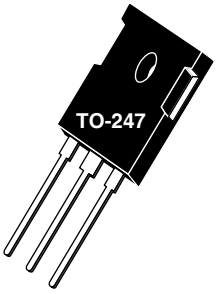
APT11N80BC3

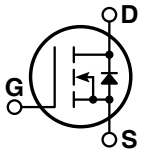
800V 11A 0.45Ω

Super Junction MOSFET



COOLMOS™ Power Semiconductors

- **Ultra low $R_{DS(ON)}$**
- **Low Miller Capacitance**
- **Ultra Low Gate Charge, Q_g**
- **Avalanche Energy Rated**
- **TO-247 Package**



MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT11N80BC3	UNIT
V_{DSS}	Drain-Source Voltage	800	Volts
I_D	Continuous Drain Current @ T_C = 25°C	11	Amps
I_{DM}	Pulsed Drain Current ①	33	
V_{GS}	Gate-Source Voltage Continuous	±20	Volts
V_{GSM}	Gate-Source Voltage Transient	±30	
P_D	Total Power Dissipation @ T_C = 25°C	156	Watts
	Linear Derating Factor	1.25	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	Drain-Source Voltage slope (V_{DS} = 640V, I_D = 11A, T_J = 125°C)	50	V/ns
I_{AR}	Repetitive Avalanche Current ⑦	11	Amps
E_{AR}	Repetitive Avalanche Energy ⑦	0.2	mJ
E_{AS}	Single Pulse Avalanche Energy ④	470	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 250µA)	800			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ② (V_{GS} = 10V, I_D = 7.1A)		0.39	0.45	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = V_{DSS}, V_{GS} = 0V)		0.5	20	µA
	Zero Gate Voltage Drain Current (V_{DS} = V_{DSS}, V_{GS} = 0V, T_J = 150°C)			200	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±20V, V_{DS} = 0V)			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 680µA)	2.1	3	3.9	Volts

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

APT Website - http://www.advancedpower.com

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050-7136 Rev B 4-2004

DYNAMIC CHARACTERISTICS

APT11N80BC3

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1 MHz		1585		pF
C_{oss}	Output Capacitance			770		
C_{rss}	Reverse Transfer Capacitance			18		
Q_g	Total Gate Charge ③	V_{GS} = 10V V_{DD} = 400V I_D = 11A @ 25°C		60		nC
Q_{gs}	Gate-Source Charge			8		
Q_{gd}	Gate-Drain ("Miller") Charge			30		
$t_{d(on)}$	Turn-on Delay Time	**RESISTIVE SWITCHING** V_{GS} = 10V V_{DD} = 400V I_D = 11A @ 25°C R_G = 7.5Ω		25		ns
t_r	Rise Time			15		
$t_{d(off)}$	Turn-off Delay Time			70	80	
t_f	Fall Time			7	10	
E_{on}	Turn-on Switching Energy ⑥	**INDUCTIVE SWITCHING @ 25°C** V_{DD} = 533V, V_{GS} = 15V I_D = 11A, R_G = 5Ω		165		µJ
E_{off}	Turn-off Switching Energy			50		
E_{on}	Turn-on Switching Energy ⑥	**INDUCTIVE SWITCHING @ 125°C** V_{DD} = 533V V_{GS} = 15V I_D = 11A, R_G = 5Ω		305		
E_{off}	Turn-off Switching Energy			65		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			11	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)			33	
V_{SD}	Diode Forward Voltage ② (V_{GS} = 0V, I_S = -11A)		1	1.2	Volts
t_{rr}	Reverse Recovery Time (I_S = 11A, dI_S/dt = -100A/µs, V_R = 640V)		550		ns
Q_{rr}	Reverse Recovery Charge (I_S = 11A, dI_S/dt = -100A/µs, V_R = 640V)		10		µC
$^{dv}/_{dt}$	Peak Diode Recovery $^{dv}/_{dt}$ ⑤			6	V/ns

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.80	°C/W
$R_{\theta JA}$	Junction to Ambient			62	

① Repetitve avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR}*f$

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

③ See MIL-STD-750 Method 3471

④ Starting T_j = +25°C, L = 194mH, R_G = 25Ω, Peak I_L = 2.2A

⑤ $^{dv}/_{dt}$ numbers reflect the limitations of the test circuit rather than the device itself. $I_S \le -I_D$ 11A $^{di}/_{dt} \le$ 700A/µs $V_R \le V_{DSS}$ $T_J \le$ 150°C

⑥ Eon includes diode reverse recovery. See figures 18, 20.

⑦ Repetitve avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR}*f$

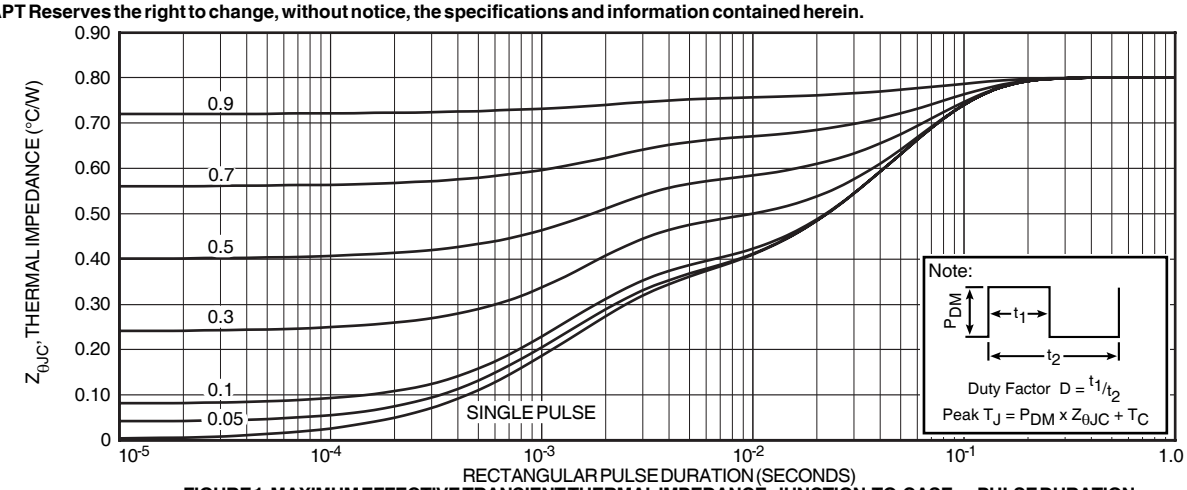


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

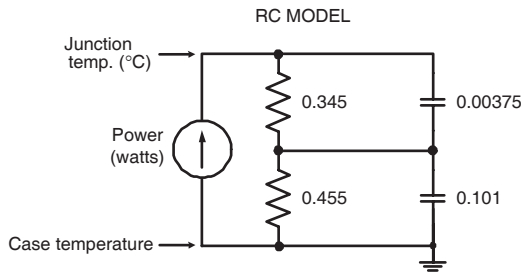


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

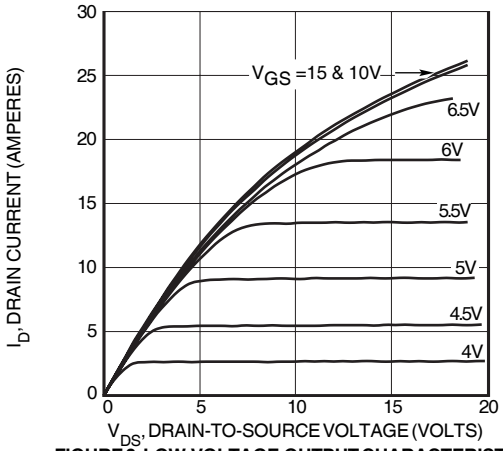


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

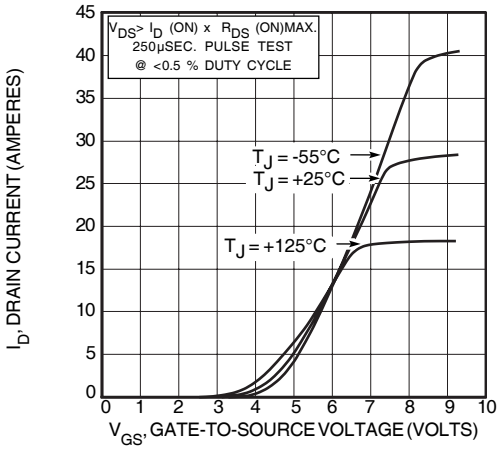


FIGURE 4, TRANSFER CHARACTERISTICS

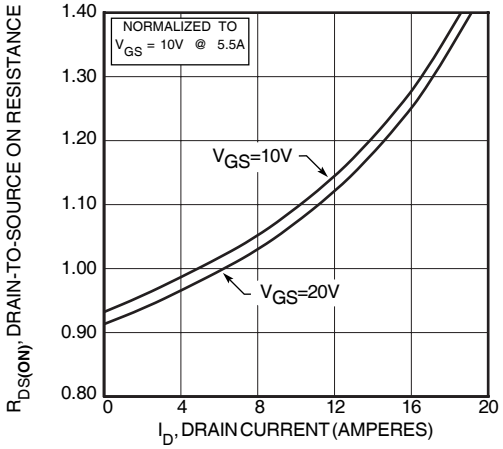


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

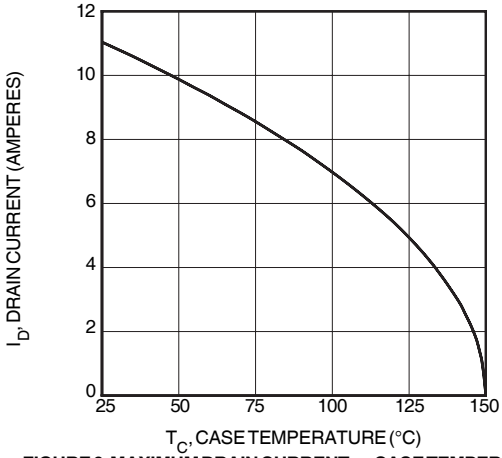


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

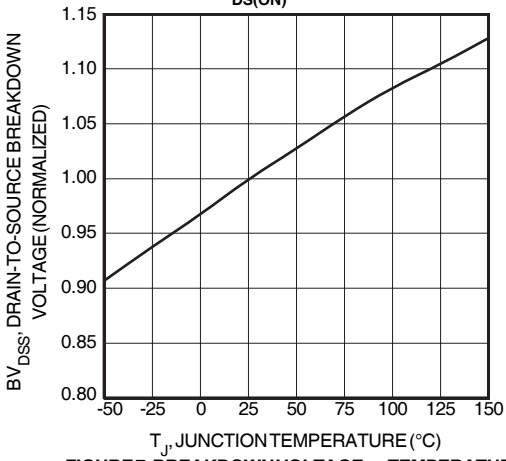


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

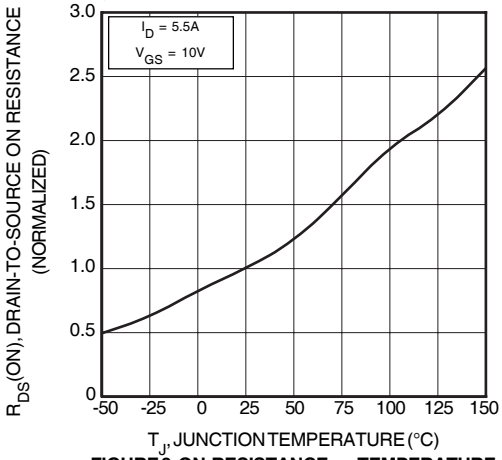


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

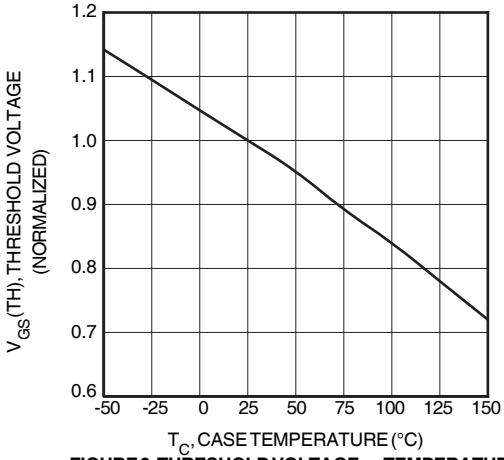


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

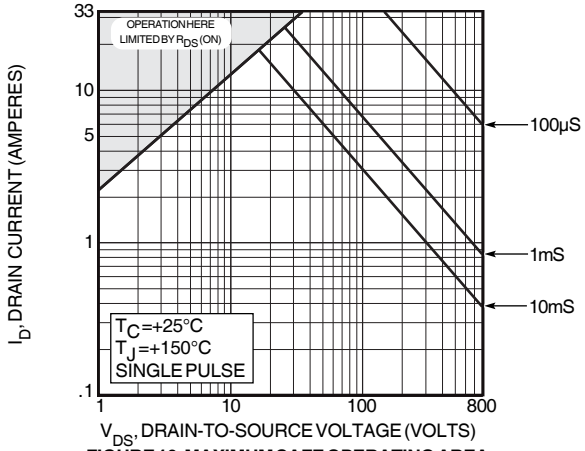


FIGURE 10, MAXIMUM SAFE OPERATING AREA

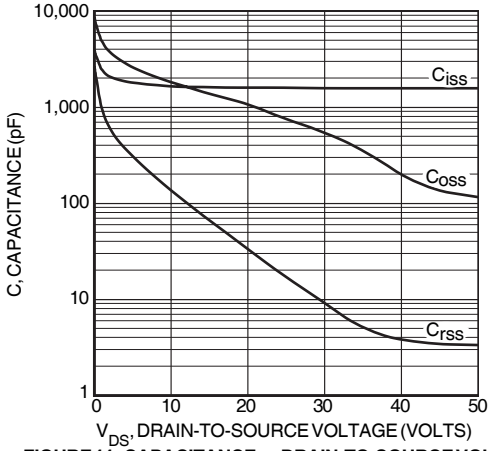


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

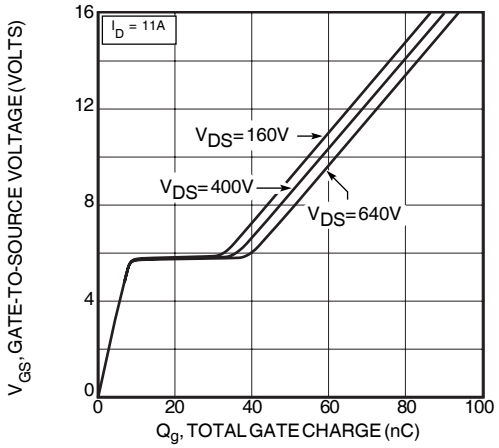


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

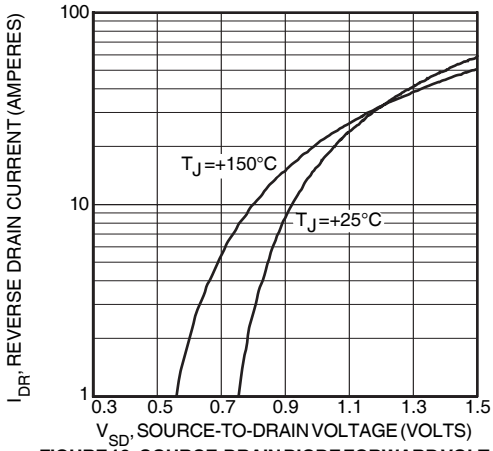


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

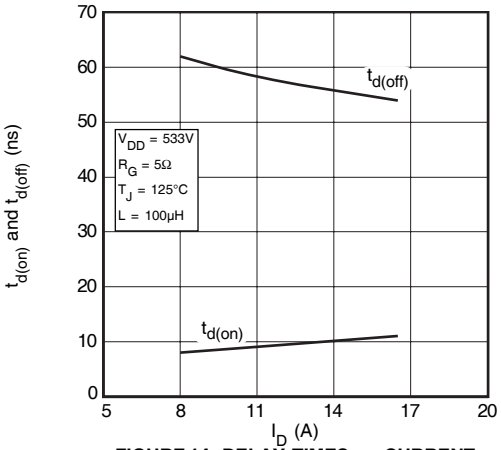


FIGURE 14, DELAY TIMES vs CURRENT

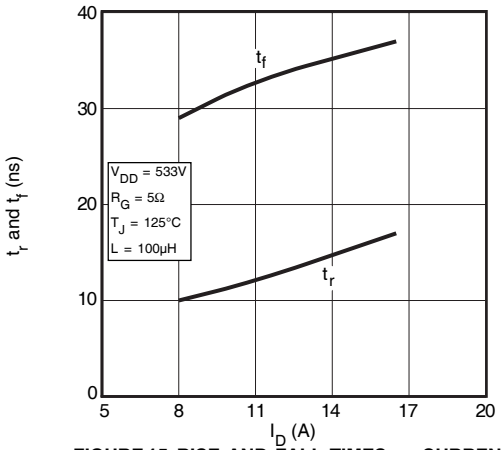


FIGURE 15, RISE AND FALL TIMES vs CURRENT

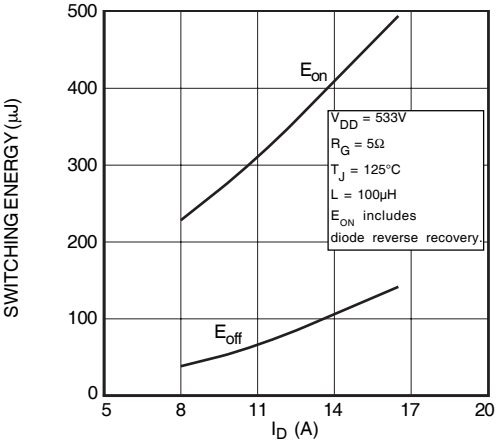


FIGURE 16, SWITCHING ENERGY vs CURRENT

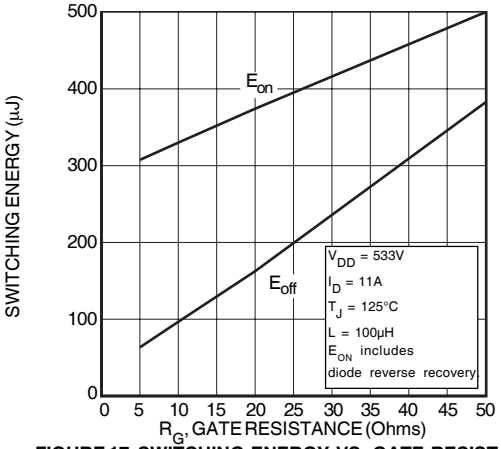


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

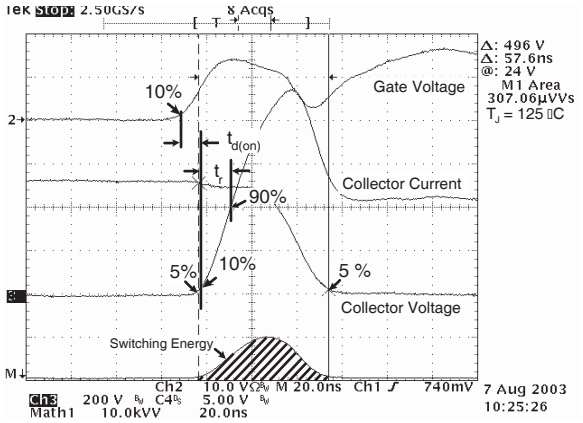


Figure 18, Turn-on Switching Waveforms and Definitions

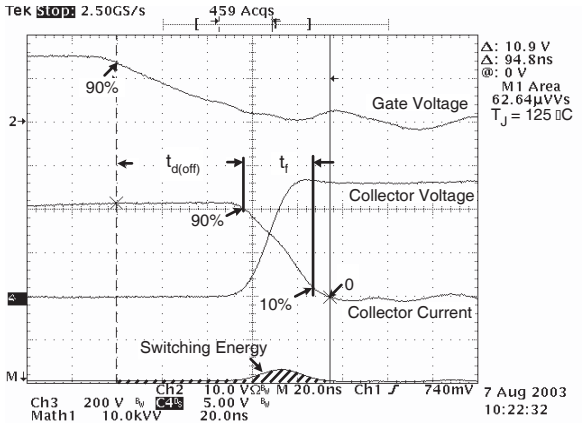


Figure 19, Turn-off Switching Waveforms and Definitions

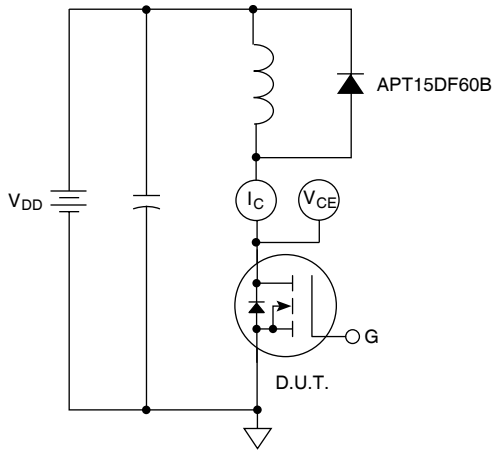
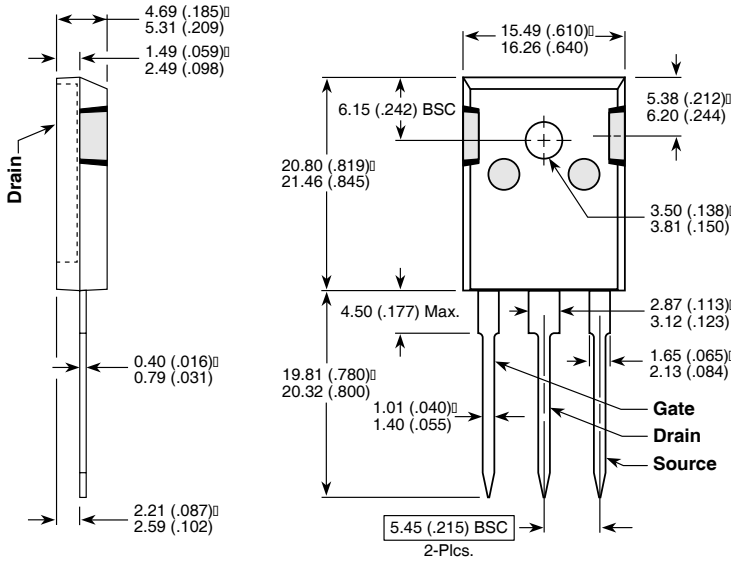


Figure 20, Inductive Switching Test Circuit

TO-247 Package Outline



Dimensions in Millimeters and (Inches)