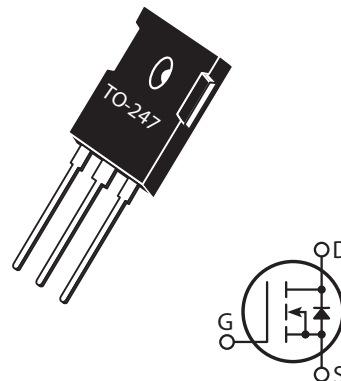


Super Junction MOSFET

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



MAXIMUM RATINGS

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

Symbol	Parameter	APT11N80BC3G	UNIT
V_{DSS}	Drain-Source Voltage	800	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	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 @ $T_C = 25^\circ\text{C}$	156	Watts
	Linear Derating Factor	1.25	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 ($V_{DS} = 640\text{V}$, $I_D = 11\text{A}$, $T_J = 125^\circ\text{C}$)	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 ($V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$)	800			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10\text{V}$, $I_D = 7.1\text{A}$)		0.39	0.45	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}$, $V_{GS} = 0\text{V}$)		0.5	20	μA
	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}$, $V_{GS} = 0\text{V}$, $T_J = 150^\circ\text{C}$)			200	
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 ($V_{DS} = V_{GS}$, $I_D = 680\mu\text{A}$)	2.1	3	3.9	Volts

DYNAMIC CHARACTERISTICS

APT11N80BC3G

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		1585		pF
C_{oss}	Output Capacitance			770		
C_{rss}	Reverse Transfer Capacitance			18		
Q_g	Total Gate Charge ^③	$V_{GS} = 10V$ $V_{DD} = 400V$ $I_D = 11A @ 25^\circ C$		60		nC
Q_{gs}	Gate-Source Charge			8		
Q_{gd}	Gate-Drain ("Miller") Charge			30		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 10V$ $V_{DD} = 400V$ $I_D = 11A @ 25^\circ C$ $R_G = 7.5\Omega$		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 $V_{DD} = 533V, V_{GS} = 15V$ $I_D = 11A, R_G = 5\Omega$		165		μJ
E_{off}	Turn-off Switching Energy			50		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 533V, V_{GS} = 15V$ $I_D = 11A, R_G = 5\Omega$		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 ($I_S = 11A, di_S/dt = -100A/\mu s, V_R = 640V$)		550		ns
Q_{rr}	Reverse Recovery Charge ($I_S = 11A, di_S/dt = -100A/\mu s, V_R = 640V$)		10		μC
dv/dt	Peak Diode Recovery dv/dt ^⑦			6	V/ns

THERMAL CHARACTERISTICS

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

① Repetitive 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 $T_J = +25^\circ C$, $L = 194mH$, $R_G = 25\Omega$, Peak $I_L = 2.2A$

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

⑥ E_{on} includes diode reverse recovery. See figures 18, 20.

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

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

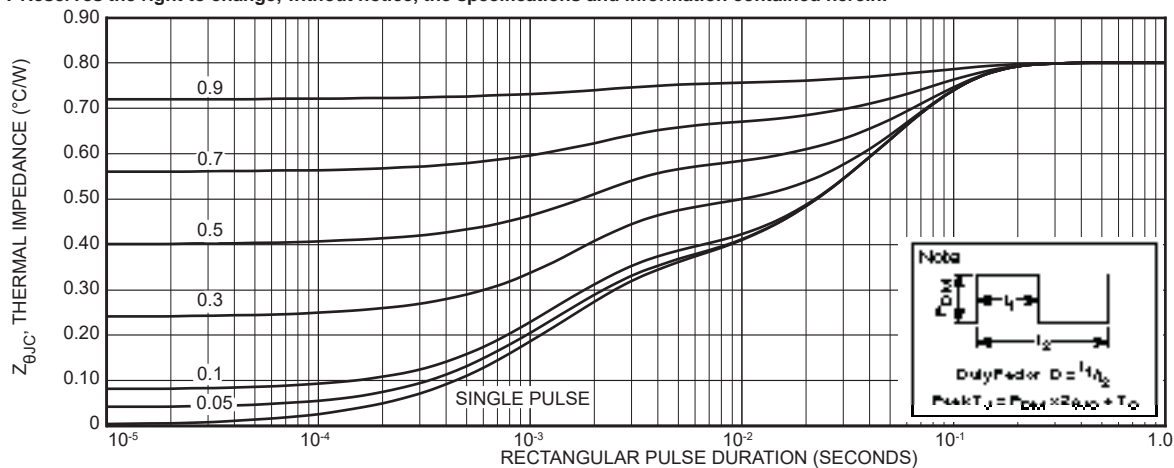


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT11N80BC3G

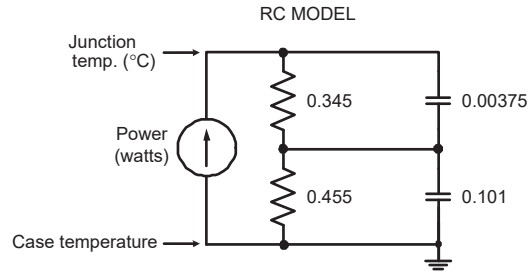


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

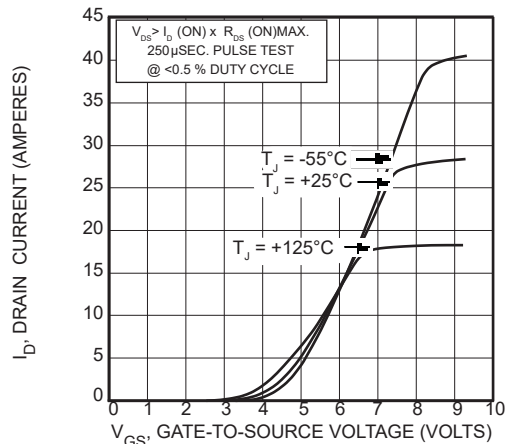


FIGURE 4, TRANSFER CHARACTERISTICS

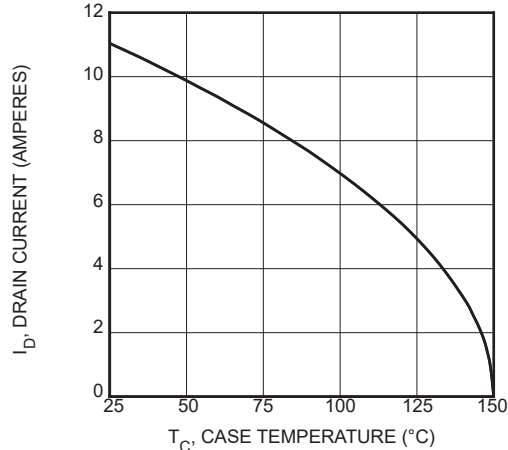


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

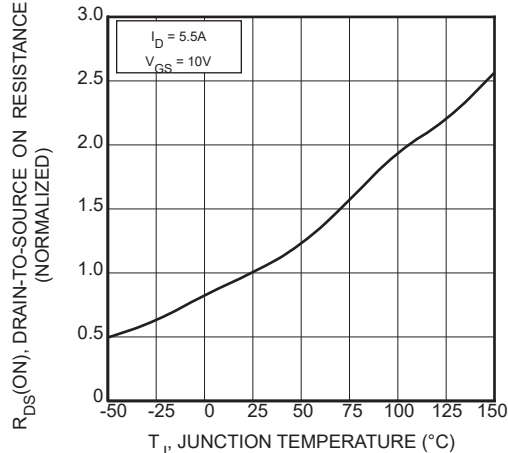


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

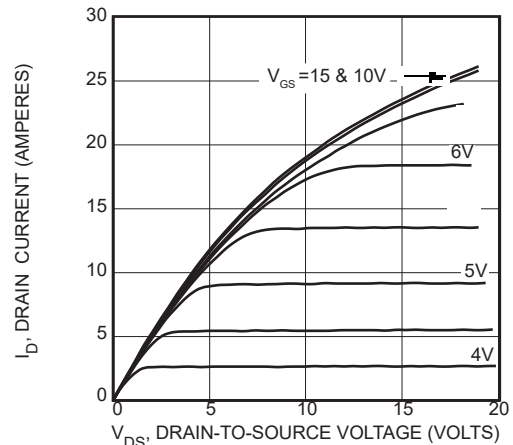


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

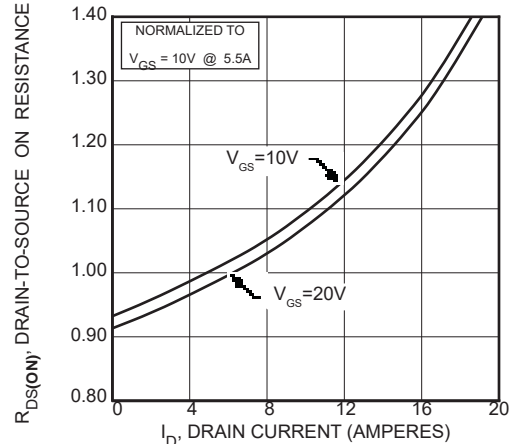


FIGURE 5, $R_{DS, \text{ (ON)}}$ vs DRAIN CURRENT

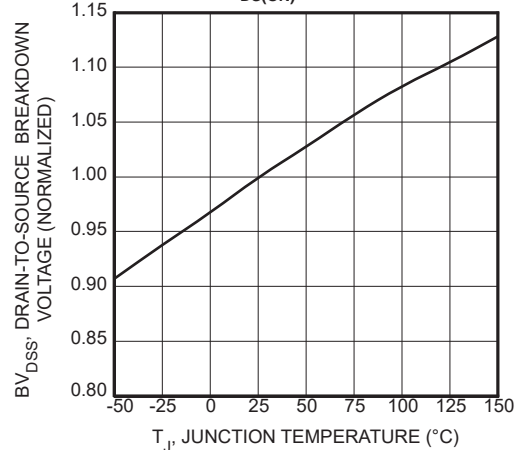


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

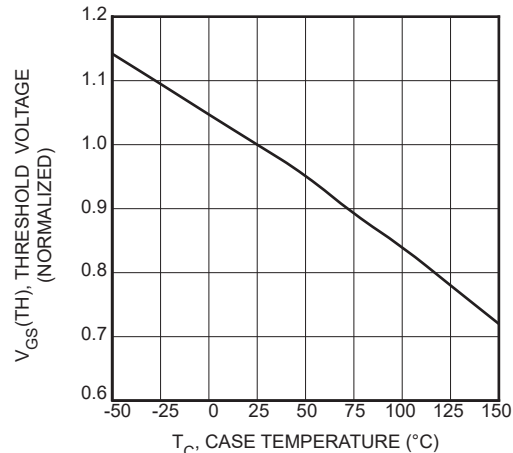


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

Typical Performance Curves

APT11N80BC3G

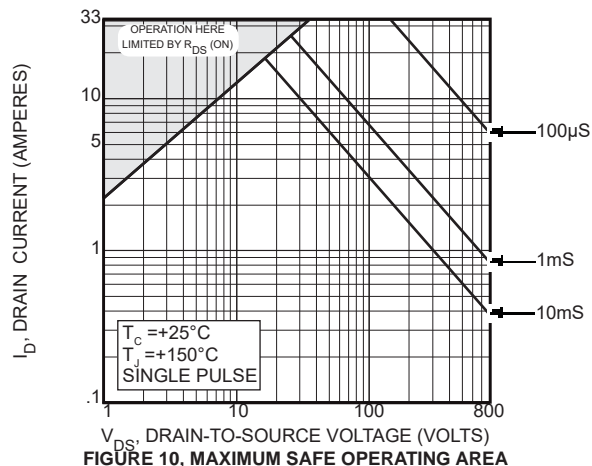


FIGURE 10, MAXIMUM SAFE OPERATING AREA

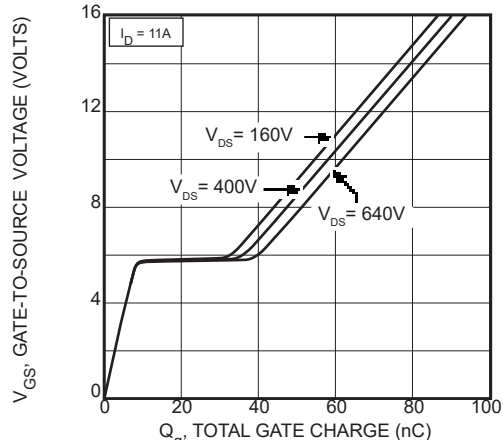


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

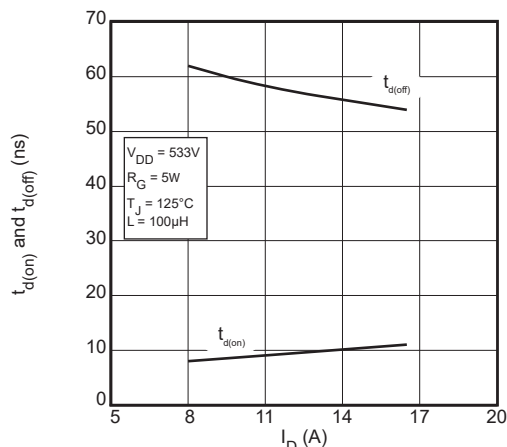


FIGURE 14, DELAY TIMES vs CURRENT

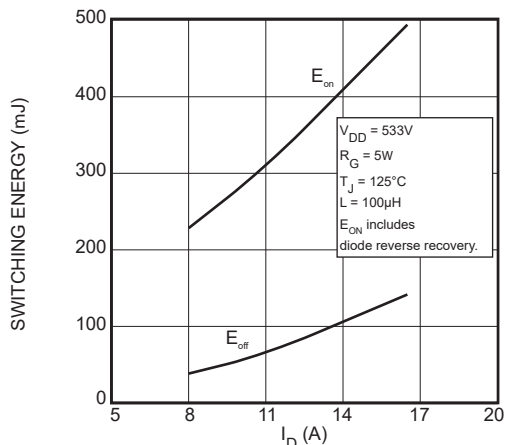


FIGURE 16, SWITCHING ENERGY vs CURRENT

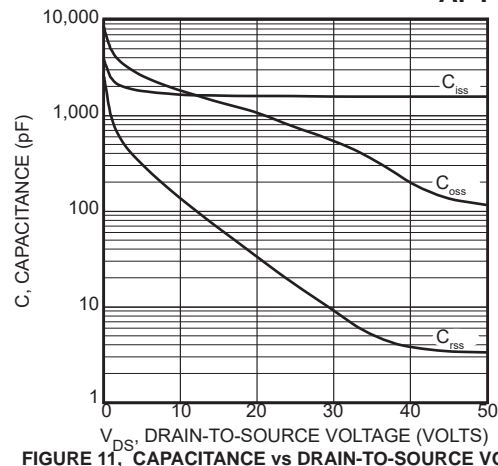


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

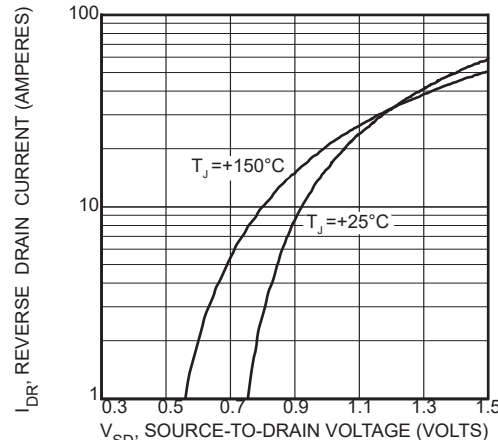


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

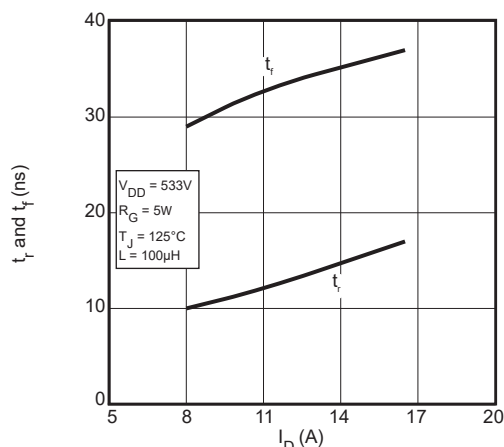


FIGURE 15, RISE AND FALL TIMES vs CURRENT

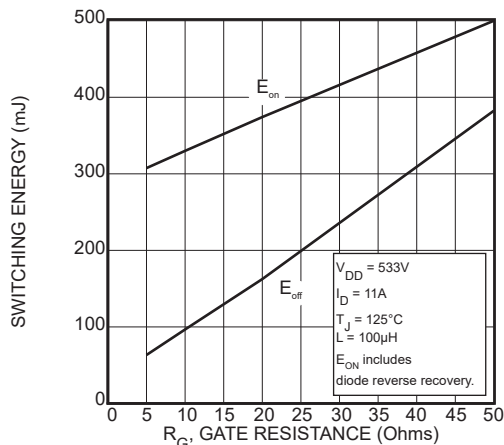


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

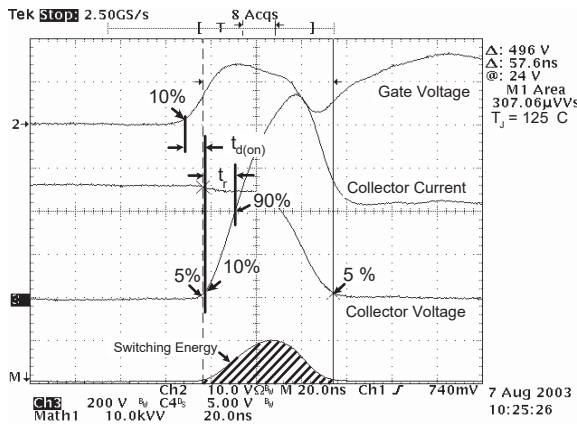


Figure 18, Turn-on Switching Waveforms and Definitions

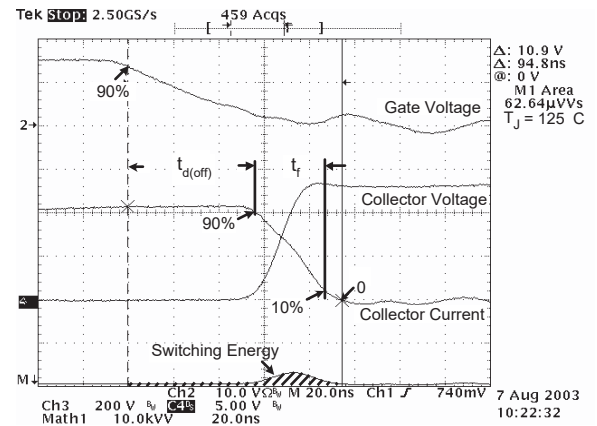


Figure 19, Turn-off Switching Waveforms and Definitions

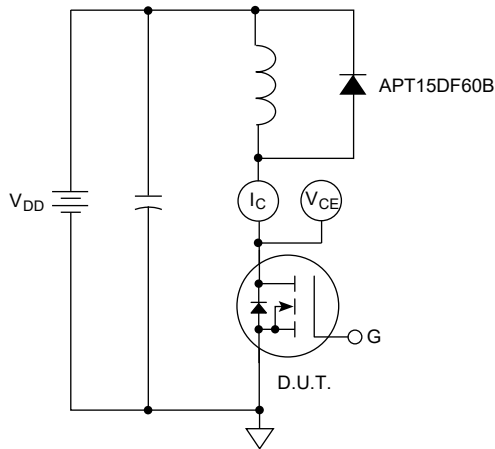
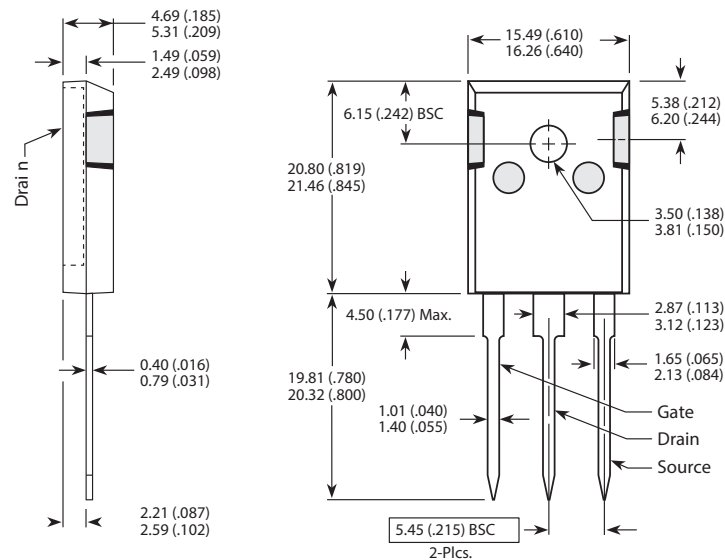


Figure 20, Inductive Switching Test Circuit

TO-247 Package Outline



Dimensions in Millimeters and (Inches)