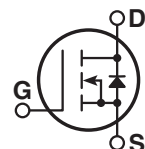
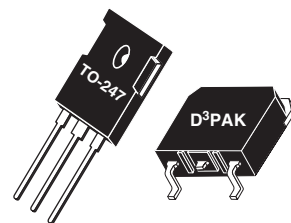




Super Junction MOSFET

- 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	APT53N60B_SC6	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	53	Amps
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	34	
I_{DM}	Pulsed Drain Current ¹	159	
V_{GS}	Gate-Source Voltage Continuous	± 20	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	417	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	
I_{AR}	Avalanche Current ²	9.3	Amps
E_{AR}	Repetitive Avalanche Energy ² ($I_D = 9.3\text{A}$, $V_{DD} = 50\text{V}$)	1.72	mJ
E_{AS}	Single Pulse Avalanche Energy ($I_D = 9.3\text{A}$, $V_{DD} = 50\text{V}$)	1135	

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 ($V_{GS} = 10\text{V}$, $I_D = 25.8\text{A}$)			0.070	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 ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$, $T_C = 150^\circ\text{C}$)			250	
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 ($V_{DS} = V_{GS}$, $I_D = 1.72\text{mA}$)	2.5	3	3.5	Volts



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

"COOLMOS™" comprise a new family of transistors developed by Infineon Technologies AG. "COOLMOS" is a trademark of Infineon Technologies AG."

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DYNAMIC CHARACTERISTICS

APT53N60B_SC6

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		4020		pF
C_{oss}	Output Capacitance			3545		
C_{rss}	Reverse Transfer Capacitance			330		
Q_g	Total Gate Charge ⁴	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 53A @ 25^\circ C$		154		nC
Q_{gs}	Gate-Source Charge			26		
Q_{gd}	Gate-Drain ("Miller") Charge			82		
$t_{d(on)}$	Turn-on Delay Time	INDUCTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 400V$ $I_D = 53A @ 125^\circ C$ $R_G = 4.3\Omega$		14		ns
t_r	Rise Time			36		
$t_{d(off)}$	Turn-off Delay Time			151		
t_f	Fall Time			74		
E_{on}	Turn-on Switching Energy ⁵	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 53A, R_G = 4.3\Omega$		960		μJ
E_{off}	Turn-off Switching Energy			873		
E_{on}	Turn-on Switching Energy ⁵	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 53A, R_G = 4.3\Omega$		1478		
E_{off}	Turn-off Switching Energy			995		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			46	Amps
I_{SM}	Pulsed Source Current ¹ (Body Diode)			159	
V_{SD}	Diode Forward Voltage ³ ($V_{GS} = 0V, I_S = -53A$)		0.9	1.2	Volts
dv/dt	Peak Diode Recovery dv/dt ⁶			15	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -53A, di/dt = 100A/\mu s$)	$T_J = 25^\circ C$	795		ns
Q_{rr}	Reverse Recovery Charge ($I_S = -53A, di/dt = 100A/\mu s$)	$T_J = 25^\circ C$	25		μC
I_{RRM}	Peak Recovery Current ($I_S = -53A, di/dt = 100A/\mu s$)	$T_J = 25^\circ C$	58		Amps

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.30	$^\circ C/W$
$R_{\theta JA}$	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

$P_{AV} = E_{AR} \cdot f$. Pulse width tp limited by Tj 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

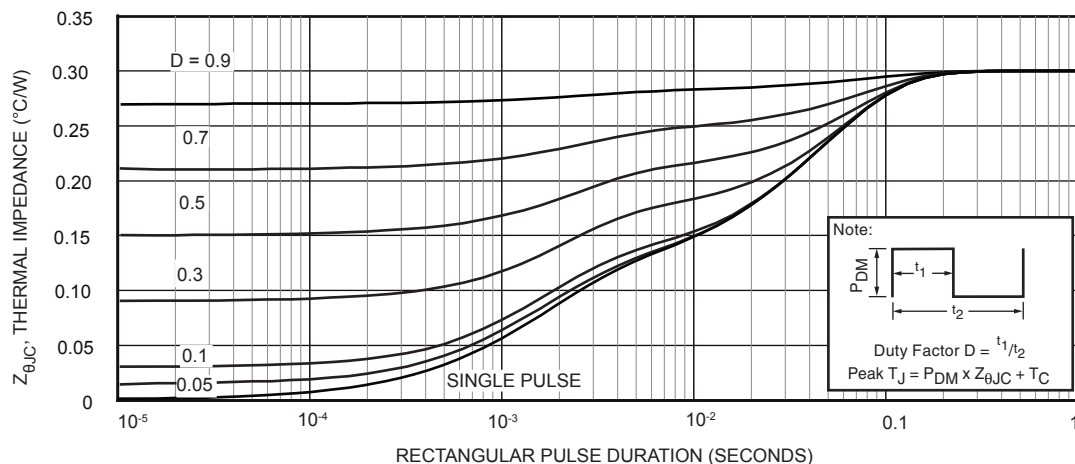


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

Typical Performance Curves

APT53N60B_SC6

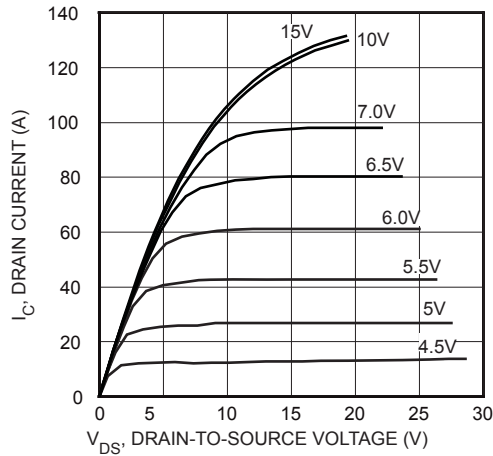


FIGURE 2, Low Voltage Output Characteristics

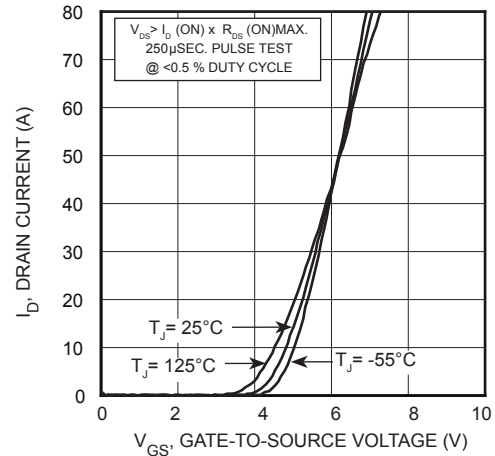


FIGURE 3, Transfer Characteristics

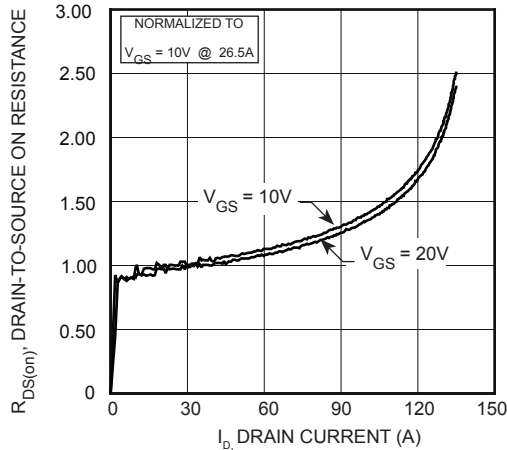


FIGURE 4, $R_{DS(ON)}$ vs Drain Current

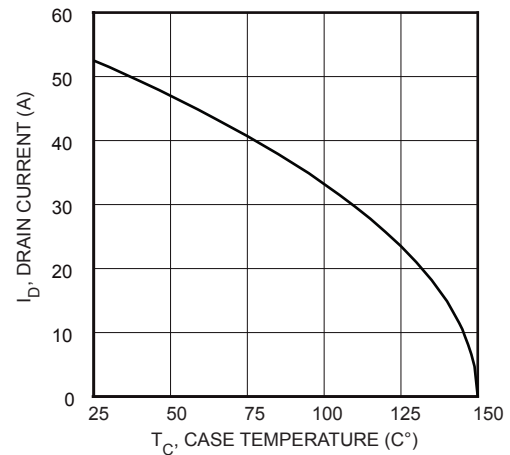


FIGURE 5, Maximum Drain Current vs Case Temperature

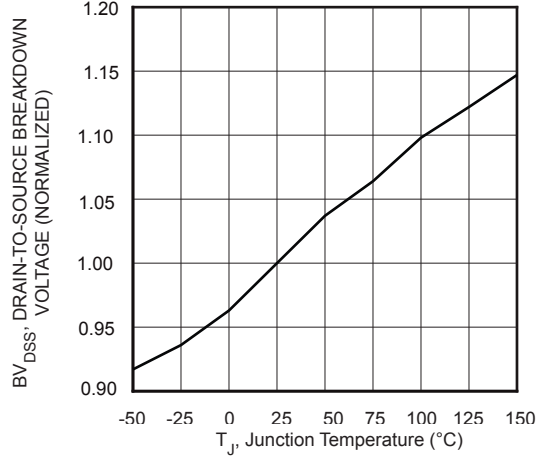


FIGURE 6, Breakdown Voltage vs Temperature

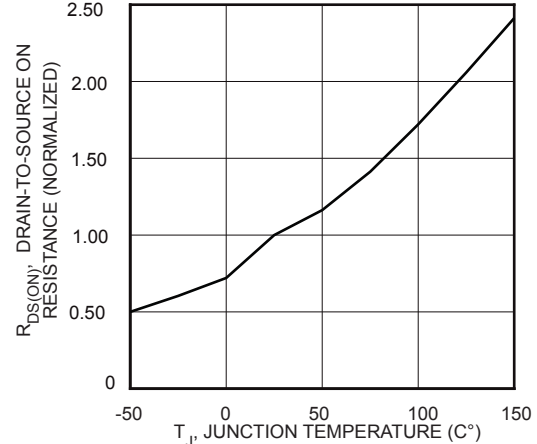


FIGURE 7, On-Resistance vs Temperature

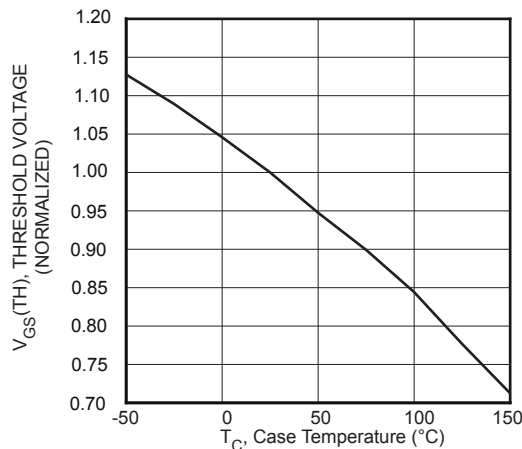


FIGURE 8, Threshold Voltage vs Temperature

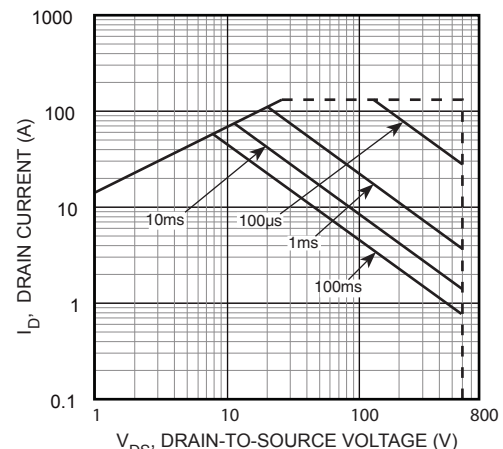


FIGURE 9, Maximum Safe Operating Area

Typical Performance Curves

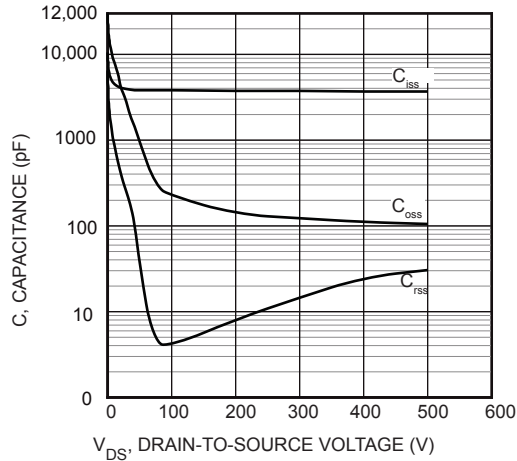


FIGURE 10, Capacitance vs Drain-To-Source Voltage

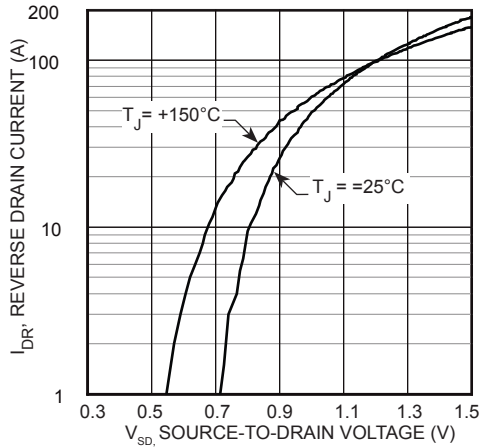


FIGURE 12, Source-Drain Diode Forward Voltage

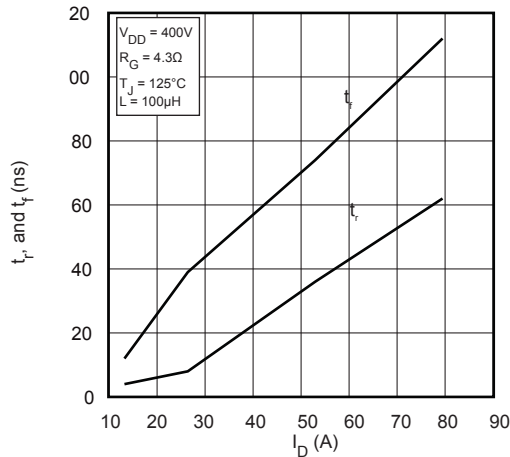


FIGURE 14, Rise and Fall Times vs Current

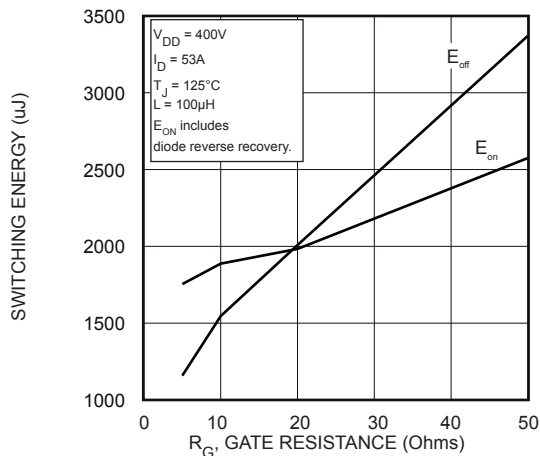


FIGURE 16, Switching Energy vs Gate Resistance

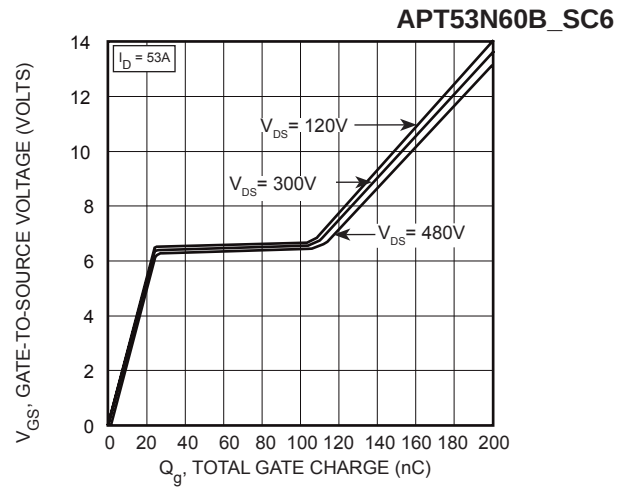


FIGURE 11, Gate Charges vs Gate-To-Source Voltage

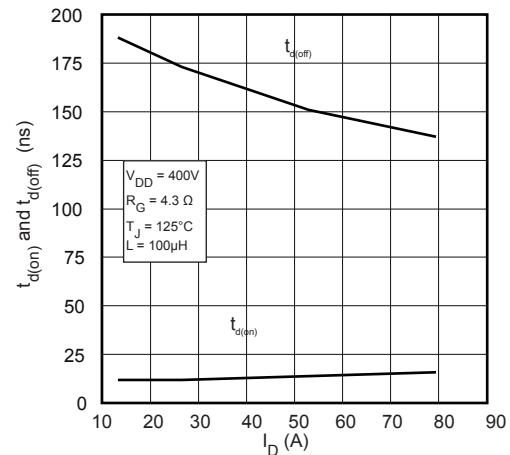


FIGURE 13, Delay Times vs Current

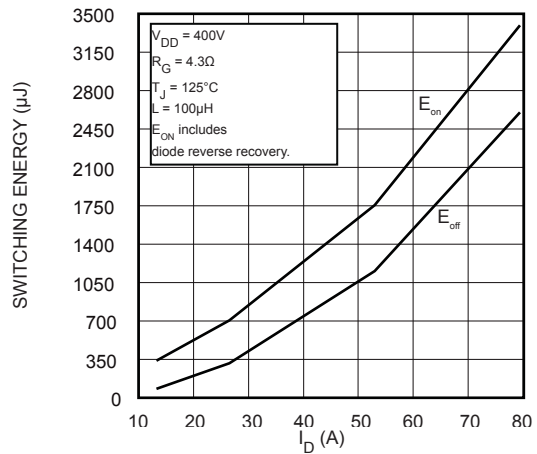


FIGURE 15, Switching Energy vs Current

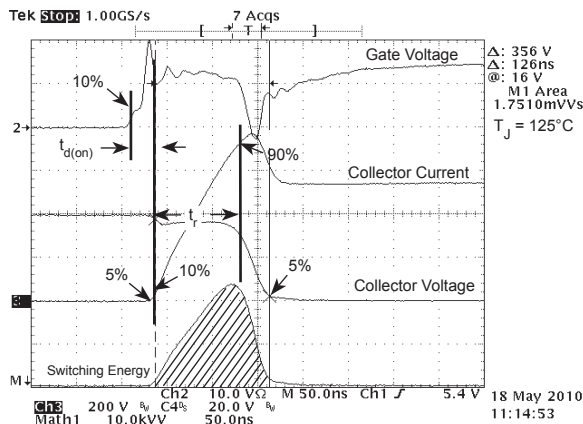


Figure 17, Turn-on Switching Waveforms and Definitions

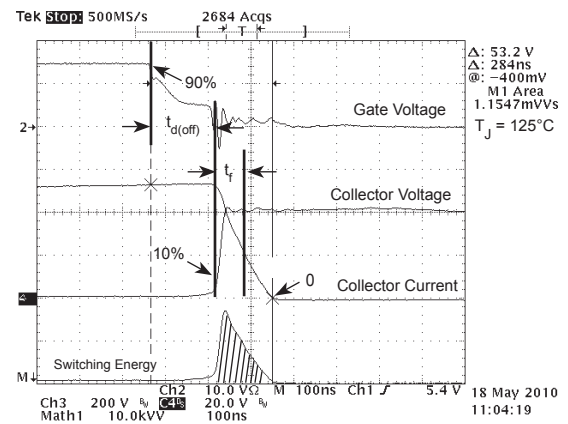


Figure 18, Turn-off Switching Waveforms and Definitions

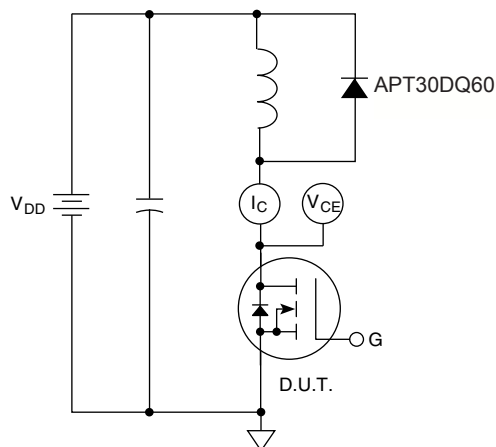
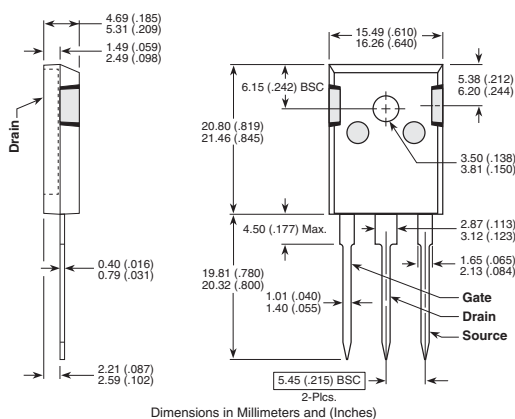


Figure 19, Inductive Switching Test Circuit

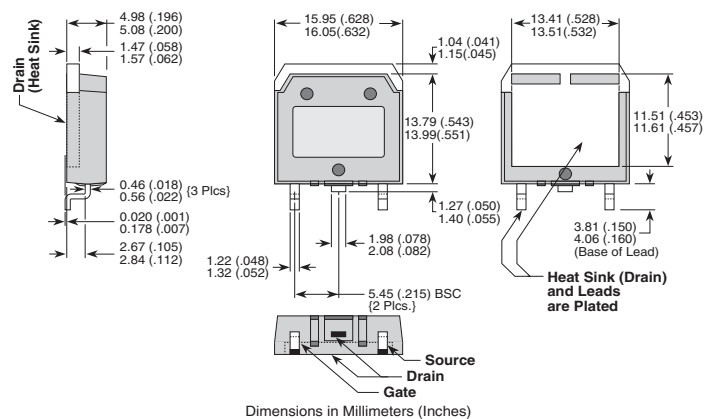
TO-247 (B) Package Outline



Dimensions in Millimeters and (Inches)

D³PAK Package Outline

e3 100% Sn Plated



Dimensions in Millimeters (Inches)

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 6,939,743, 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. US and Foreign patents pending. All Rights Reserved.