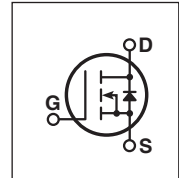
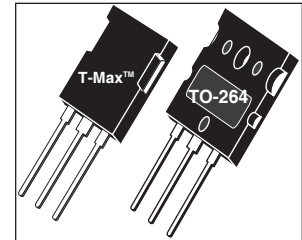




Super Junction FREDFET



- Ultra Low $R_{DS(ON)}$
- Low Miller Capacitance
- Ultra Low Gate Charge, Q_g
- Avalanche Energy Rated
- Extreme dv/dt Rated
- Intrinsic Fast-Recovery Body Diode
- Extreme Low Reverse Recovery Charge
- Ideal For ZVS Applications
- Popular T-MAX™ or TO-264 Package

Unless stated otherwise, Microsemi discrete FREDFETs contain a single FREDFET die. This device is made with two parallel FREDFET die. It is intended for switch-mode operation. It is not suitable for linear mode operation.

MAXIMUM RATINGS

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

Symbol	Parameter	APT40N60B2CF(G)_LCF(G)	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	40	Amps
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	26	
I_{DM}	Pulsed Drain Current ^①	80	
V_{GS}	Gate-Source Voltage Continuous	± 30	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	417	Watts
	Linear Derating Factor	3.33	W/ $^\circ\text{C}$
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 ($V_{DS} = 480\text{V}$, $I_D = 40\text{A}$, $T_J = 125^\circ\text{C}$)	80	V/ns
I_{AR}	Avalanche Current ^⑦	20	Amps
E_{AR}	Repetitive Avalanche Energy ^⑦	1	mJ
E_{AS}	Single Pulse Avalanche Energy ^④	690	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0\text{V}$, $I_D = 500\mu\text{A}$)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10\text{V}$, $I_D = 20\text{A}$)			0.110	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$)			4.2	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$, $T_C = 150^\circ\text{C}$)			3400	
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 ($V_{DS} = V_{GS}$, $I_D = 2\text{mA}$)	3	4	5	Volts

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

Microsemi Website - <http://www.microsemi.com>

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DYNAMIC CHARACTERISTICS

APT40N60B2CF(G)_LCF(G)

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		5040		pF
C_{oss}	Output Capacitance			1365		
C_{rss}	Reverse Transfer Capacitance			80		
Q_g	Total Gate Charge ^③	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 40A @ 25^\circ C$		185		nC
Q_{gs}	Gate-Source Charge			36		
Q_{gd}	Gate-Drain ("Miller") Charge			115		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 380V$ $I_D = 40A @ 25^\circ C$ $R_G = 1.8\Omega$		12		ns
t_r	Rise Time			15		
$t_{d(off)}$	Turn-off Delay Time			60		
t_f	Fall Time			6.4		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 40A, R_G = 5\Omega$		725		μJ
E_{off}	Turn-off Switching Energy			365		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 40A, R_G = 5\Omega$		1195		
E_{off}	Turn-off Switching Energy			440		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			40	Amps
I_{SM}	Pulsed Source Current ^① (Body Diode)			80	
V_{SD}	Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -40A$)			2.4	Volts
dv/dt	Peak Diode Recovery dv/dt ^⑤			40	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -40A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		195	ns
		$T_j = 125^\circ C$		290	
Q_{rr}	Reverse Recovery Charge ($I_S = -40A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		1.8	μC
		$T_j = 125^\circ C$		3.5	
I_{RRM}	Peak Recovery Current ($I_S = -40A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		17	Amps
		$T_j = 125^\circ C$		22	

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			31	

- ① Repetitive Rating: Pulse width limited by maximum junction temperature
- ② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%
- ③ See MIL-STD-750 Method 3471
- ④ Starting $T_j = +25^\circ C$, $L = 13.80mH$, $R_G = 25\Omega$, Peak $I_L = 10A$
- ⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_D 40A$ $di/dt \leq 700A/\mu s$ $v_R \leq 480V$ $T_j \leq 125^\circ C$
- ⑥ E_{on} includes diode reverse recovery. See figures 18, 20.
- ⑦ Repetitive avalanche causes additional power losses that can be calculated as $P_{AV} = E_{AR} \cdot f$

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

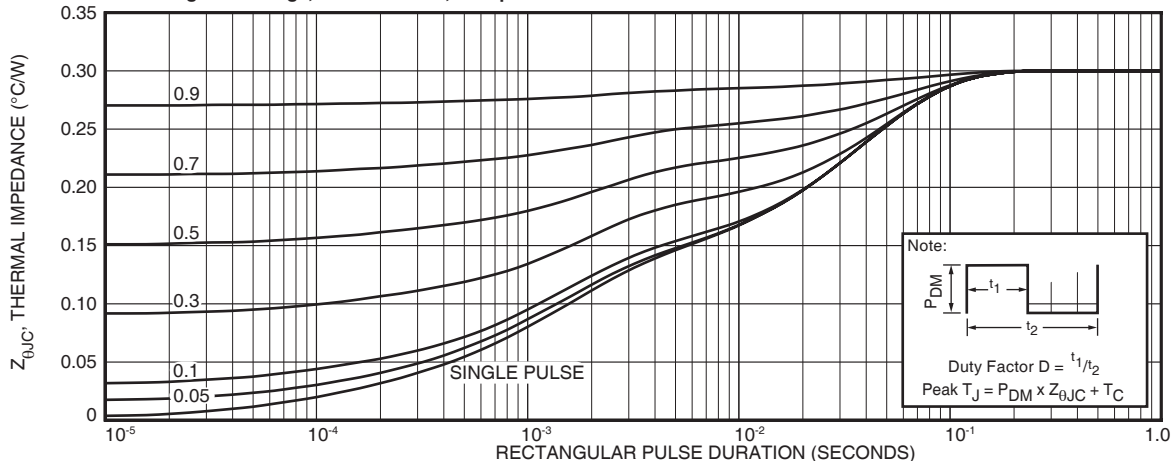


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT40N60B2CF(G)_LCF(G)

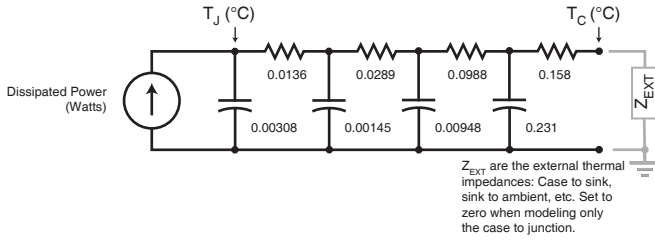


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

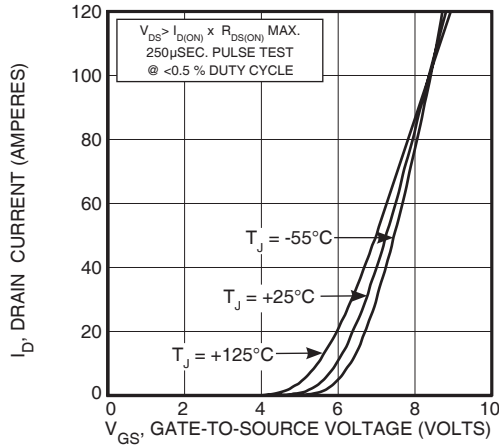


FIGURE 4, TRANSFER CHARACTERISTICS

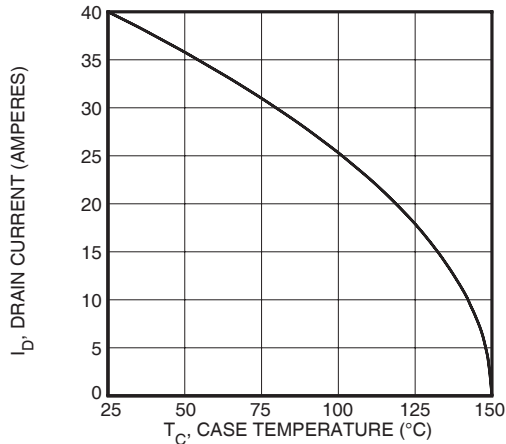


FIGURE 6, MAXIMUM DRAIN CURRENT vs. CASE TEMPERATURE

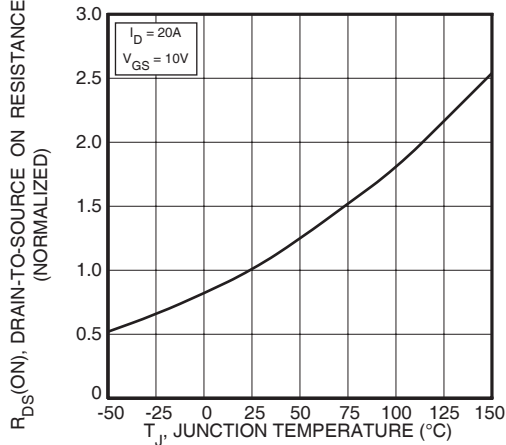


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

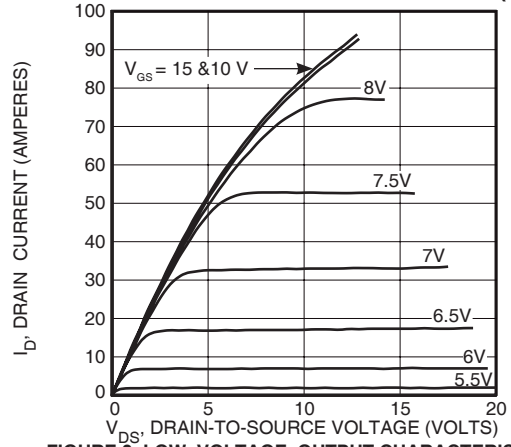


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

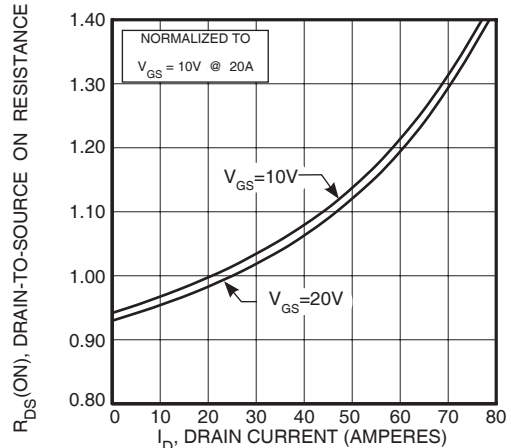


FIGURE 5, $R_{DS}(ON)$ vs. DRAIN CURRENT

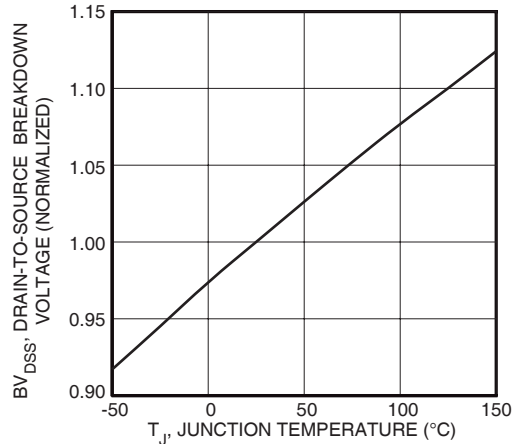


FIGURE 7, BREAKDOWN VOLTAGE vs. TEMPERATURE

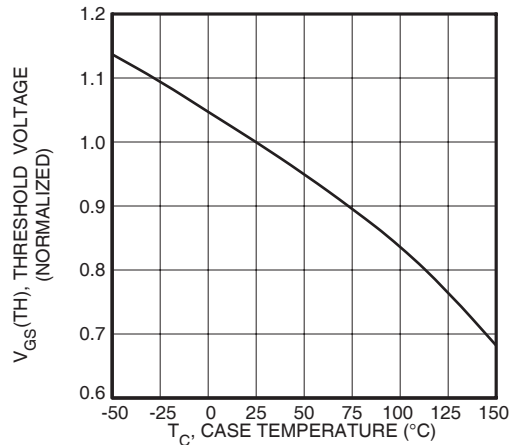


FIGURE 9, THRESHOLD VOLTAGE vs. TEMPERATURE

I_D , DRAIN CURRENT (AMPERES)

Graph removed

V_{DS} , DRAIN-TO-SOURCE VOLTAGE (VOLTS)
FIGURE 10, MAXIMUM SAFE OPERATING AREA

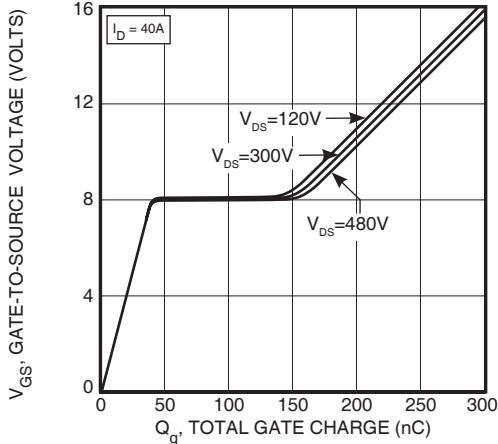


FIGURE 12, GATE CHARGE vs GATE-TO-SOURCE VOLTAGE

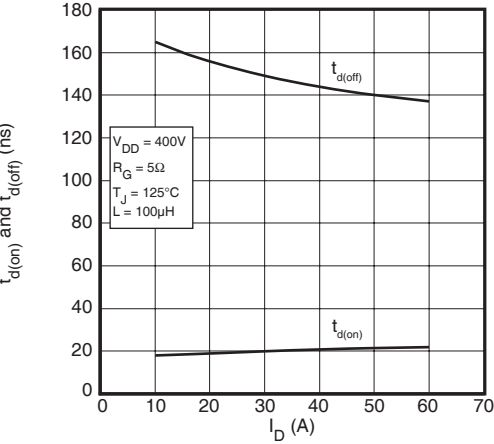


FIGURE 14, DELAY TIMES vs CURRENT

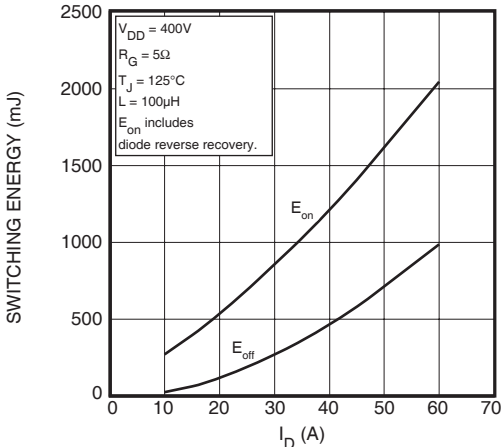


FIGURE 16, SWITCHING ENERGY vs CURRENT

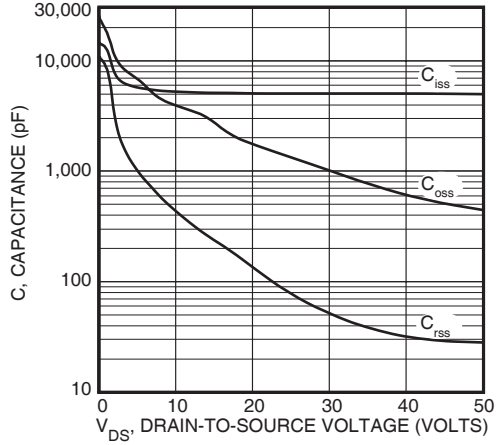


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

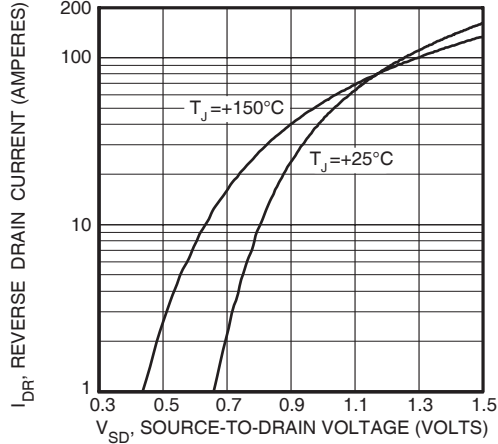


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

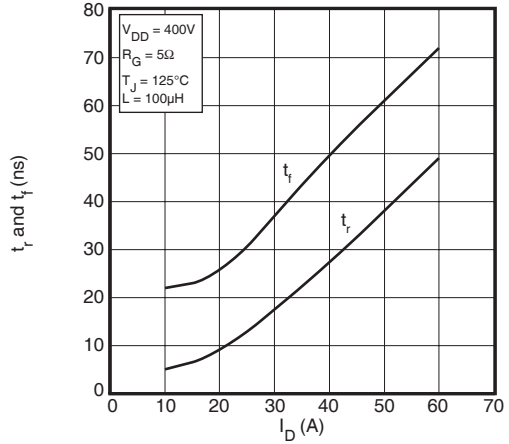


FIGURE 15, RISE AND FALL TIMES vs CURRENT

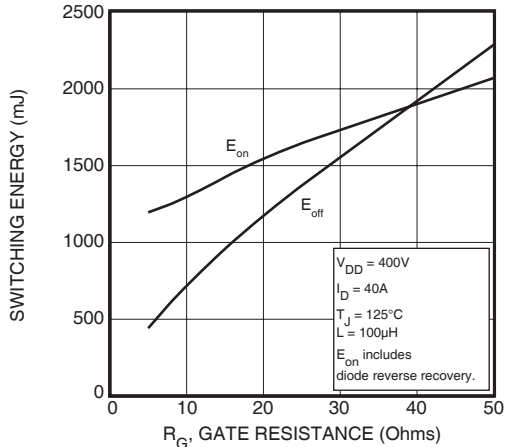


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

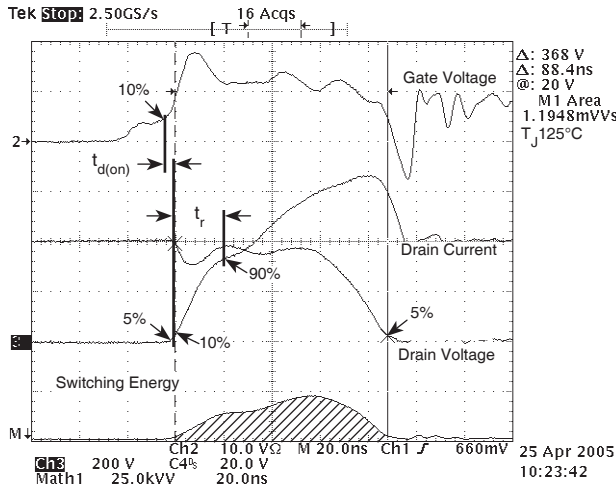


Figure 18, Turn-on Switching Waveforms and Definitions

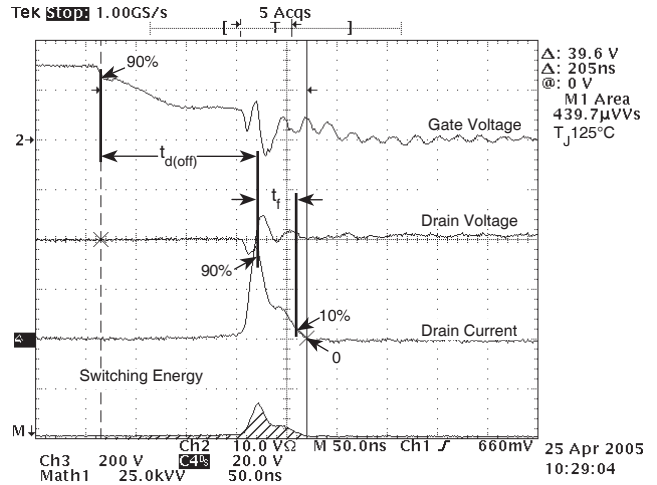


Figure 19, Turn-off Switching Waveforms and Definitions

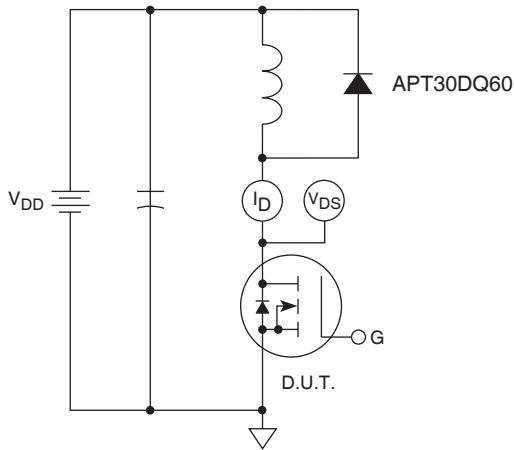
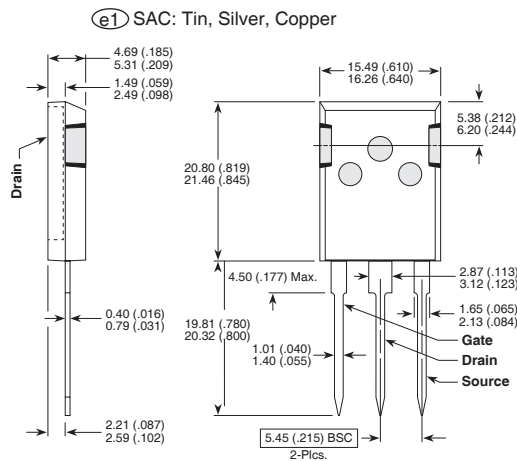


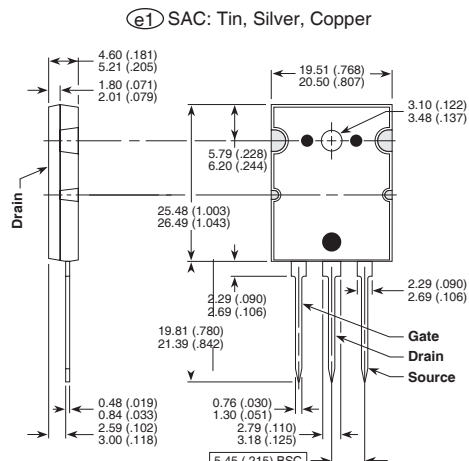
Figure 20, Inductive Switching Test Circuit

T-MAX™ (B2) Package Outline (B2CF)

TO-264 (L) Package Outline (LCF)



These dimensions are equal to the TO-247 without the mounting hole.
Dimensions in Millimeters and (Inches)



Dimensions in Millimeters and (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 and foreign patents. US and Foreign patents pending. All Rights Reserved.