

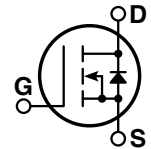
**POWER MOS 7® FREDFET**

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 APT'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

• **FAST RECOVERY BODY DIODE**


**MAXIMUM RATINGS**

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

Symbol	Parameter	APT20M20JFLL	UNIT
$V_{DSS}$	Drain-Source Voltage	200	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	104	Amps
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	416	
$V_{GS}$	Gate-Source Voltage Continuous	±30	Volts
$V_{GSM}$	Gate-Source Voltage Transient	±40	
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	463	Watts
	Linear Derating Factor	3.70	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)	100	Amps
$E_{AR}$	Repetitive Avalanche Energy <sup>①</sup>	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy <sup>④</sup>	2500	

**STATIC ELECTRICAL CHARACTERISTICS**

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250\mu\text{A}$ )	200			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, I_D = 52A$ )			0.020	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 200V, V_{GS} = 0V$ )			250	μA
	Zero Gate Voltage Drain Current ( $V_{DS} = 160V, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			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.

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

### DYNAMIC CHARACTERISTICS

APT20M20JFLL

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		6850		pF
$C_{oss}$	Output Capacitance			2180		
$C_{rss}$	Reverse Transfer Capacitance			95		
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 100V$ $I_D = 104A @ 25^\circ C$		110		nC
$Q_{gs}$	Gate-Source Charge			43		
$Q_{gd}$	Gate-Drain ("Miller") Charge			47		
$t_{d(on)}$	Turn-on Delay Time	<b>RESISTIVE SWITCHING</b> $V_{GS} = 15V$ $V_{DD} = 100V$ $I_D = 104A @ 25^\circ C$ $R_G = 0.6\Omega$		13		ns
$t_r$	Rise Time			40		
$t_{d(off)}$	Turn-off Delay Time			26		
$t_f$	Fall Time			2		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 25°C</b> $V_{DD} = 130V, V_{GS} = 15V$ $I_D = 104A, R_G = 5\Omega$		465		$\mu J$
$E_{off}$	Turn-off Switching Energy			455		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 125°C</b> $V_{DD} = 130V, V_{GS} = 15V$ $I_D = 104A, R_G = 5\Omega$		920		
$E_{off}$	Turn-off Switching Energy			915		

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)			104	Amps
$I_{SM}$	Pulsed Source Current ① (Body Diode)			416	Amps
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -104A$ )			1.3	Volts
$dv/dt$	Peak Diode Recovery $dv/dt$ ⑤			8	V/ns
$t_{rr}$	Reverse Recovery Time ( $I_S = -104A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		220	ns
		$T_j = 125^\circ C$		420	
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -104A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		1.07	$\mu C$
		$T_j = 125^\circ C$		2.9	
$I_{RRM}$	Peak Recovery Current ( $I_S = -104A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		12.1	Amps
		$T_j = 125^\circ C$		20.6	

### THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.27	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			40	

① Repetitive Rating: Pulse width limited by maximum junction temperature

② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting  $T_j = +25^\circ C$ ,  $L = 0.46mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 104A$

⑤  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_D 104A$   $di/dt \leq 700A/\mu s$   $V_R \leq V_{DSS}$   $T_j \leq 150^\circ C$

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

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

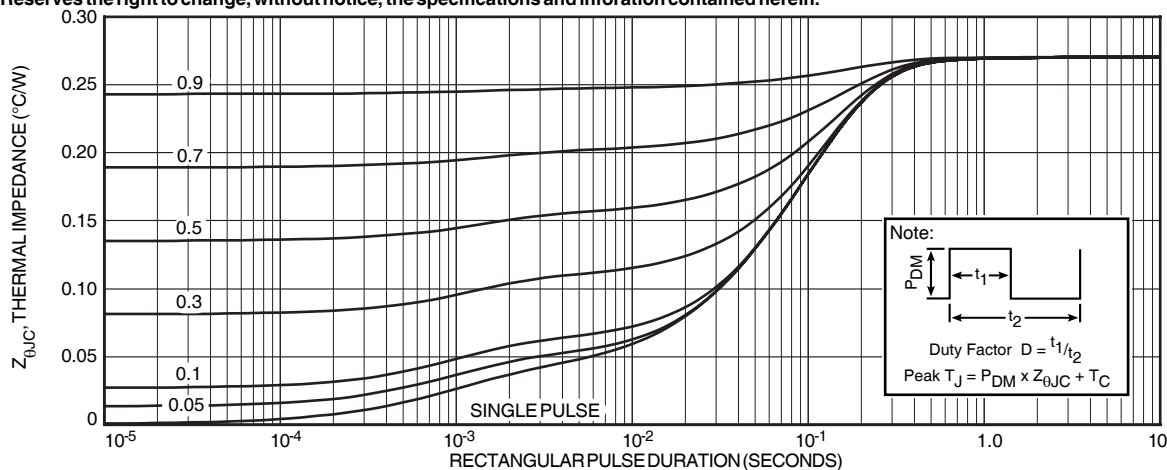


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT20M20JFLL

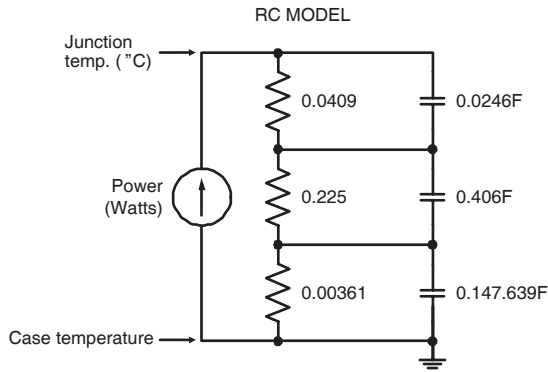


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

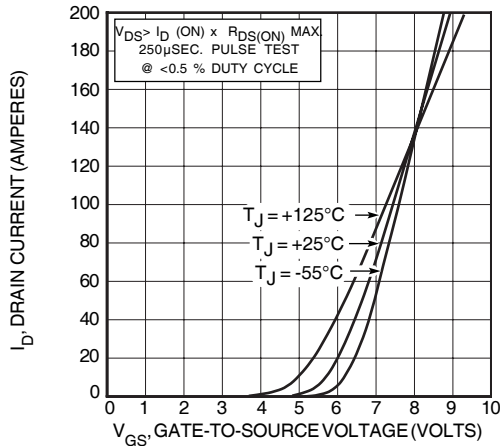


FIGURE 4, TRANSFER CHARACTERISTICS

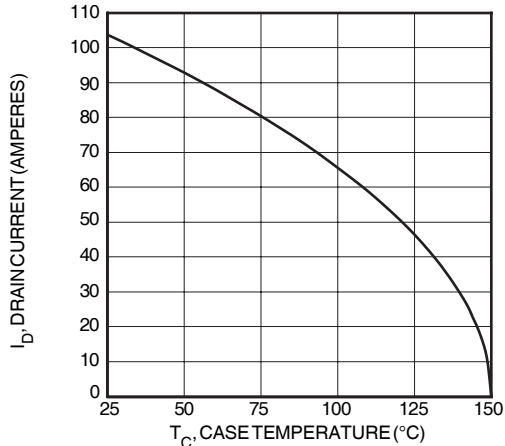


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

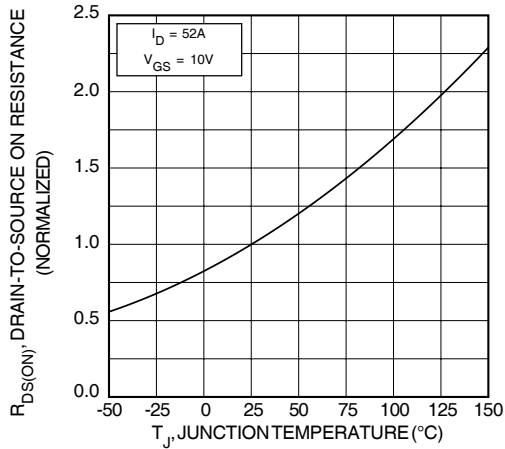


FIGURE 8,  $R_{DS(ON)}$  vs. TEMPERATURE

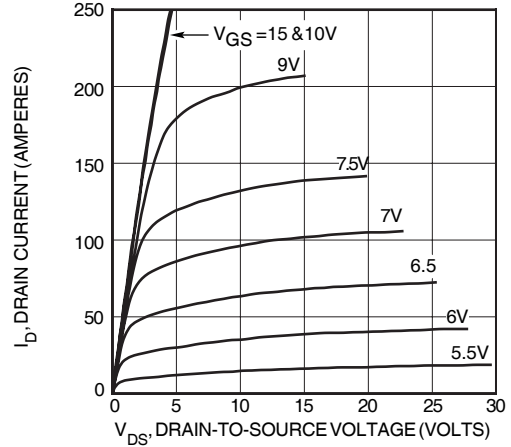


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

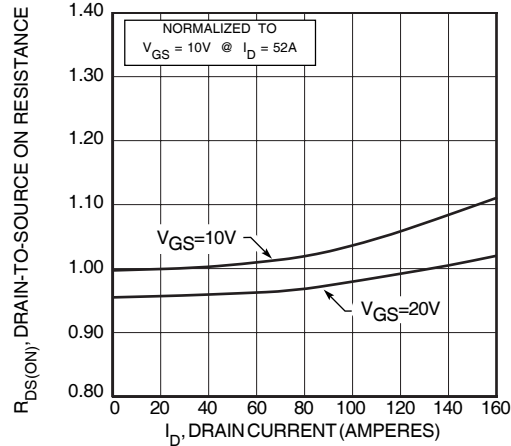


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

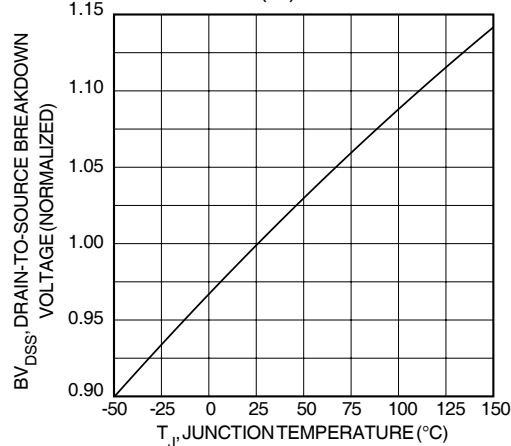


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

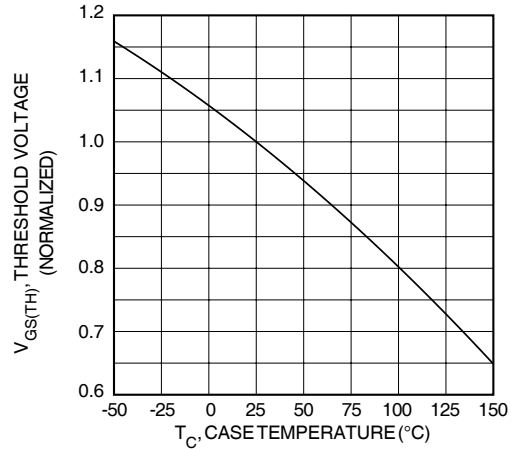


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

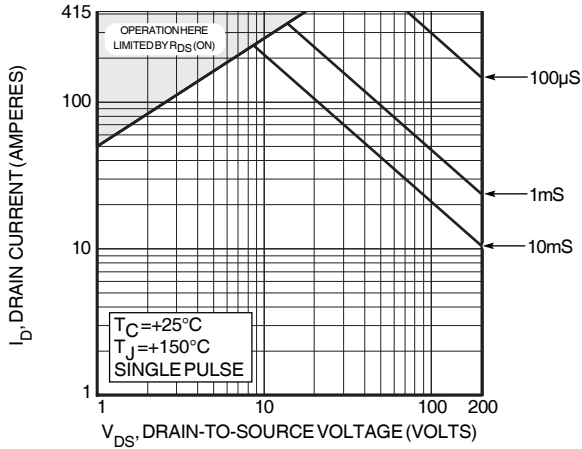


FIGURE 10, MAXIMUM SAFE OPERATING AREA

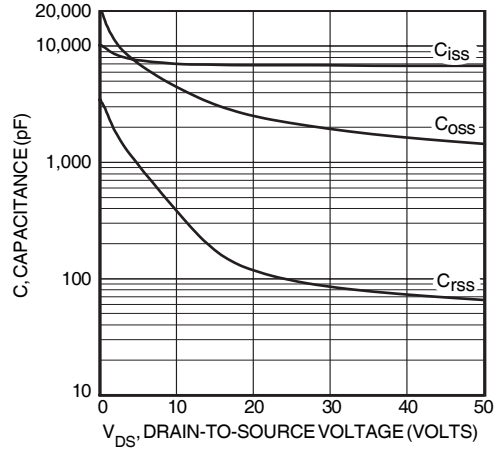


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

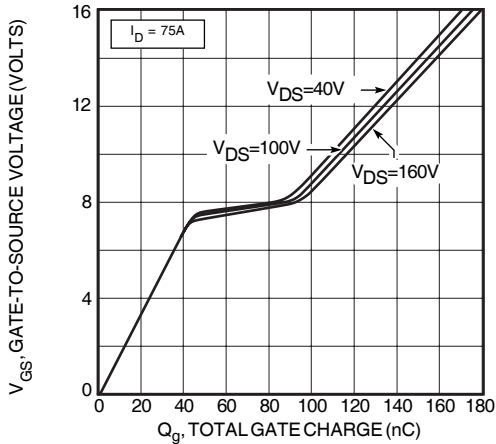


FIGURE 12, GATE CHARGE vs GATE-TO-SOURCE VOLTAGE

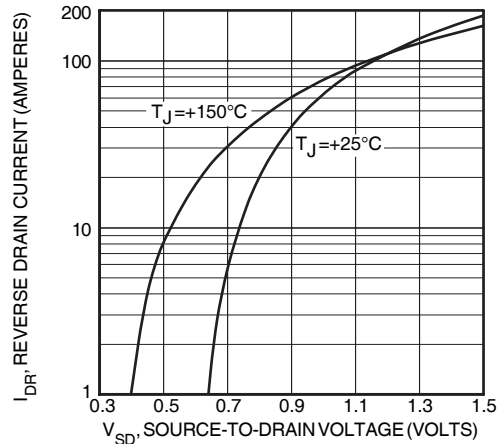


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

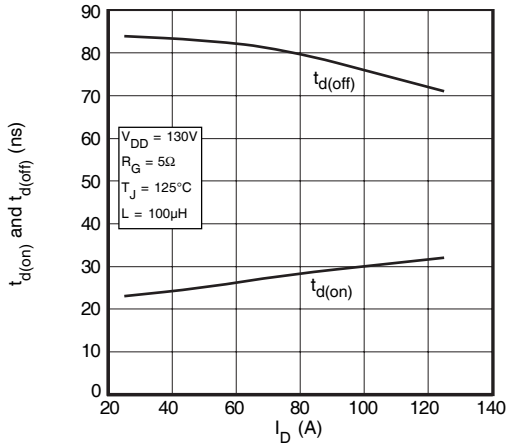


FIGURE 14, DELAY TIMES vs CURRENT

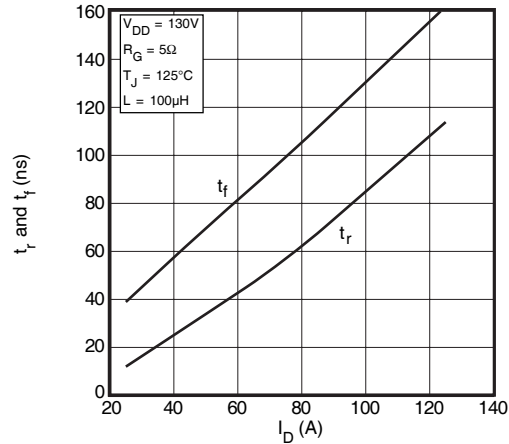


FIGURE 15, RISE AND FALL TIMES vs CURRENT

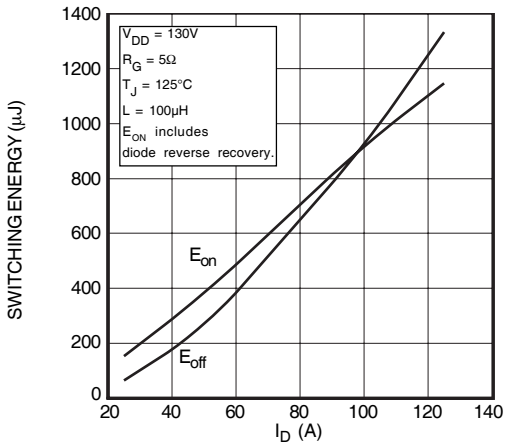


FIGURE 16, SWITCHING ENERGY vs CURRENT

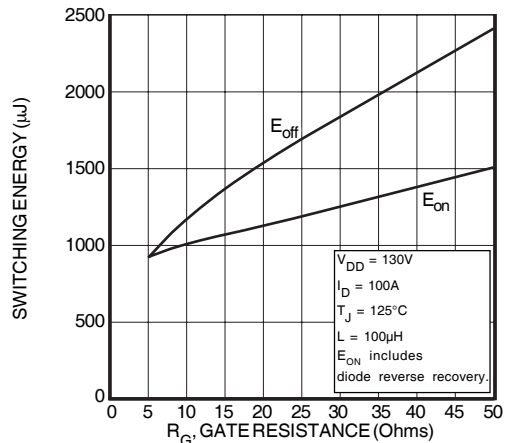


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

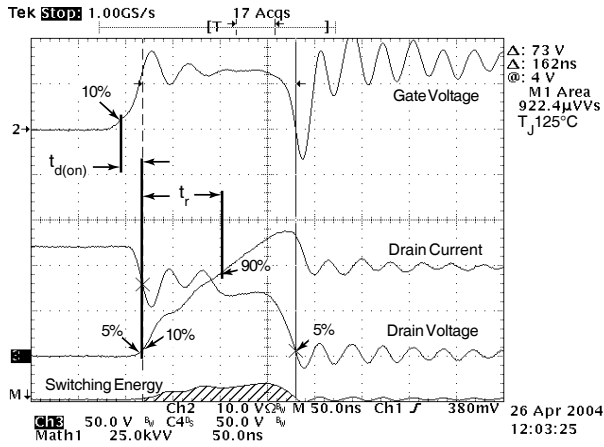


Figure 18, Turn-on Switching Waveforms and Definitions

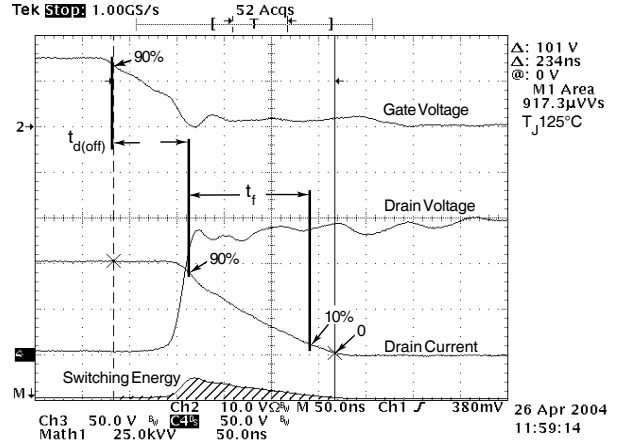


Figure 19, Turn-off Switching Waveforms and Definitions

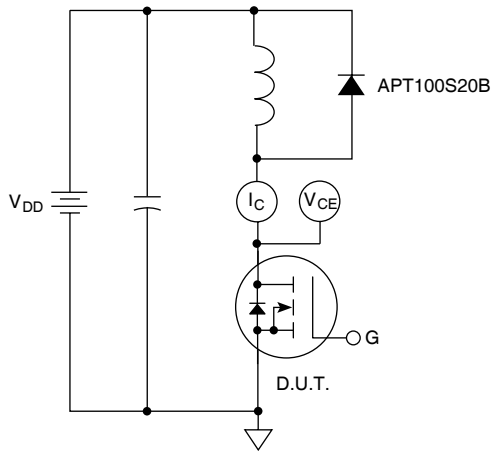
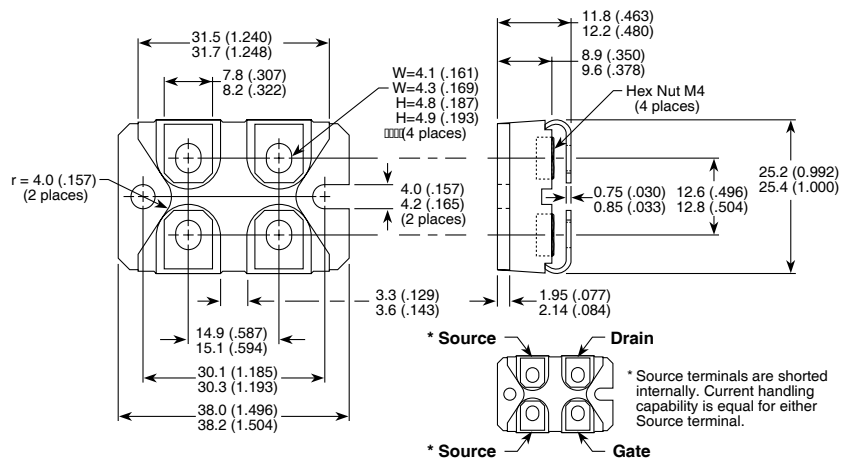


Figure 20, Inductive Switching Test Circuit

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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