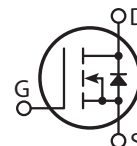
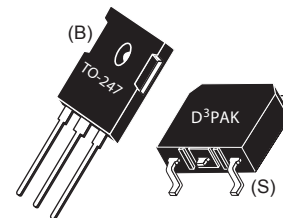




## Super Junction MOSFET



- 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 D<sup>3</sup> Package

### MAXIMUM RATINGS

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

Symbol	Parameter	APT60N60B_SCS(G)	UNIT
$V_{DSS}$	Drain-Source Voltage	600	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	60	Amps
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	38	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	230	
$V_{GS}$	Gate-Source Voltage Continuous	$\pm 30$	Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	431	Watts
	Linear Derating Factor	3.45	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	
$dv/dt$	MOSFET $dv/dt$ Ruggedness ( $V_{DS} = 480\text{V}$ )	50	V/ns
$I_{AR}$	Avalanche Current <sup>②</sup>	11	Amps
$E_{AR}$	Repetitive Avalanche Energy <sup>②</sup>	3	mJ
$E_{AS}$	Single Pulse Avalanche Energy <sup>③</sup>	1950	

### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$V_{(BR)DSS}$	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 <sup>④</sup> ( $V_{GS} = 10\text{V}, I_D = 44\text{A}$ )			0.045	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 600\text{V}, V_{GS} = 0\text{V}$ )			25	$\mu\text{A}$
	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 ( $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ )			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 3\text{mA}$ )	2.1	3	3.9	Volts

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

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

**DYNAMIC CHARACTERISTICS**

**APT60N60B\_SCS(G)**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		7200		pF
$C_{oss}$	Output Capacitance			8500		
$C_{rss}$	Reverse Transfer Capacitance			290		
$Q_g$	Total Gate Charge <sup>⑤</sup>	$V_{GS} = 10V$ $V_{DD} = 400V$ $I_D = 44A @ 25^\circ C$		150	190	nC
$Q_{gs}$	Gate-Source Charge			34		
$Q_{gd}$	Gate-Drain ("Miller") Charge			50		
$t_{d(on)}$	Turn-on Delay Time	<b>RESISTIVE SWITCHING</b> $V_{GS} = 15V$ $V_{DD} = 400V$ $I_D = 44A @ 25^\circ C$ $R_G = 4.3\Omega$		30		ns
$t_r$	Rise Time			20		
$t_{d(off)}$	Turn-off Delay Time			100		
$t_f$	Fall Time			10		
$E_{on}$	Turn-on Switching Energy <sup>⑥</sup>	<b>INDUCTIVE SWITCHING @ 25°C</b> $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 44A, R_G = 4.3\Omega$		675		μJ
$E_{off}$	Turn-off Switching Energy			520		
$E_{on}$	Turn-on Switching Energy <sup>⑥</sup>	<b>INDUCTIVE SWITCHING @ 125°C</b> $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 44A, R_G = 4.3\Omega$		1100		
$E_{off}$	Turn-off Switching Energy			635		

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

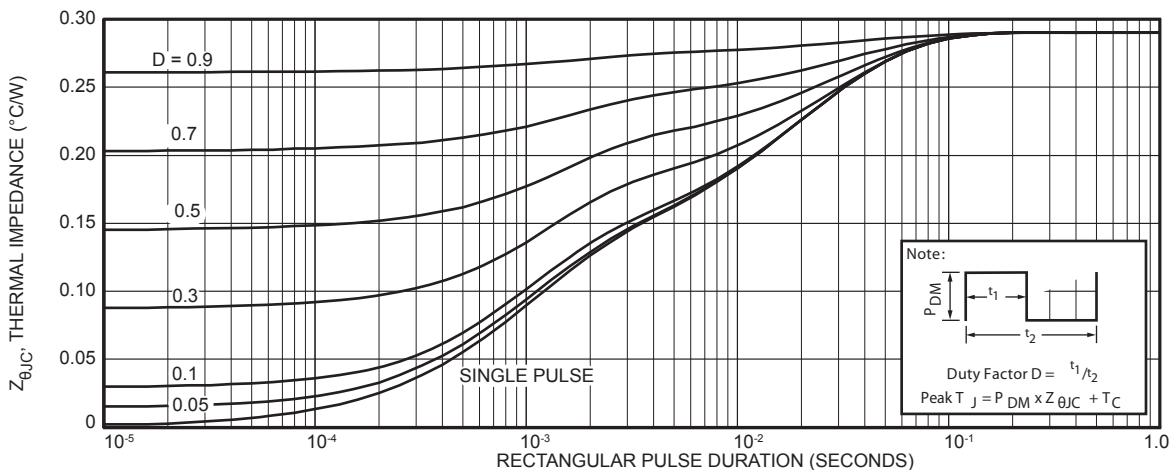
Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)			44	Amps
$I_{SM}$	Pulsed Source Current <sup>①</sup> (Body Diode)			180	
$V_{SD}$	Diode Forward Voltage <sup>④</sup> ( $V_{GS} = 0V, I_S = -44A$ )			1.2	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -44A, di_S/dt = 100A/\mu s$ )		600		ns
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -44A, di_S/dt = 100A/\mu s$ )		17		μC
$dv/dt$	Peak Diode Recovery $dv/dt$ <sup>⑦</sup>			4	V/ns

**THERMAL CHARACTERISTICS**

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.29	°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  $P_{AV} = E_{AR} \cdot f$
- ③ Starting  $T_j = +25^\circ C$ ,  $L = 33.23mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 11A$
- ④ Pulse Test: Pulse width < 380μs, Duty Cycle < 2%
- ⑤ See MIL-STD-750 Method 3471
- ⑥  $E_{on}$  includes diode reverse recovery. See figures 18, 20.
- ⑦ We do not recommend using this CoolMOS™ product in topologies that have free wheeling load current conducted in the body diode that is hard commutated. The current commutation is very "snappy", resulting in high di/dt at the completion of commutation, and the likelihood of severe over-voltage transients due to the resulting high dv/dt.

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



# Typical Performance Curves

APT60N60B\_SCS(G)

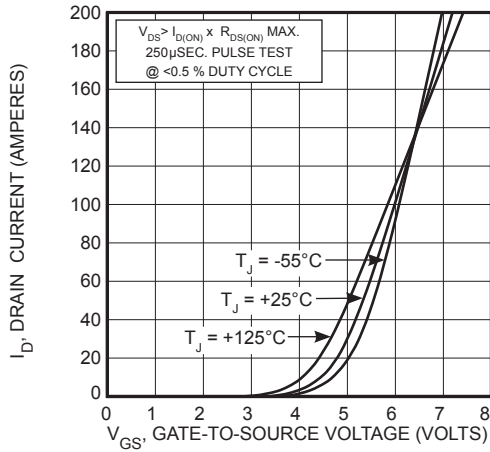


FIGURE 3, TRANSFER CHARACTERISTICS

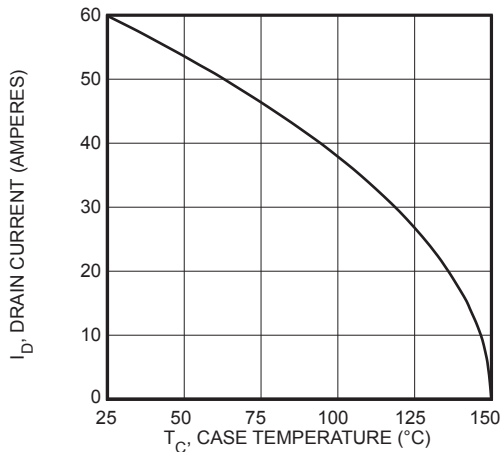


FIGURE 5, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

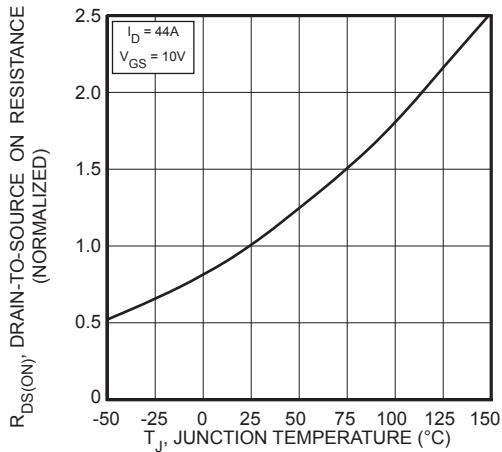


FIGURE 7, ON-RESISTANCE vs. TEMPERATURE

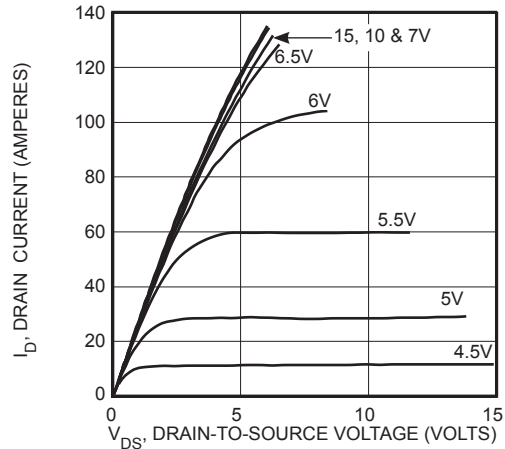


FIGURE 2, LOW VOLTAGE OUTPUT CHARACTERISTICS

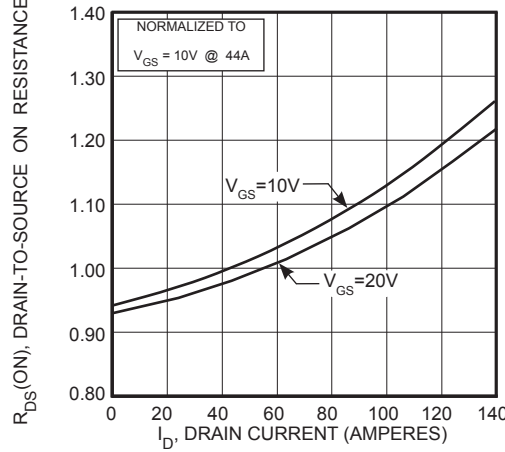


FIGURE 4,  $R_{DS(ON)}$  vs DRAIN CURRENT

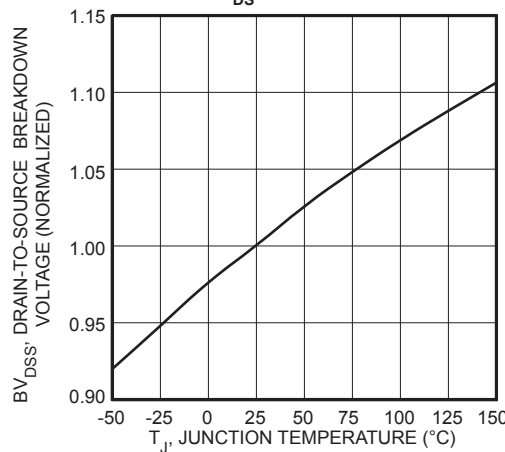


FIGURE 6, BREAKDOWN VOLTAGE vs TEMPERATURE

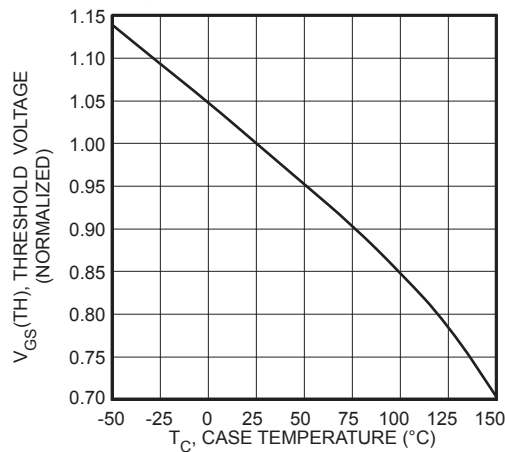


FIGURE 8, THRESHOLD VOLTAGE vs TEMPERATURE

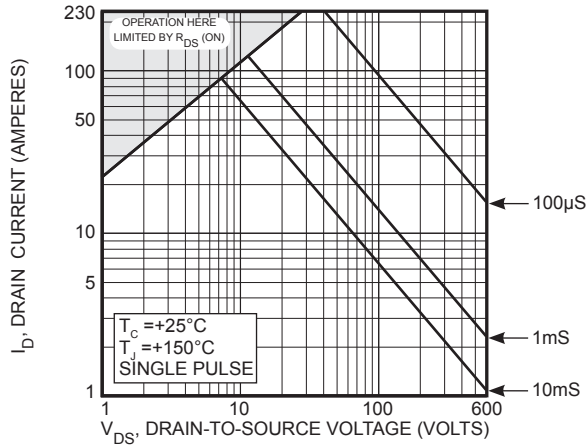


FIGURE 9, MAXIMUM SAFE OPERATING AREA

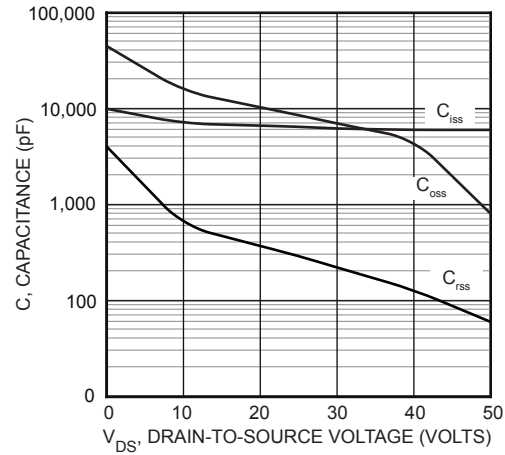


FIGURE 10, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

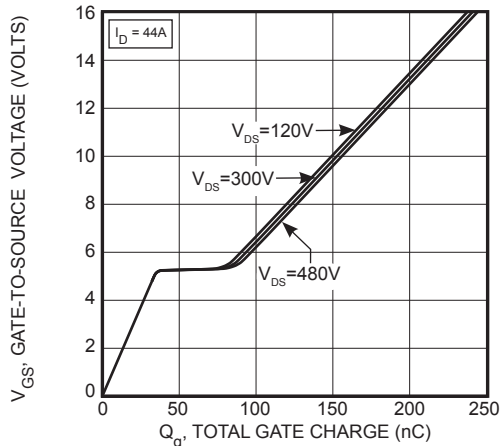


FIGURE 11, GATE CHARGE vs GATE-TO-SOURCE VOLTAGE

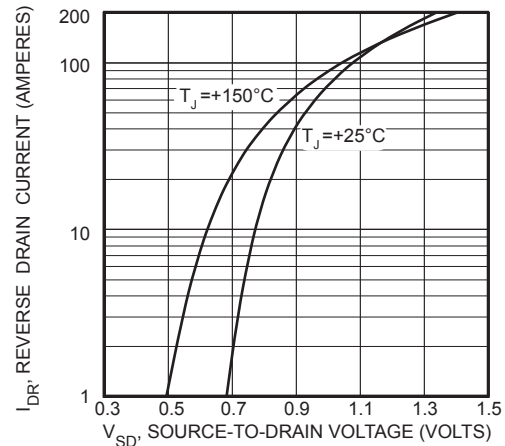


FIGURE 12, SOURCE-DRAIN DIODE FORWARD VOLTAGE

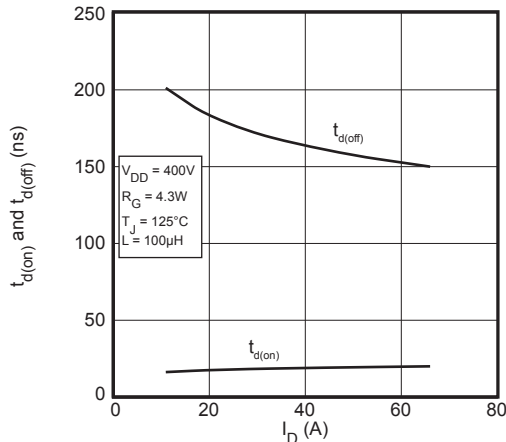


FIGURE 13, DELAY TIMES vs CURRENT

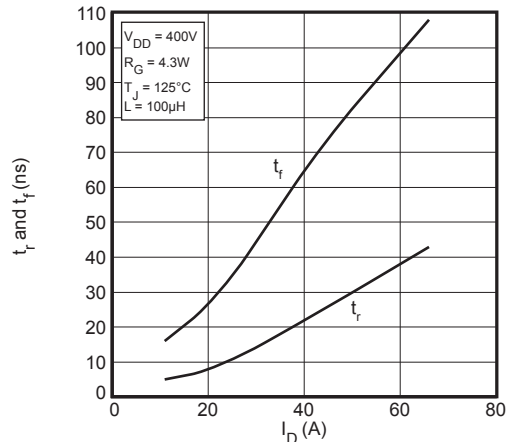


FIGURE 14, RISE AND FALL TIMES vs CURRENT

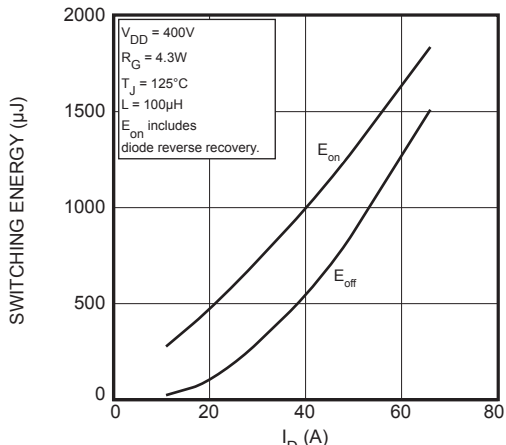


FIGURE 15, SWITCHING ENERGY vs CURRENT

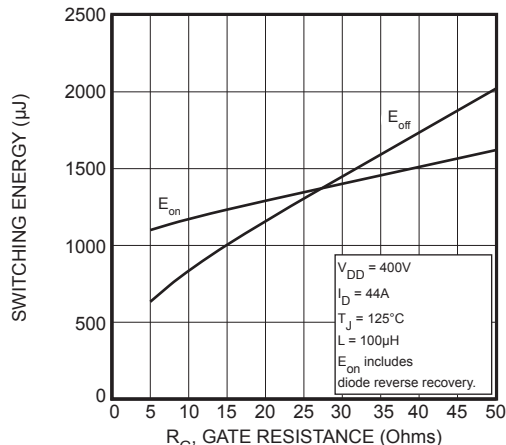


FIGURE 16, SWITCHING ENERGY vs. GATE RESISTANCE

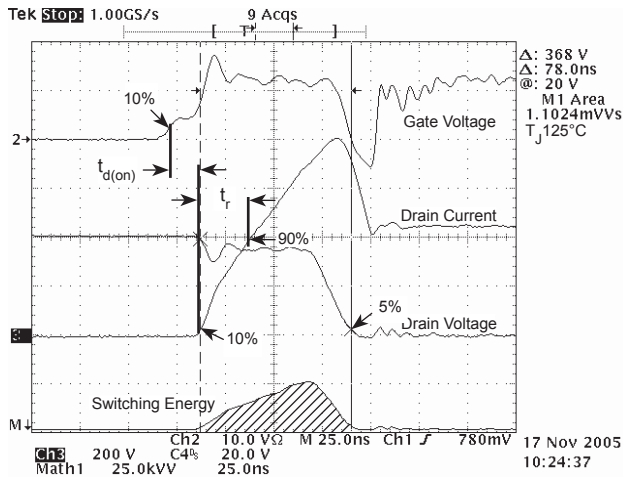


Figure 17, Turn-on Switching Waveforms and Definitions

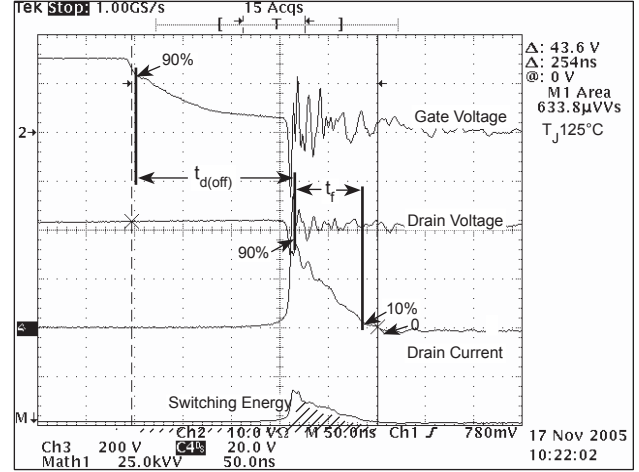


Figure 18, Turn-off Switching Waveforms and Definitions

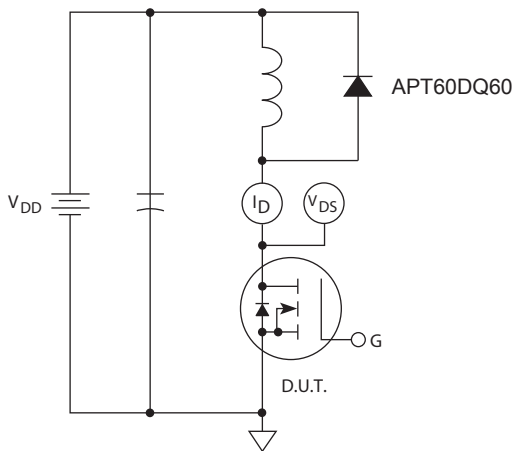
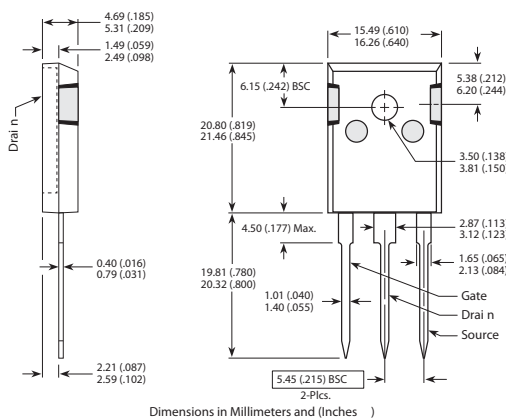


Figure 19, Inductive Switching Test Circuit

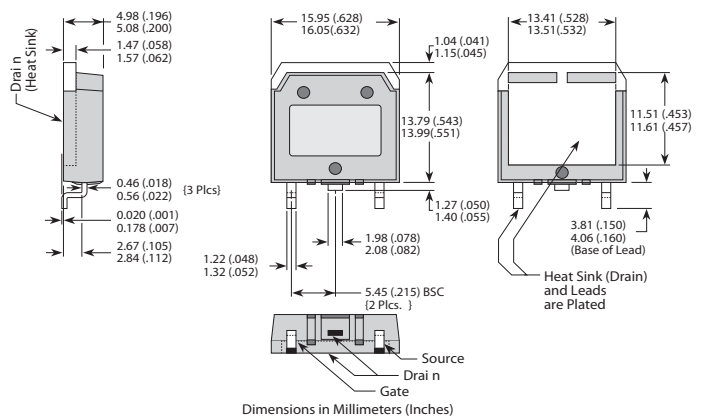
**TO-247 Package Outline**

① SAC: Tin, Silver, Copper



**D<sup>3</sup>PAK Package Outline**

③ 100% Sn



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