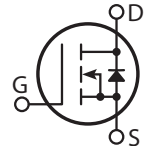
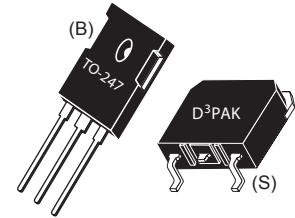




Super Junction MOSFET



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

Symbol	Parameter	APT60N60BCSG_SCSG	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 ^①	230	
V_{GS}	Gate-Source Voltage Continuous	±30	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	431	Watts
	Linear Derating Factor	3.45	W/°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°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 ^②	11	Amps
E_{AR}	Repetitive Avalanche Energy ^②	3	mJ
E_{AS}	Single Pulse Avalanche Energy ^③	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 ^④ ($V_{GS} = 10\text{V}, I_D = 44\text{A}$)			0.045	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}, V_{GS} = 0\text{V}$)			25	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 ($V_{DS} = V_{GS}, I_D = 3\text{mA}$)	2.1	3	3.9	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."

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

DYNAMIC CHARACTERISTICS

APT60N60BCSG_SCSG

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 ^⑤	$V_{GS} = 10V$ $V_{DD} = 400V$ $I_D = 44A @ 25^\circ C$		150	190	nC
Q_{gs}	Gate-Source Charge			34		
Q_{gd}	Gate-Drain ("Miller") Charge			50		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 400V$ $I_D = 44A @ 25^\circ C$ $R_G = 4.3\Omega$		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 ^⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 44A, R_G = 4.3\Omega$		675		μJ
E_{off}	Turn-off Switching Energy			520		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 44A, R_G = 4.3\Omega$		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 ^① (Body Diode)			180	
V_{SD}	Diode Forward Voltage ^④ ($V_{GS} = 0V, I_S = -44A$)			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 ^⑦			4	V/ns

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.29	$^\circ C/W$
$R_{\theta JA}$	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 $P_{AV} = E_{AR} \cdot f$
- ③ Starting $T_j = +25^\circ C$, $L = 33.23mH$, $R_G = 25\Omega$, Peak $I_L = 11A$
- ④ Pulse Test: Pulse width < 380 μs , 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.

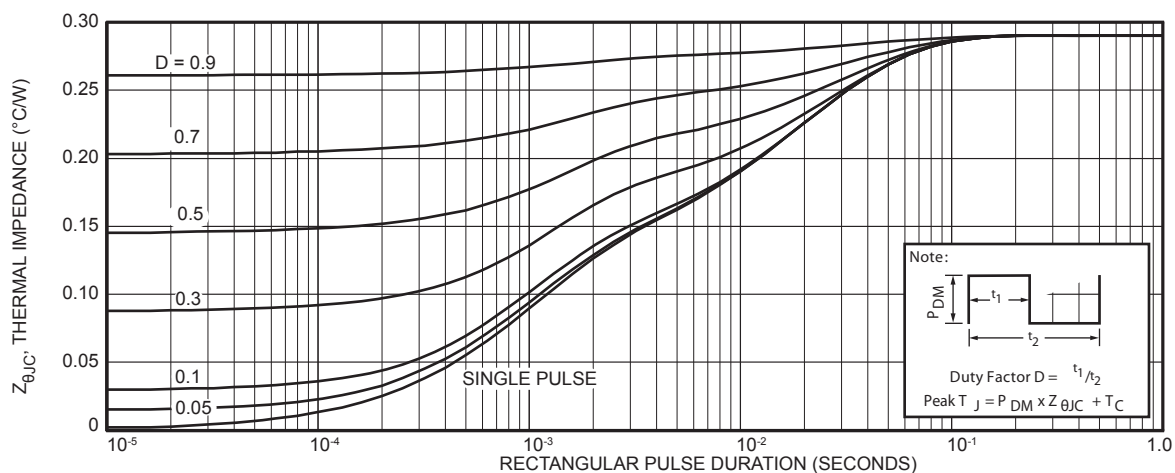


FIGURE 1. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT60N60BCSG_SCSG

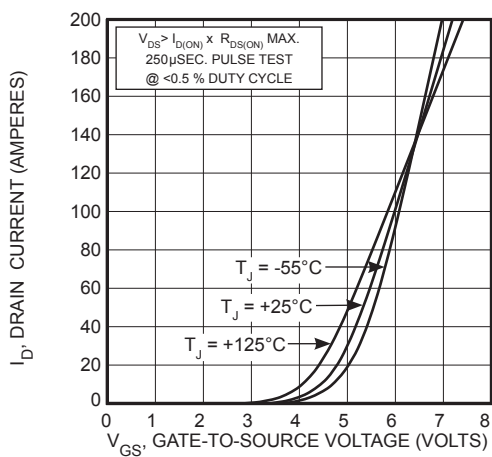


FIGURE 3, TRANSFER CHARACTERISTICS

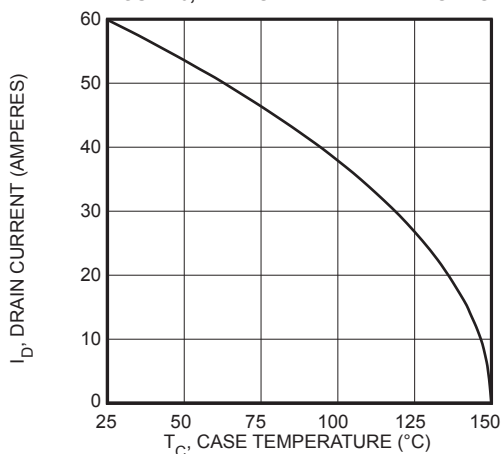


FIGURE 5, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

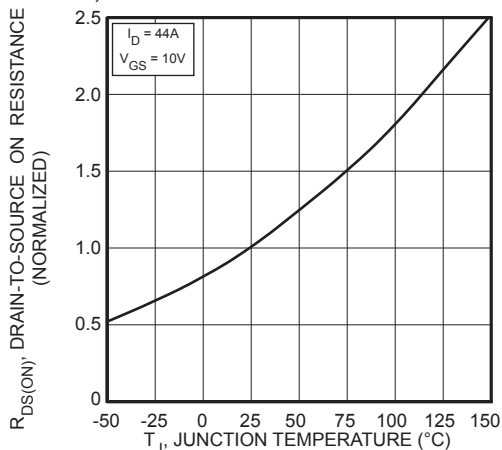


FIGURE 7, ON-RESISTANCE vs. TEMPERATURE

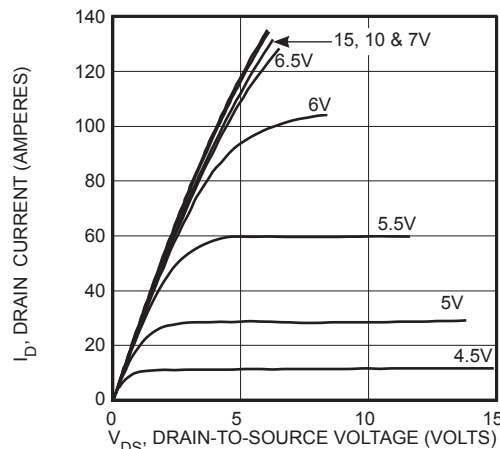


FIGURE 2, LOW VOLTAGE OUTPUT CHARACTERISTICS

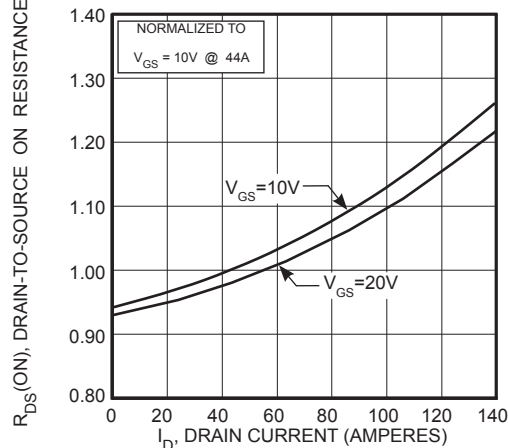


FIGURE 4, $R_{DS(ON)}$ vs DRAIN CURRENT

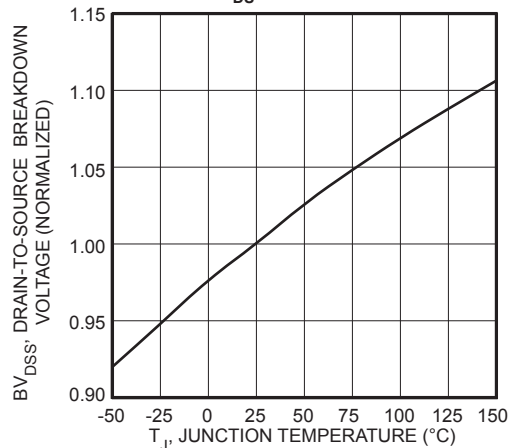


FIGURE 6, BREAKDOWN VOLTAGE vs TEMPERATURE

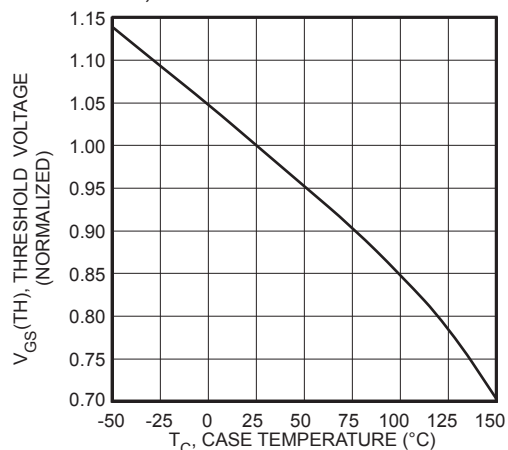


FIGURE 8, THRESHOLD VOLTAGE vs TEMPERATURE

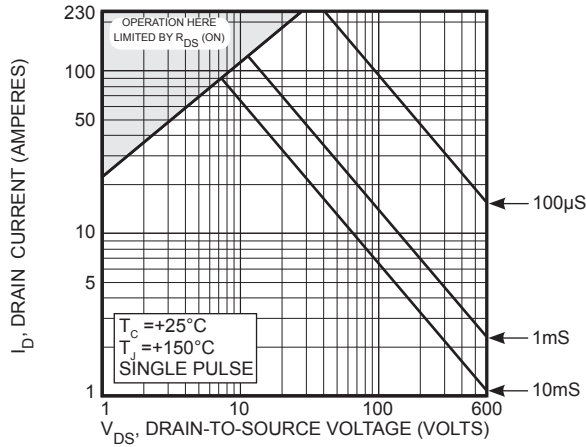


FIGURE 9, MAXIMUM SAFE OPERATING AREA

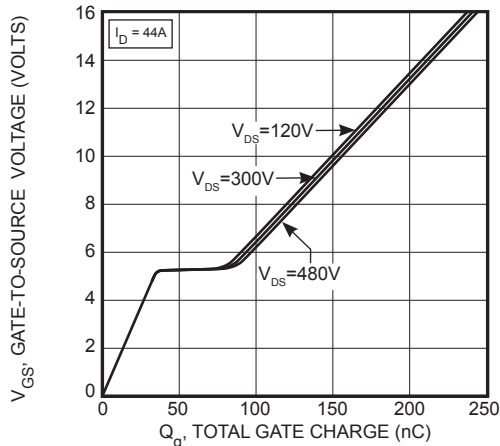


FIGURE 11, GATE CHARGE vs GATE-TO-SOURCE VOLTAGE

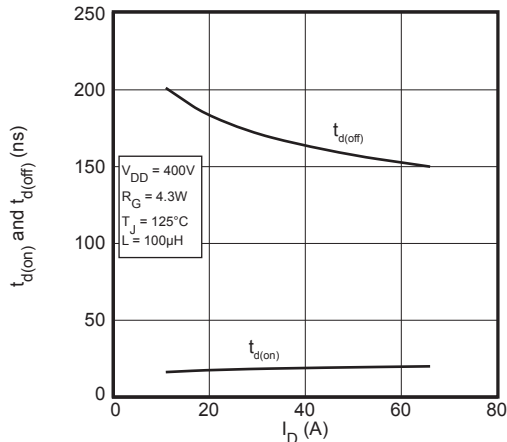


FIGURE 13, DELAY TIMES vs CURRENT

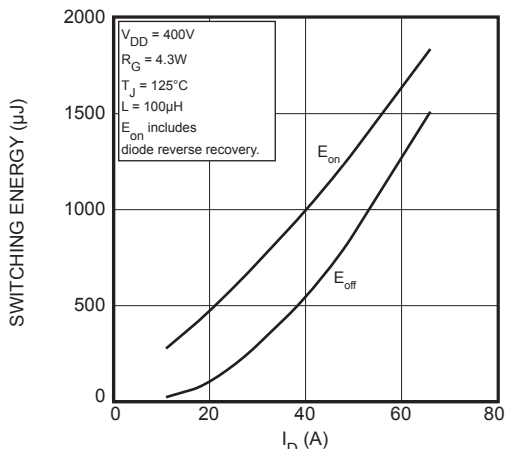


FIGURE 15, SWITCHING ENERGY vs CURRENT

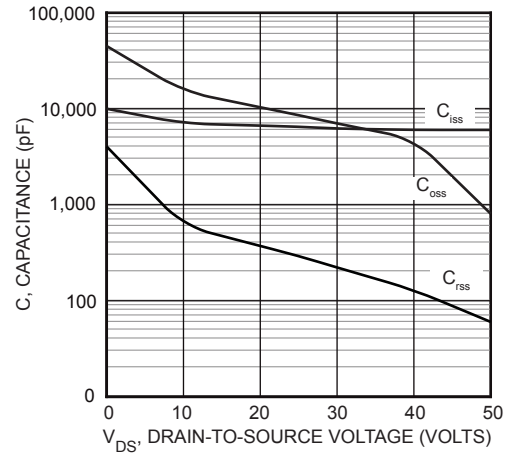


FIGURE 10, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

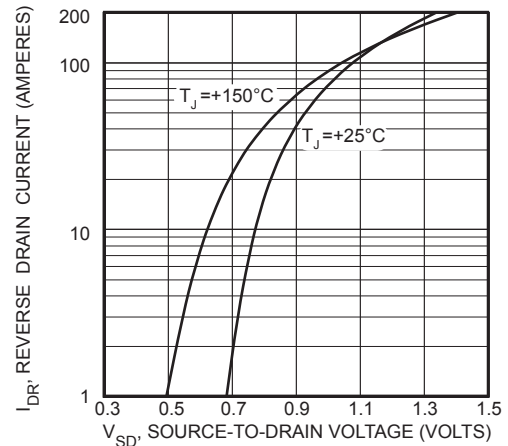


FIGURE 12, SOURCE-DRAIN DIODE FORWARD VOLTAGE

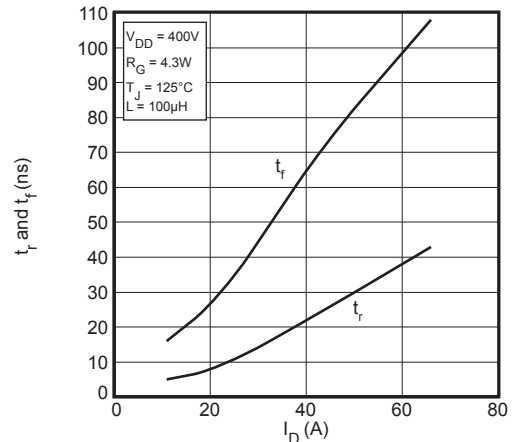


FIGURE 14, RISE AND FALL TIMES vs CURRENT

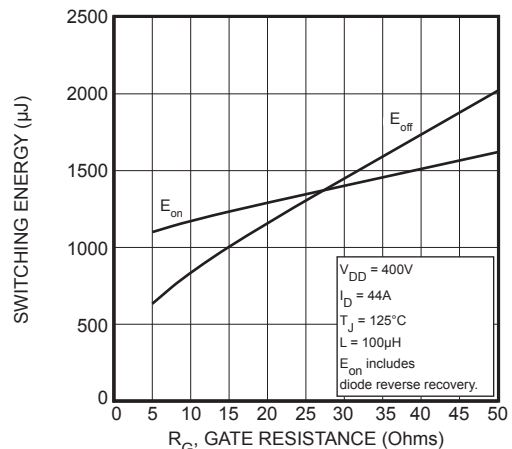


FIGURE 16, SWITCHING ENERGY vs GATE RESISTANCE

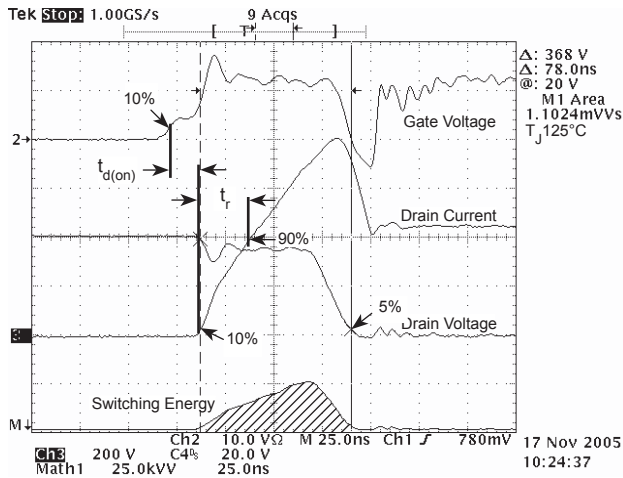


Figure 17, Turn-on Switching Waveforms and Definitions

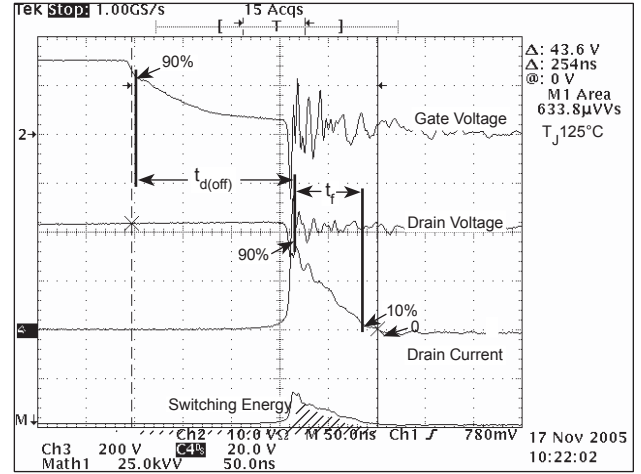


Figure 18, Turn-off Switching Waveforms and Definitions

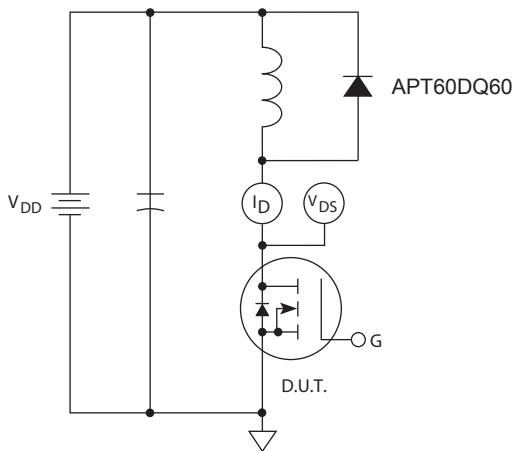
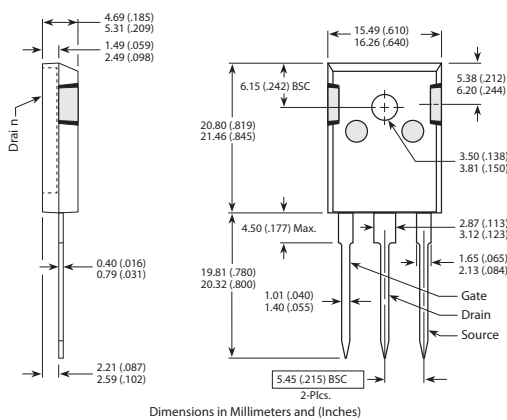


Figure 19, Inductive Switching Test Circuit

TO-247 Package Outline

Ⓔ3 100% Sn



D³PAK Package Outline

Ⓔ3 100% Sn

