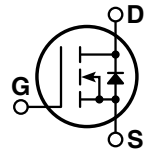


Power MOS 7<sup>®</sup> is a new generation of low loss, high voltage, N-Channel enhancement mode power MOSFETS. Both conduction and switching losses are addressed with Power MOS 7<sup>®</sup> by significantly lowering  $R_{DS(ON)}$  and  $Q_g$ . Power MOS 7<sup>®</sup> combines lower conduction and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

- Lower Input Capacitance
- Lower Miller Capacitance
- Lower Gate Charge,  $Q_g$
- Increased Power Dissipation
- Easier To Drive
- Popular SOT-227 Package




### MAXIMUM RATINGS

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

Symbol	Parameter	APT6010JFLL	UNIT
$V_{DSS}$	Drain-Source Voltage	600	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	47	Amps
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	188	
$V_{GS}$	Gate-Source Voltage Continuous	±30	Volts
$V_{GSM}$	Gate-Source Voltage Transient	±40	
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	520	Watts
	Linear Derating Factor	4.16	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 <sup>①</sup> (Repetitive and Non-Repetitive)	47	Amps
$E_{AR}$	Repetitive Avalanche Energy <sup>①</sup>	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy <sup>④</sup>	3000	

### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250\mu\text{A}$ )	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, I_D = 23.5A$ )			0.100	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 600V, V_{GS} = 0V$ )			250	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 480V, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			1000	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 2.5mA$ )	3		5	Volts

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

**DYNAMIC CHARACTERISTICS**

**APT6010JFLL**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		6710		pF
$C_{oss}$	Output Capacitance			1250		
$C_{rss}$	Reverse Transfer Capacitance			90		
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 47A @ 25^\circ C$		150		nC
$Q_{gs}$	Gate-Source Charge			30		
$Q_{gd}$	Gate-Drain ("Miller") Charge			75		
$t_{d(on)}$	Turn-on Delay Time	<b>RESISTIVE SWITCHING</b> $V_{GS} = 15V$ $V_{DD} = 300V$ $I_D = 47A @ 25^\circ C$ $R_G = 0.6\Omega$		12		ns
$t_r$	Rise Time			17		
$t_{d(off)}$	Turn-off Delay Time			34		
$t_f$	Fall Time			10		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 25°C</b> $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 47A, R_G = 5\Omega$		770		$\mu J$
$E_{off}$	Turn-off Switching Energy			845		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 125°C</b> $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 47A, R_G = 5\Omega$		1000		
$E_{off}$	Turn-off Switching Energy			1060		

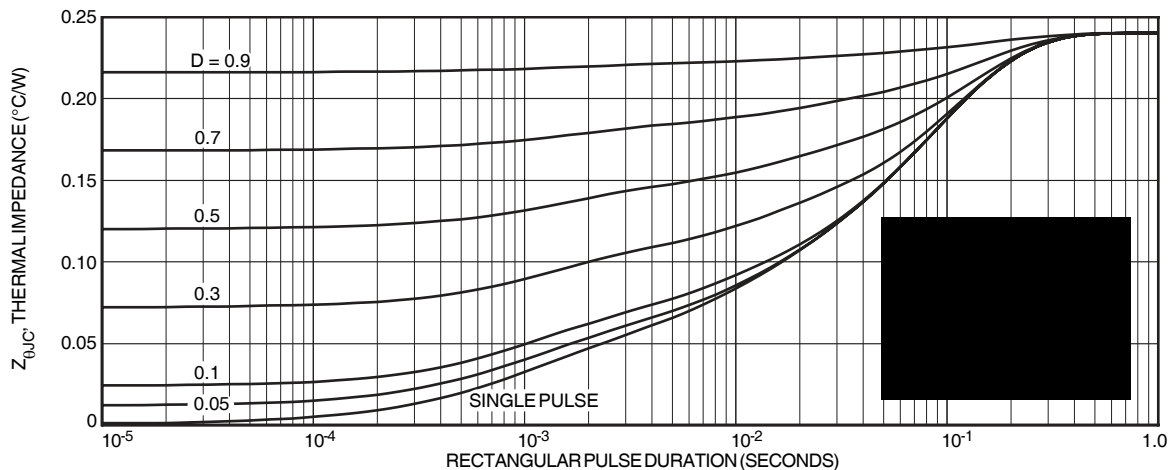
**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)			47	Amps
$I_{SM}$	Pulsed Source Current ① (Body Diode)			188	Amps
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -47A$ )			1.3	Volts
$dv/dt$	Peak Diode Recovery $dv/dt$ ⑤			15	V/ns
$t_{rr}$	Reverse Recovery Time ( $I_S = -47A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		300	ns
		$T_j = 125^\circ C$		600	
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -47A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		2.0	$\mu C$
		$T_j = 125^\circ C$		6.8	
$I_{RRM}$	Peak Recovery Current ( $I_S = -47A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		15	Amps
		$T_j = 125^\circ C$		27	

**THERMAL CHARACTERISTICS**

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.24	$^\circ C/W$
$V_{isolation}$	RMS Volatage (50-60hHZ Sinusoidal Waveform from Terminals to Mounting Base for 1 Min.)	2500			Volts

- ① Repetitive Rating: Pulse width limited by maximum junction temperature
  - ② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%
  - ③ See MIL-STD-750 Method 3471
  - ④ Starting  $T_j = +25^\circ C, L = 2.72mH, R_G = 25\Omega, \text{Peak } I_L = 47A$
  - ⑤  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_D 47A, di/dt \leq 700A/\mu s, v_R \leq 600V, T_j \leq 150^\circ C$
  - ⑥  $E_{on}$  includes diode reverse recovery. See figures 18, 20.
- Microsemi reserves the right to change, without notice, the specifications and inforation contained herein.



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

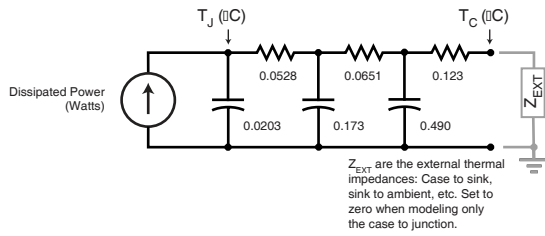


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

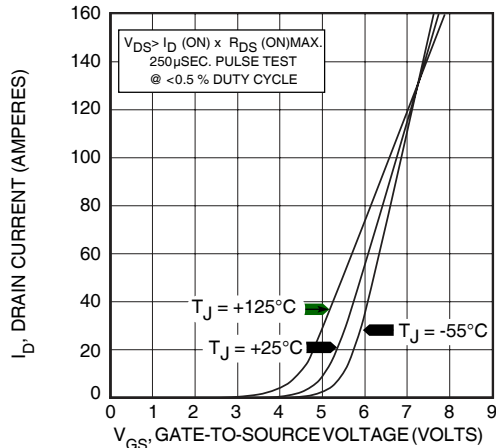


FIGURE 4, TRANSFER CHARACTERISTICS

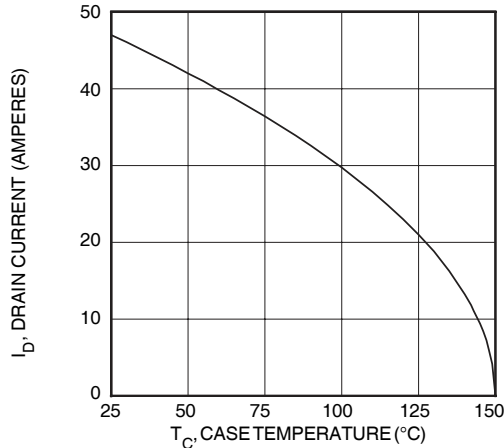


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

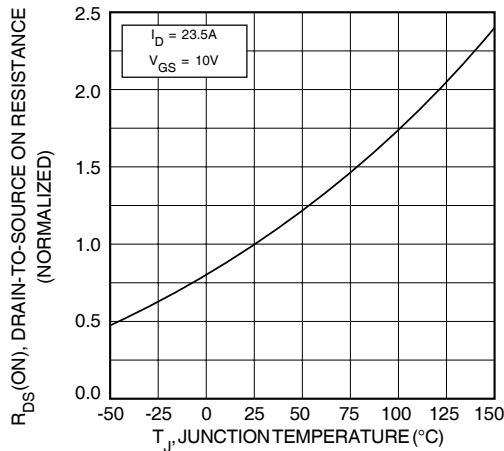


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

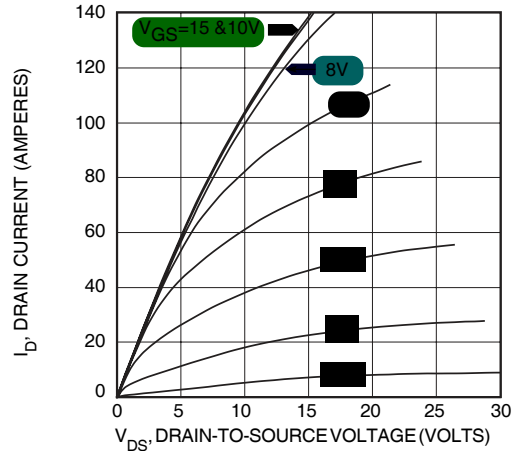


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

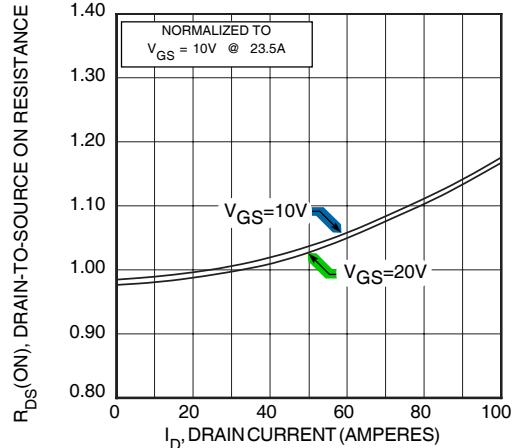


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

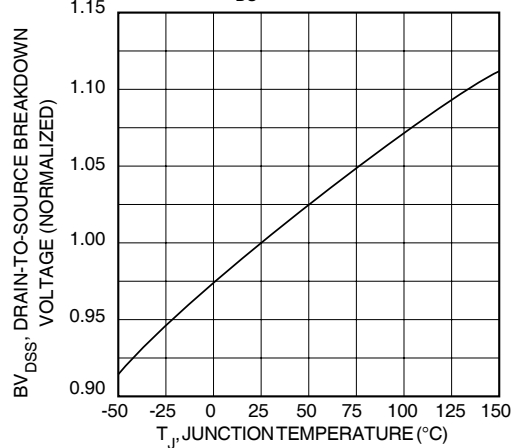


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

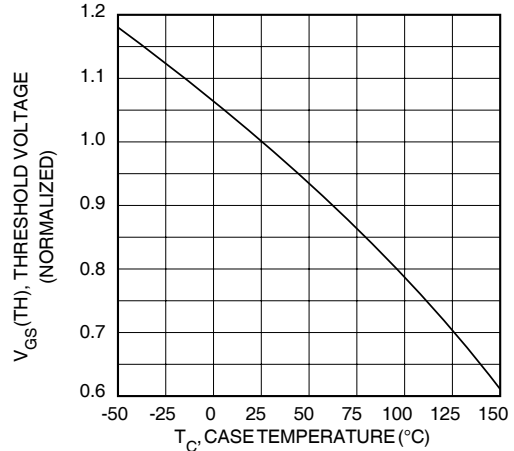


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

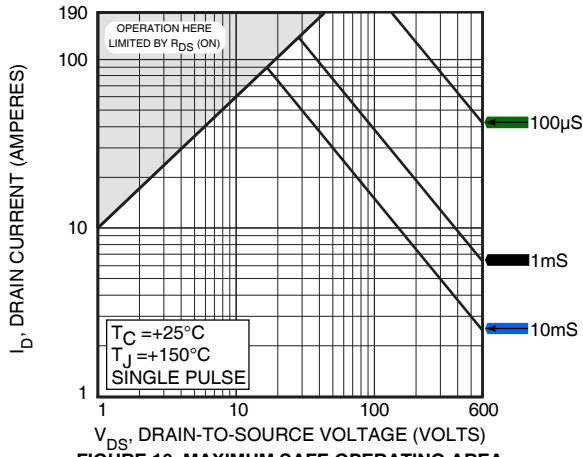


FIGURE 10, MAXIMUM SAFE OPERATING AREA

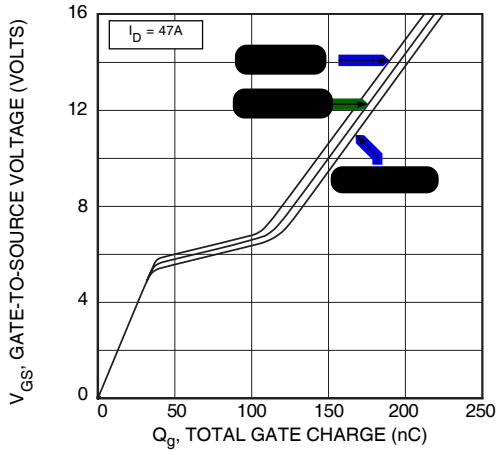


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

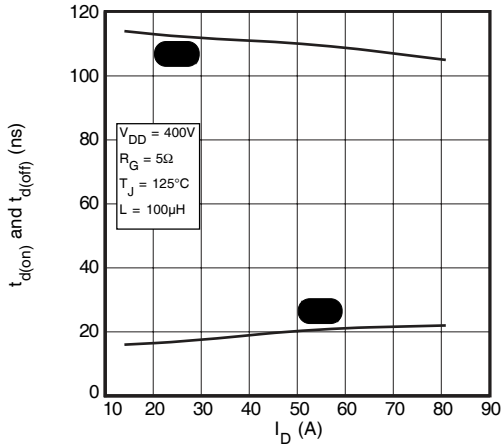


FIGURE 14, DELAY TIMES vs CURRENT

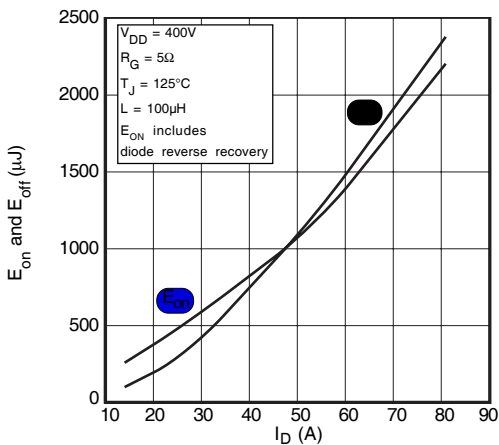


FIGURE 16, SWITCHING ENERGY vs CURRENT

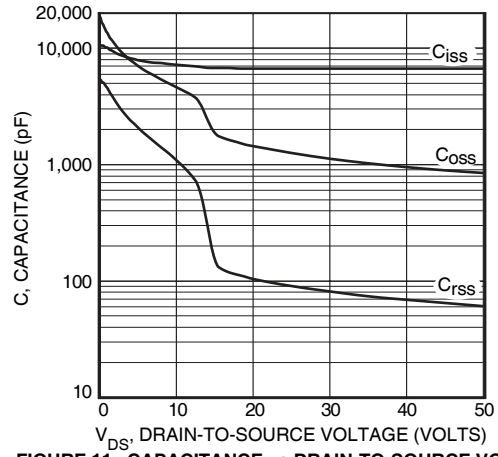


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

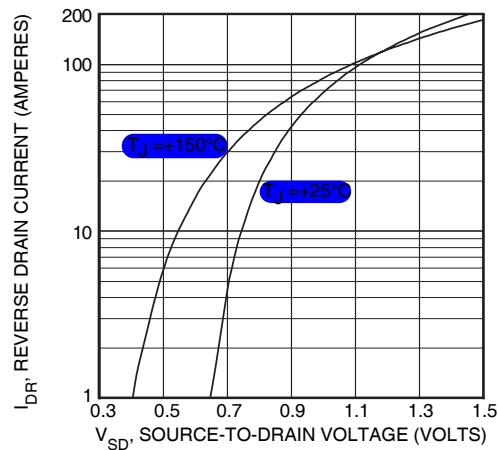


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

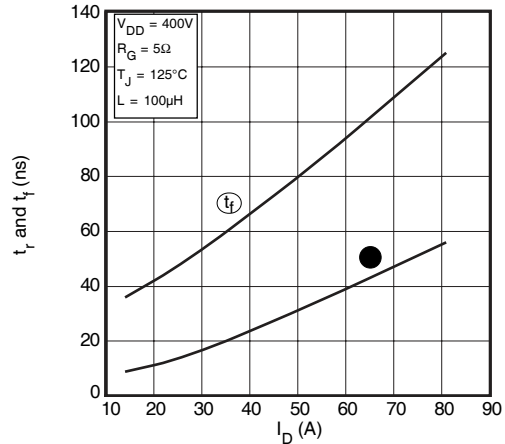


FIGURE 15, RISE AND FALL TIMES vs CURRENT

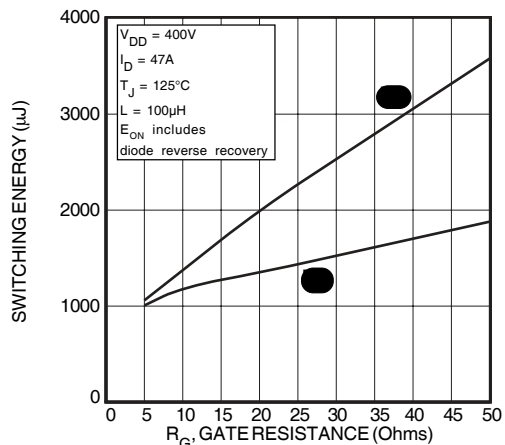


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

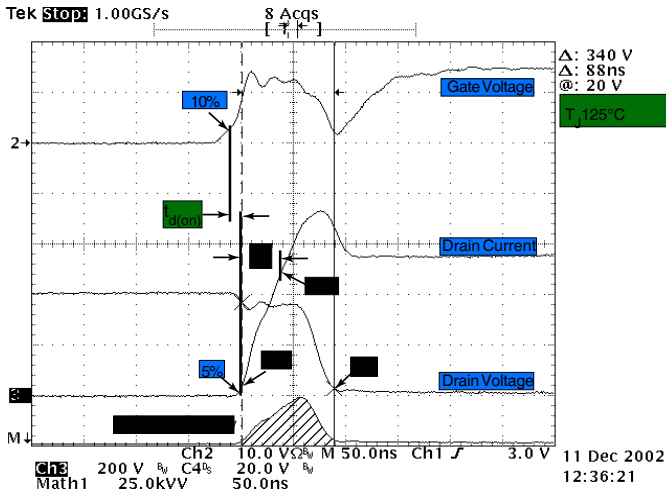


Figure 18, Turn-on Switching Waveforms and Definitions

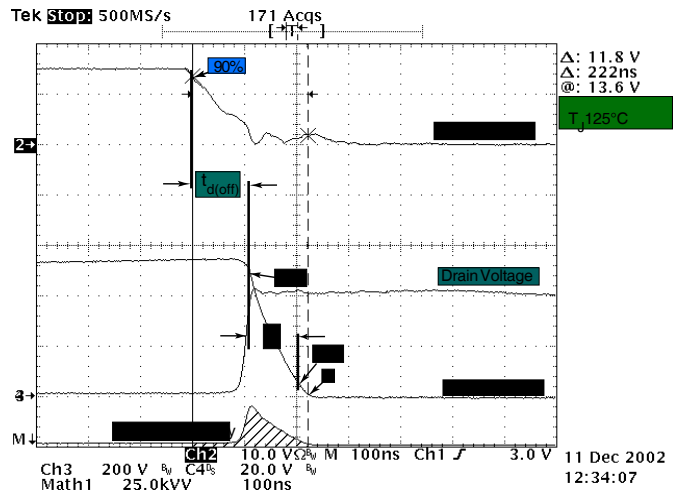


Figure 19, Turn-off Switching Waveforms and Definitions

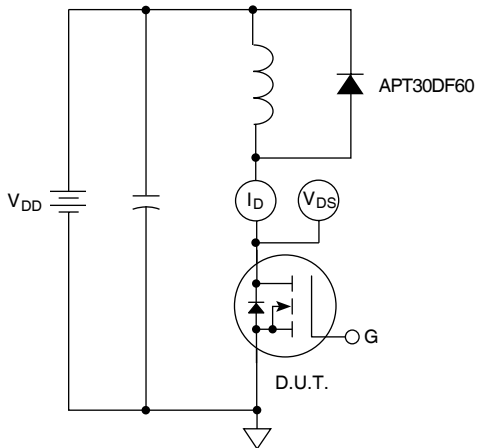
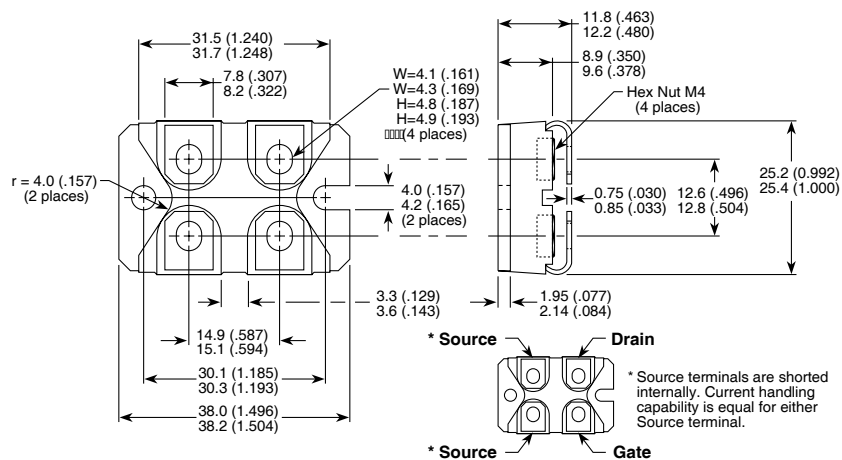


Figure 20, Inductive Switching Test Circuit

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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