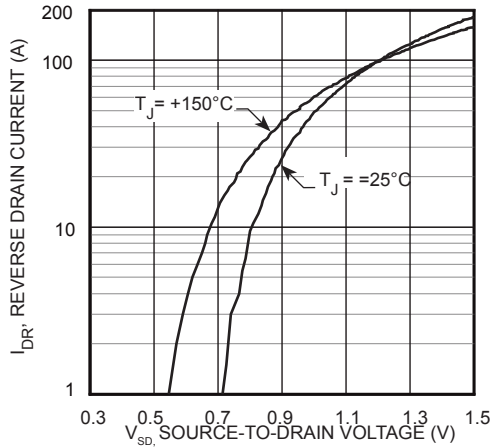


FIGURE 12, Source-Drain Diode Forward Voltage

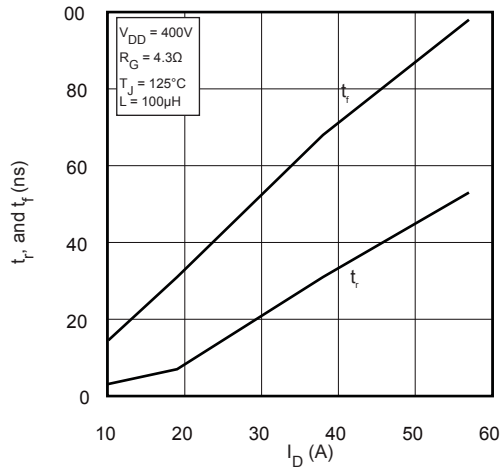


FIGURE 14, Rise and Fall Times vs Current

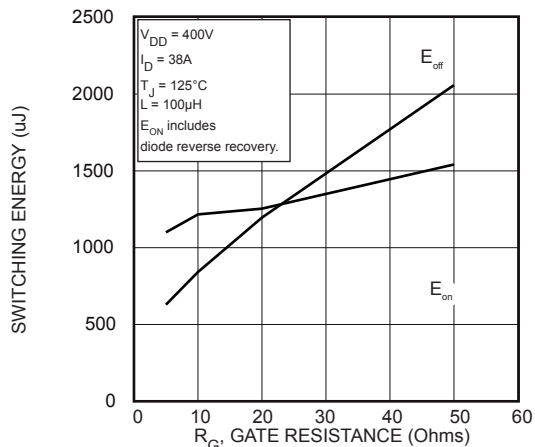


FIGURE 16, Switching Energy vs Gate Resistance

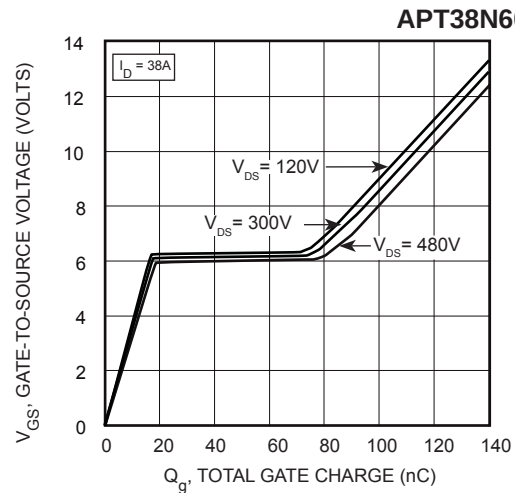


FIGURE 11, Gate Charges vs Gate-To-Source Voltage

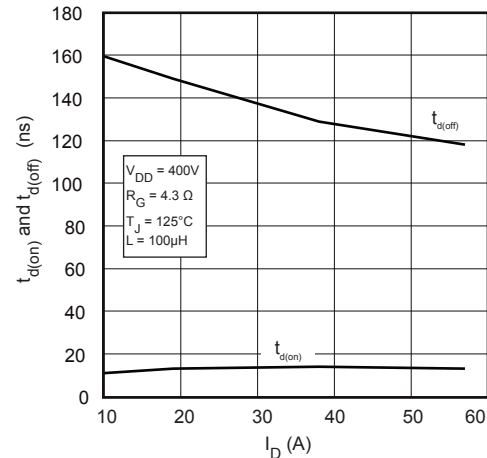


FIGURE 13, Delay Times vs Current

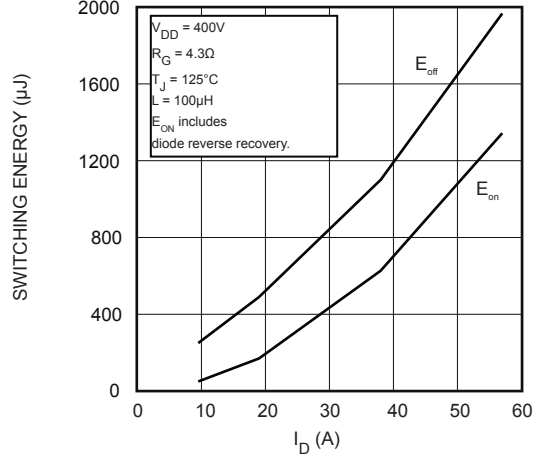


FIGURE 15, Switching Energy vs Current

Typical Performance Curves

APT38N60B_SC6

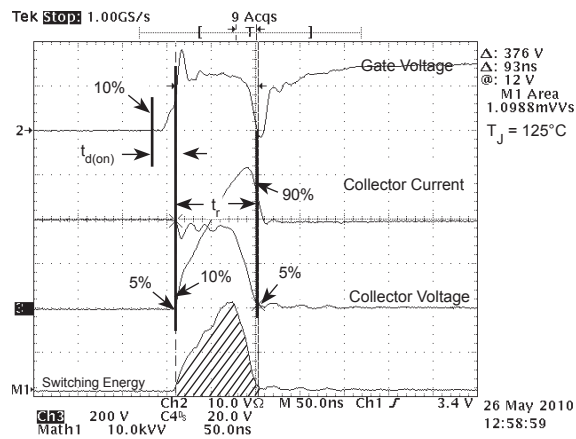


Figure 17, Turn-on Switching Waveforms and Definitions

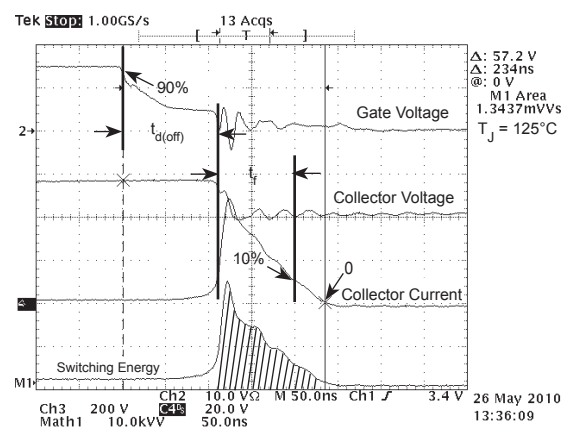


Figure 18, Turn-off Switching Waveforms and Definitions

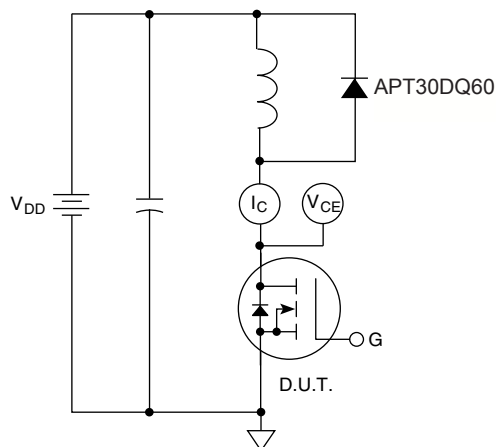
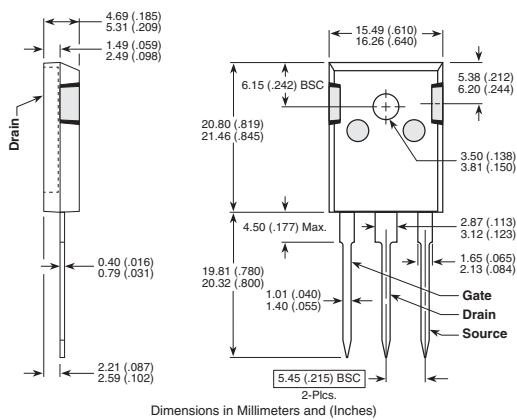


Figure 19, Inductive Switching Test Circuit

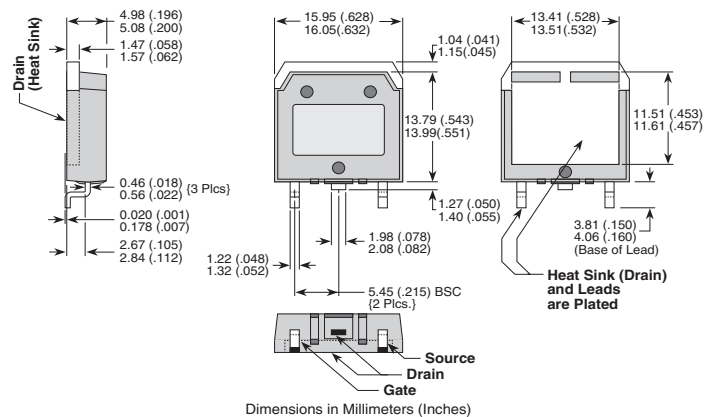
TO-247 (B) Package Outline



Dimensions in Millimeters and (Inches)

D³PAK Package Outline

Ⓔ3 100% Sn Plated



Dimensions in Millimeters (Inches)

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