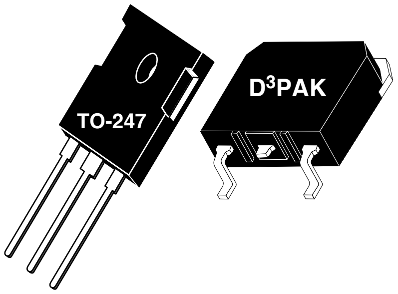
Microsemi®
POWER PRODUCTS GROUP

APT1201R4BFLL(G)
APT1201R4SFLL(G)

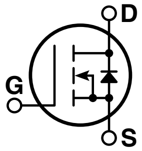
1200V 9A 1.50 Ω

POWER MOS 7® FREDFET



Power MOS 7® is a new generation of low loss, high voltage, N-Channel enhancement mode power MOSFETS. Both conduction and switching losses are addressed with Power MOS 7® by significantly lowering $R_{DS(ON)}$ and Q_g. Power MOS 7® combines lower conduction and switching losses along with exceptionally fast switching speeds inherent with Microsem's patented metal gate structure.

- **Lower Input Capacitance**
- **Lower Miller Capacitance**
- **Lower Gate Charge, Qg**
- **Increased Power Dissipation**
- **Easier To Drive**
- **TO-247 or Surface Mount D³PAK Package**



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

Symbol	Parameter	APT1201R4B_SFLL	UNIT
V_{DSS}	Drain-Source Voltage	1200	Volts
I_D	Continuous Drain Current @ T_C = 25°C	9	Amps
I_{DM}	Pulsed Drain Current ①	36	
V_{GS}	Gate-Source Voltage Continuous	±30	Volts
V_{GSM}	Gate-Source Voltage Transient	±40	
P_D	Total Power Dissipation @ T_C = 25°C	300	Watts
	Linear Derating Factor	2.40	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.	300	
I_{AR}	Avalanche Current ① (Repetitive and Non-Repetitive)	9	Amps
E_{AR}	Repetitive Avalanche Energy ①	30	mJ
E_{AS}	Single Pulse Avalanche Energy ④	1210	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 250μA)	1200			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ② (V_{GS} = 10V, I_D = 4.5A)			1.50	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = 1200V, V_{GS} = 0V)			250	μA
	Zero Gate Voltage Drain Current (V_{DS} = 960V, V_{GS} = 0V, T_C = 125°C)			1000	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±30V, V_{DS} = 0V)			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 1mA)	3		5	Volts

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

DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1 MHz		2030		pF
C_{oss}	Output Capacitance			310		
C_{rss}	Reverse Transfer Capacitance			60		
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 600V$ $I_D = 9A$ @ 25°C		75		nC
Q_{gs}	Gate-Source Charge			10		
Q_{gd}	Gate-Drain ("Miller") Charge			50		
$t_{d(on)}$	Turn-on Delay Time	**RESISTIVE SWITCHING** $V_{GS} = 15V$ $V_{DD} = 600V$ $I_D = 9A$ @ 25°C $R_G = 1.6\Omega$		8		ns
t_r	Rise Time			5		
$t_{d(off)}$	Turn-off Delay Time			27		
t_f	Fall Time			11		
E_{on}	Turn-on Switching Energy ⑥	**INDUCTIVE SWITCHING @ 25°C** $V_{DD} = 800V$, $V_{GS} = 15V$ $I_D = 9A$, $R_G = 5\Omega$		500		μJ
E_{off}	Turn-off Switching Energy			XX		
E_{on}	Turn-on Switching Energy ⑥	**INDUCTIVE SWITCHING @ 125°C** $V_{DD} = 800V$, $V_{GS} = 15V$ $I_D = 9A$, $R_G = 4.3\Omega$		545		
E_{off}	Turn-off Switching Energy			18		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)				9	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)				36	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V$, $I_S = -I_D$ 9A)				1.3	Volts
$^{dv}/_{dt}$	Peak Diode Recovery $^{dv}/_{dt}$ ⑤				18	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -I_D$ 9A, $^{di}/_{dt} = 100A/\mu s$)	$T_j = 25°C$			210	ns
		$T_j = 125°C$			710	
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D$ 9A, $^{di}/_{dt} = 100A/\mu s$)	$T_j = 25°C$		0.7		μC
		$T_j = 125°C$		2.0		
I_{RRM}	Peak Recovery Current ($I_S = -I_D$ 9A, $^{di}/_{dt} = 100A/\mu s$)	$T_j = 25°C$		10		Amps
		$T_j = 125°C$		15		

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.42	°C/W
$R_{\theta JA}$	Junction to Ambient			40	

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 $T_j = +25°C$, L = 29.9mH, $R_G = 25\Omega$, Peak $I_L = 9A$

⑤ $^{dv}/_{dt}$ numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_D 9A$ $^{di}/_{dt} \leq 700A/\mu s$ $V_R \leq 1200$ $T_J \leq 150°C$

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

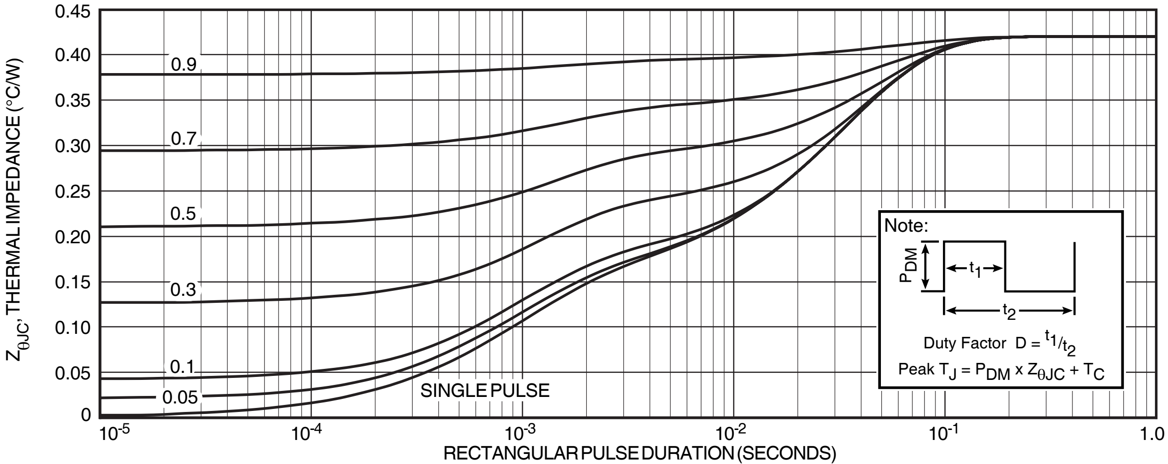
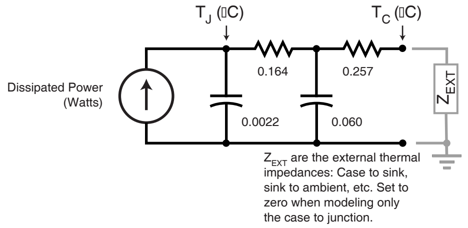


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION



Z_{EXT} are the external thermal impedances: Case to sink, sink to ambient, etc. Set to zero when modeling only the case to junction.

FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

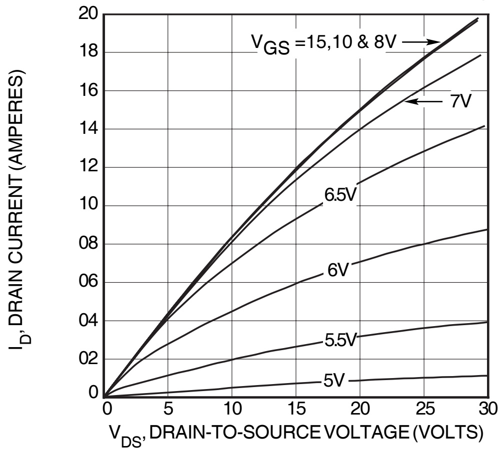


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

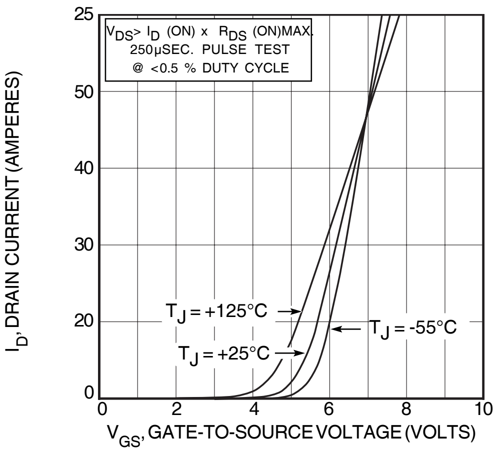


FIGURE 4, TRANSFER CHARACTERISTICS

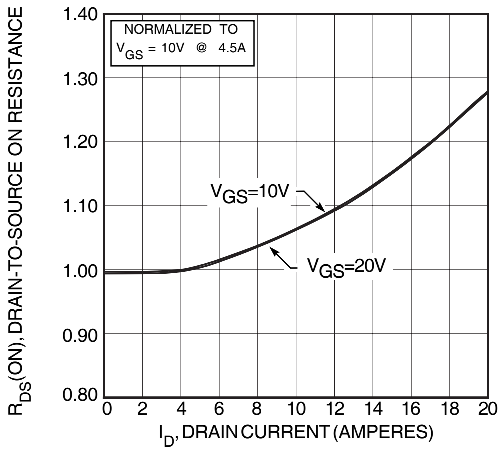


FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

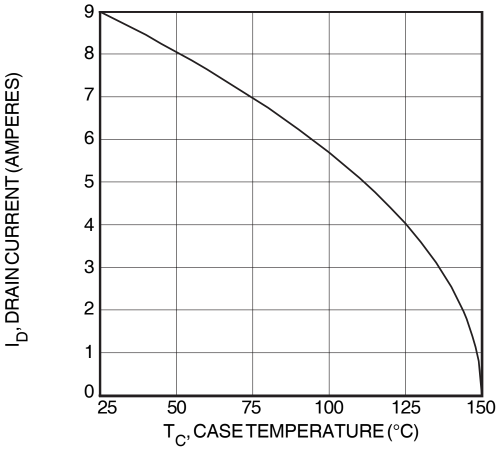


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

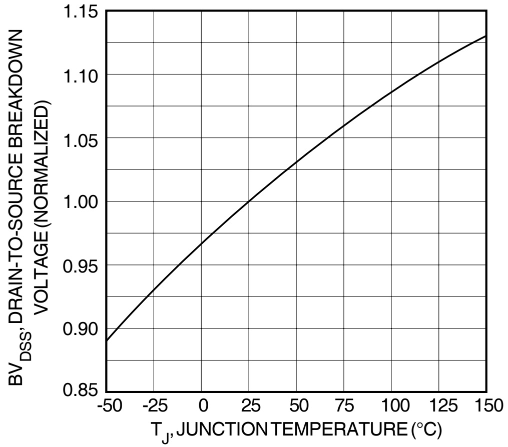


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

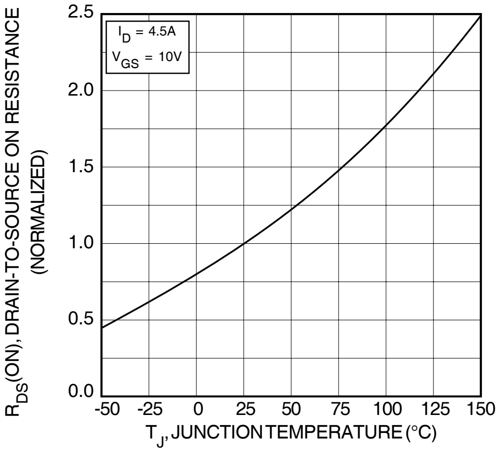


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

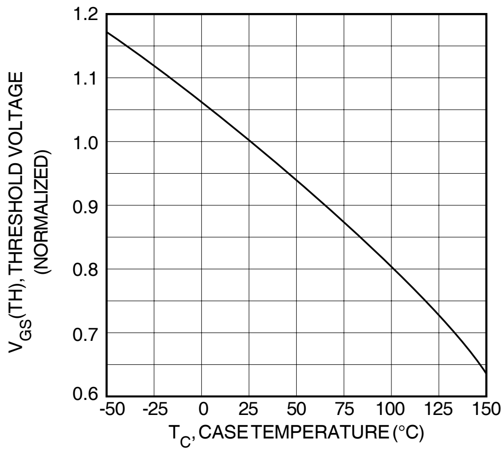


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

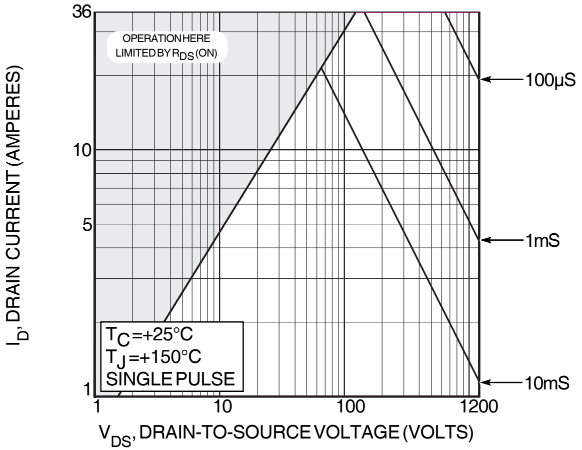


FIGURE 10, MAXIMUM SAFE OPERATING AREA

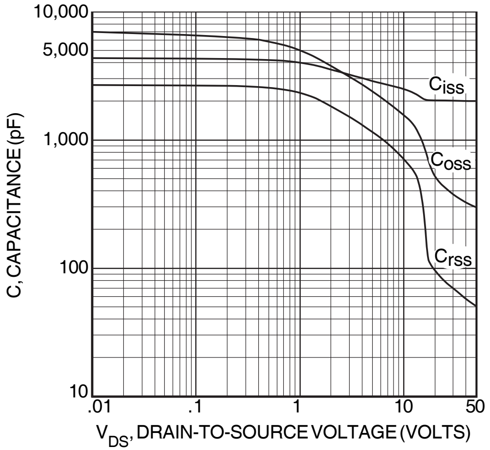


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

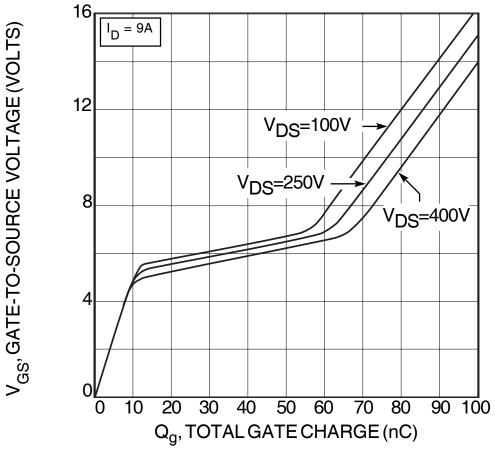


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

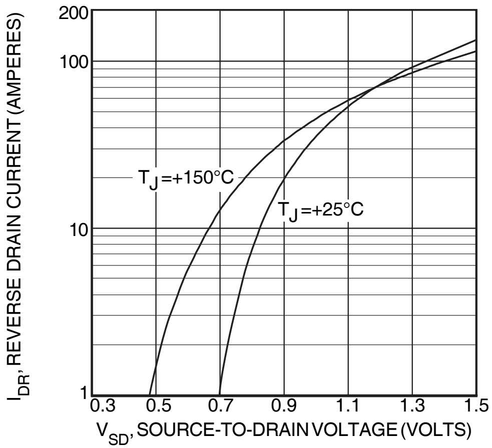


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

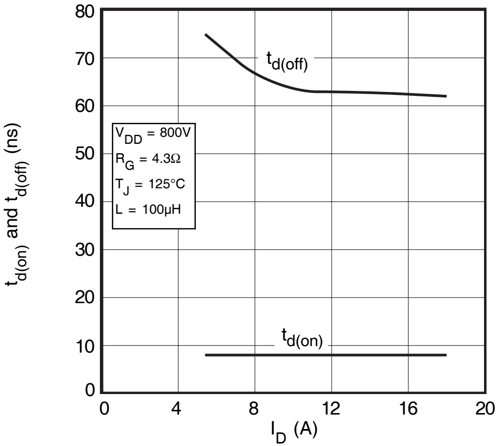


FIGURE 14, DELAY TIMES vs CURRENT

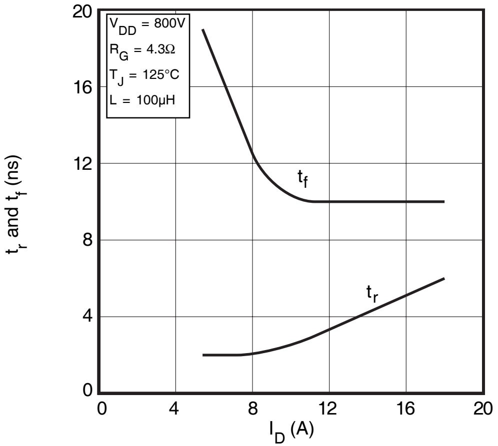


FIGURE 15, RISE AND FALL TIMES vs CURRENT

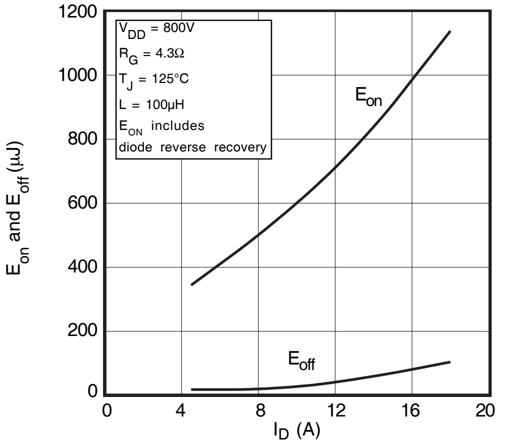


FIGURE 16, SWITCHING ENERGY vs CURRENT

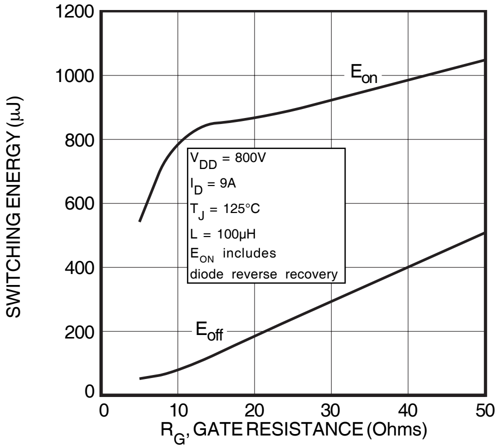


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

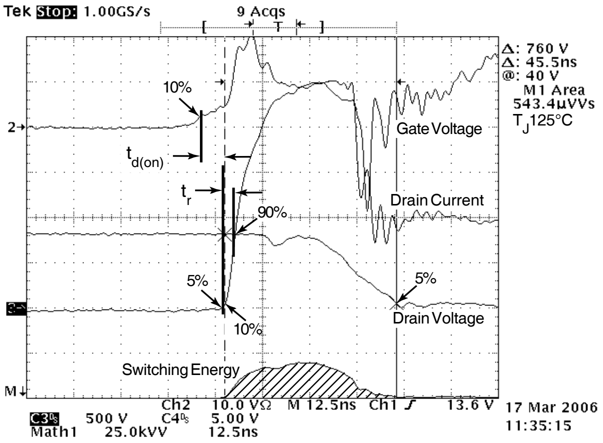


Figure 18, Turn-on Switching Waveforms and Definitions

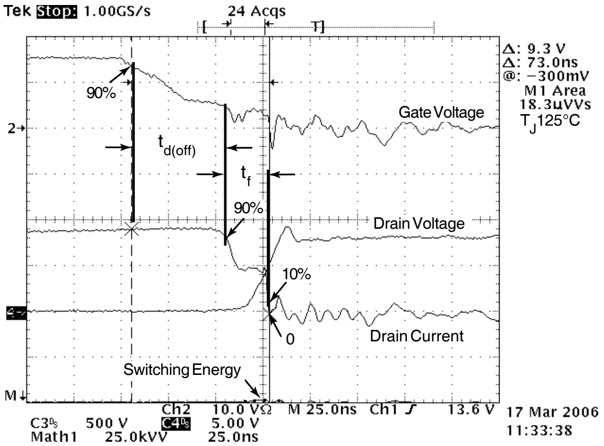


Figure 19, Turn-off Switching Waveforms and Definitions

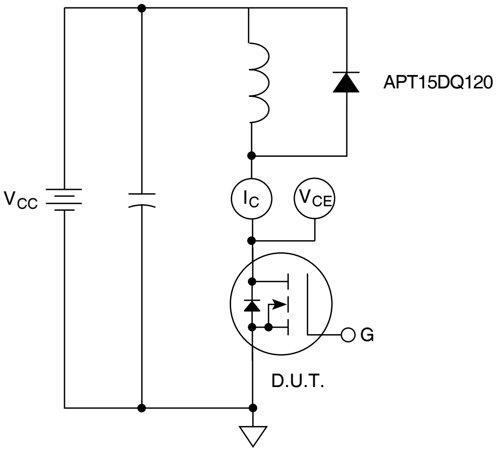
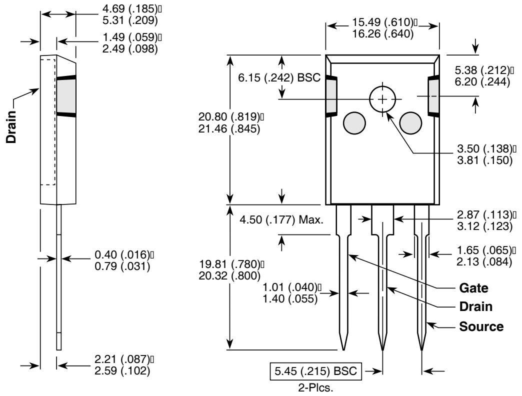


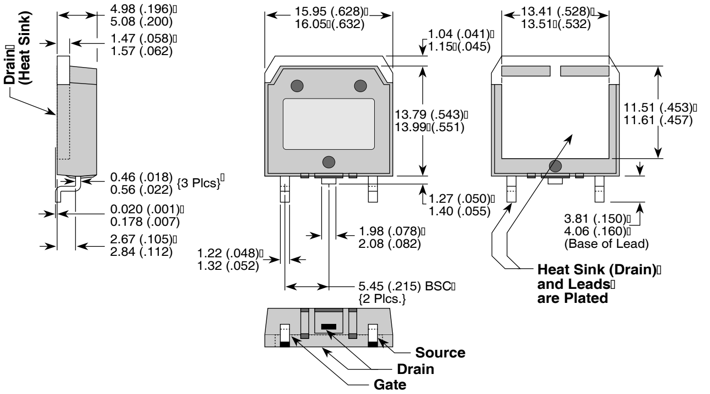
Figure 20, Inductive Switching Test Circuit

TO-247 Package Outline



Dimensions in Millimeters and (Inches)

D^{3}PAK Package Outline



Dimensions in Millimeters (Inches)

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