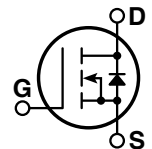
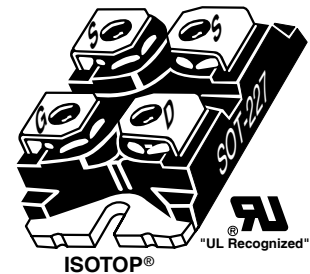


### POWER MOS 7® MOSFET

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

#### MAXIMUM RATINGS

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

Symbol	Parameter	APT20M11JLL	UNIT
$V_{DSS}$	Drain-Source Voltage	200	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	176	Amps
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	704	
$V_{GS}$	Gate-Source Voltage Continuous	$\pm 30$	Volts
$V_{GSM}$	Gate-Source Voltage Transient	$\pm 40$	
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	694	Watts
	Linear Derating Factor	5.56	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.	300	
$I_{AR}$	Avalanche Current <sup>①</sup> (Repetitive and Non-Repetitive)	176	Amps
$E_{AR}$	Repetitive Avalanche Energy <sup>①</sup>	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy <sup>④</sup>	3600	

#### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250\mu A$ )	200			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, I_D = 88A$ )			0.011	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 200V, V_{GS} = 0V$ )			100	$\mu A$
	Zero Gate Voltage Drain Current ( $V_{DS} = 160V, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			500	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 5mA$ )	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

APT20M11JLL

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		10320		pF
$C_{oss}$	Output Capacitance			4220		
$C_{rss}$	Reverse Transfer Capacitance			90		
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 100V$ $I_D = 176A @ 25^\circ C$		180		nC
$Q_{gs}$	Gate-Source Charge			80		
$Q_{gd}$	Gate-Drain ("Miller") Charge			65		
$t_{d(on)}$	Turn-on Delay Time	<b>RESISTIVE SWITCHING</b> $V_{GS} = 15V$ $V_{DD} = 100V$ $I_D = 176A @ 25^\circ C$ $R_G = 0.6\Omega$		24		ns
$t_r$	Rise Time			65		
$t_{d(off)}$	Turn-off Delay Time			55		
$t_f$	Fall Time			9		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 25°C</b> $V_{DD} = 133V, V_{GS} = 15V$ $I_D = 176A, R_G = 5\Omega$		1190		$\mu J$
$E_{off}$	Turn-off Switching Energy			2485		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 125°C</b> $V_{DD} = 133V, V_{GS} = 15V$ $I_D = 176A, R_G = 5\Omega$		1260		
$E_{off}$	Turn-off Switching Energy			2815		

# SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)			176	Amps
$I_{SM}$	Pulsed Source Current ① (Body Diode)			704	
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -176A$ )			1.3	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -176A, di_S/dt = 100A/\mu s$ )		460		ns
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -176A, di_S/dt = 100A/\mu s$ )		7.0		$\mu C$
$dv/dt$	Peak Diode Recovery $dv/dt$ ⑤			5	V/ns

# THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.18	$^\circ C/W$
$R_{\theta JA}$	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  $T_J = +25^\circ C$ ,  $L = 0.23mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 176A$

⑤  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_D 176A$   $di/dt \leq 700A/\mu s$   $V_R \leq V_{DSS}$   $T_J \leq 150^\circ C$

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.

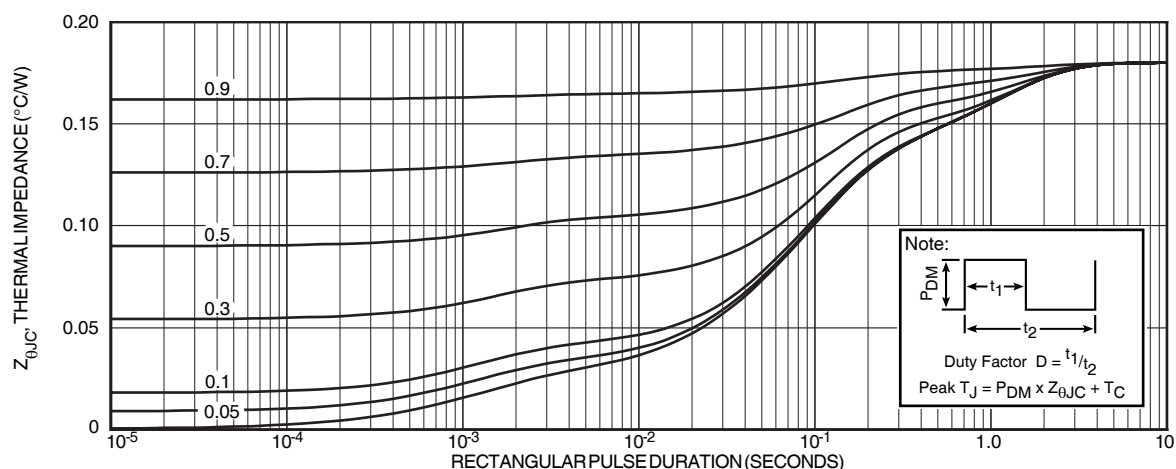


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

# Typical Performance Curves

APT20M11JLL

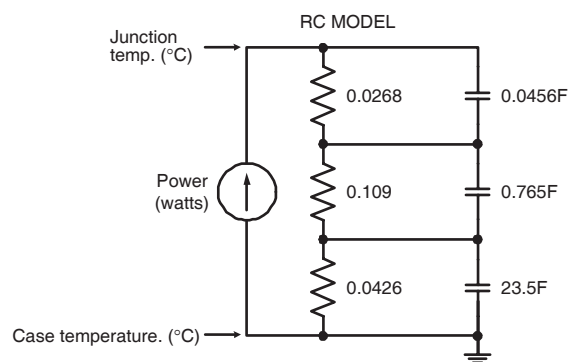


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

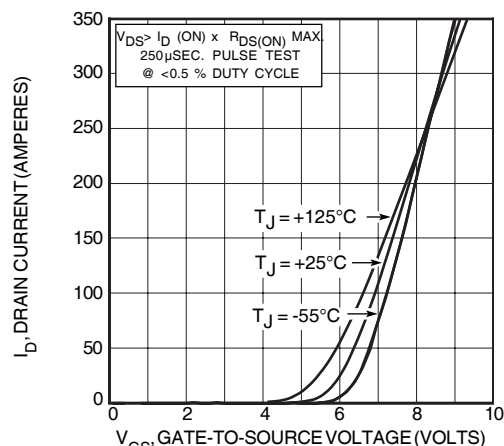


FIGURE 4, TRANSFER CHARACTERISTICS

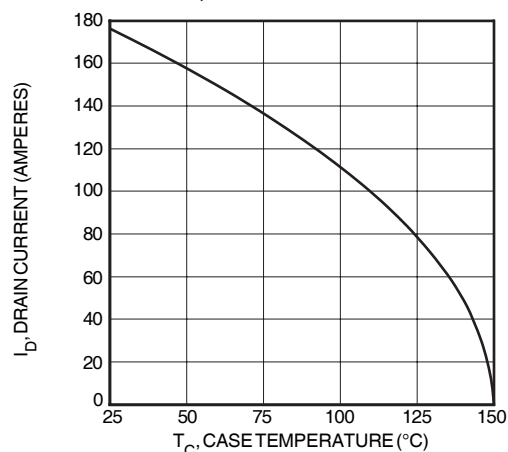


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

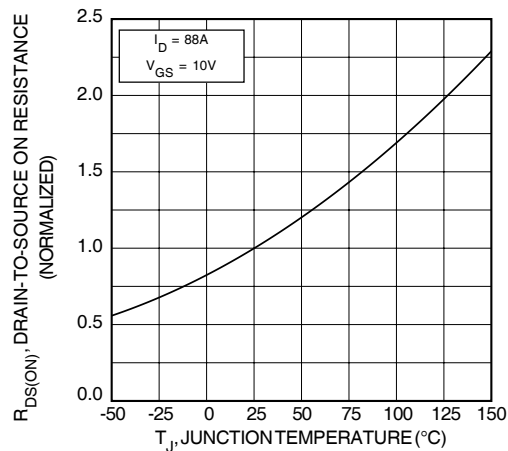


FIGURE 8,  $R_{DS(ON)}$  vs. TEMPERATURE

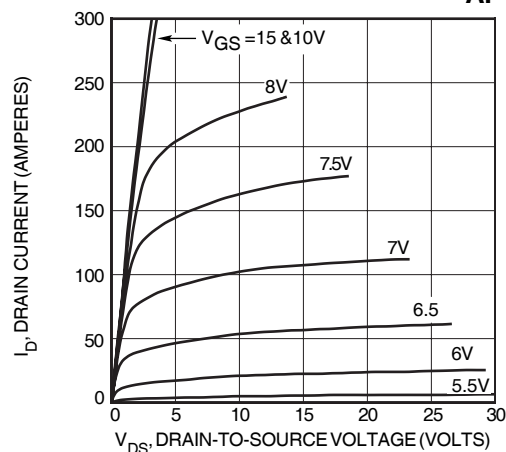


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

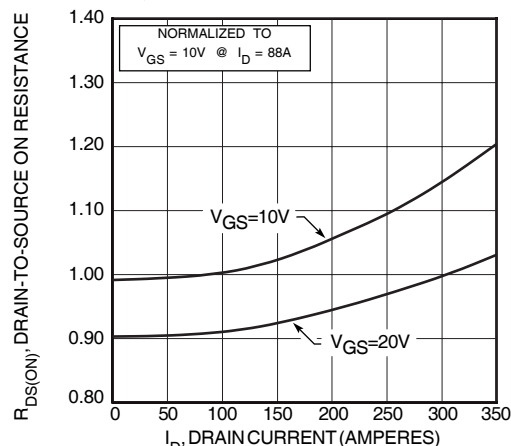


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

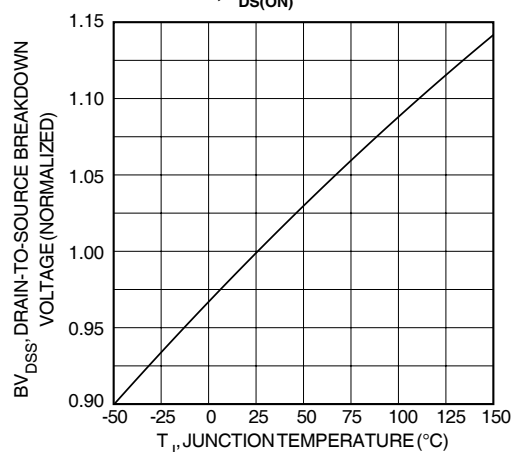


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

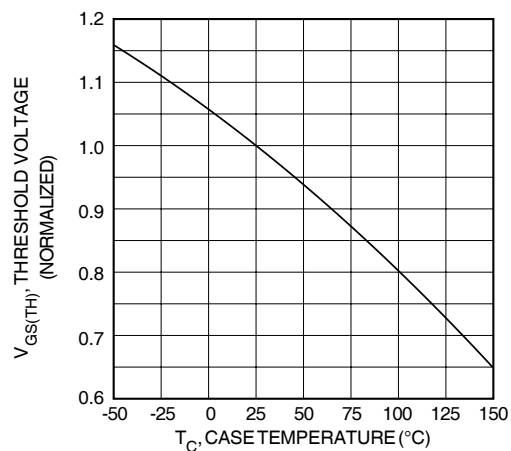


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

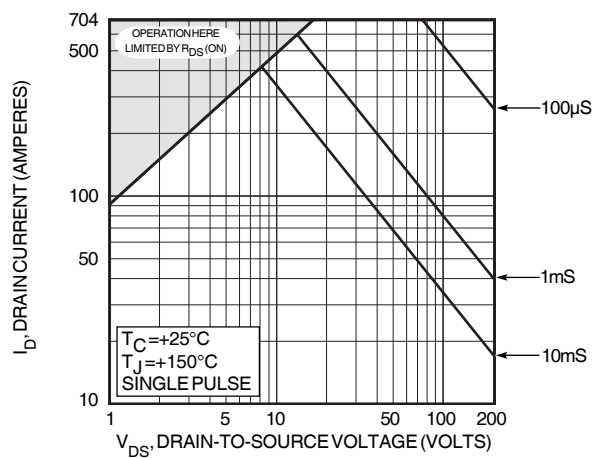


FIGURE 10, MAXIMUM SAFE OPERATING AREA

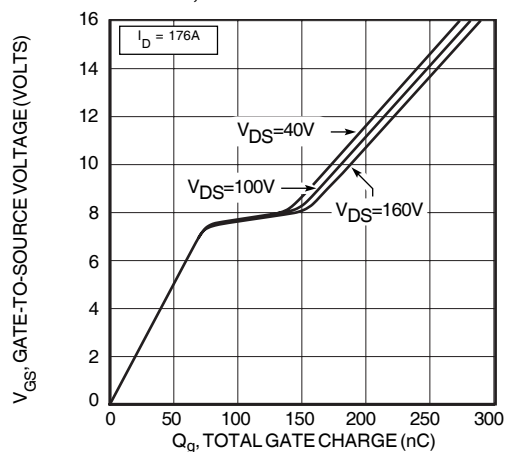


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

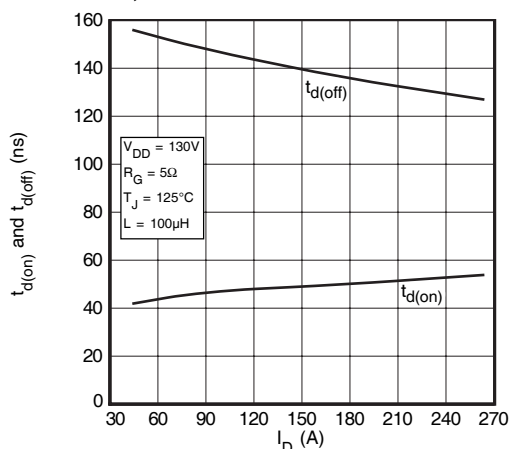


FIGURE 14, DELAY TIMES vs CURRENT

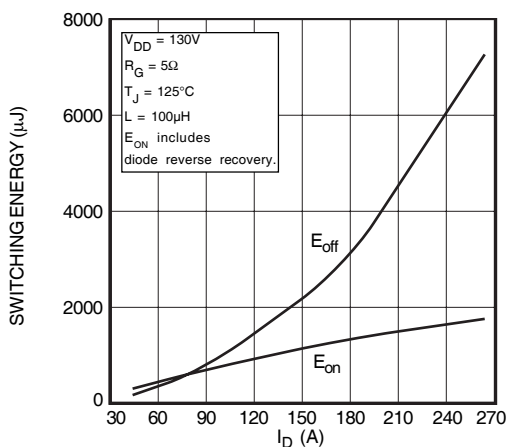


FIGURE 16, SWITCHING ENERGY vs CURRENT

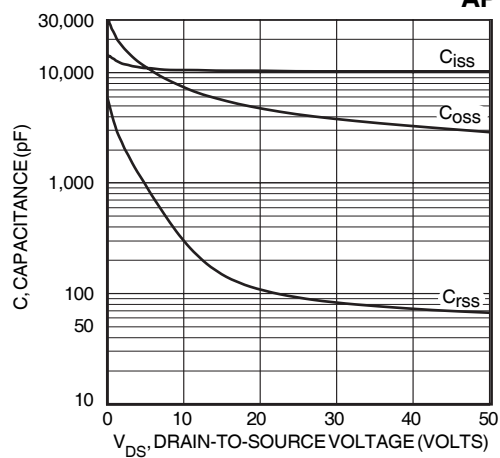


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

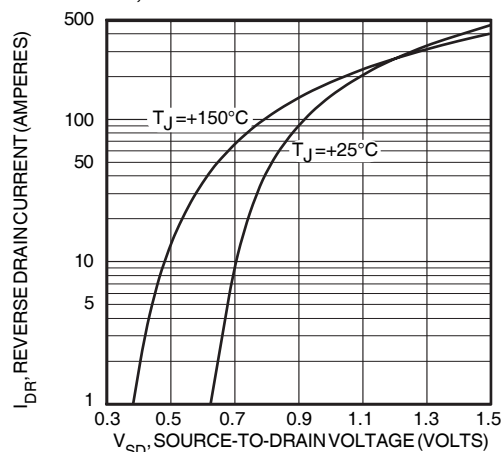


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

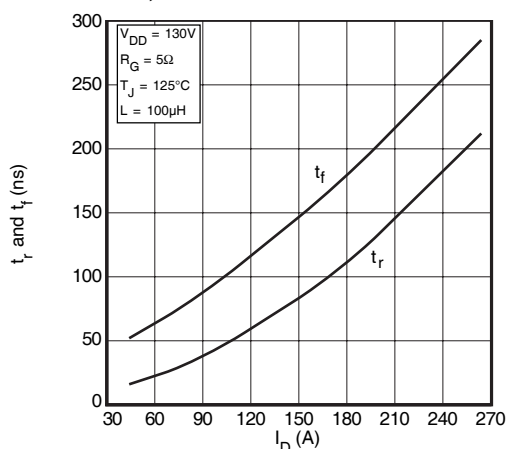


FIGURE 15, RISE AND FALL TIMES vs CURRENT

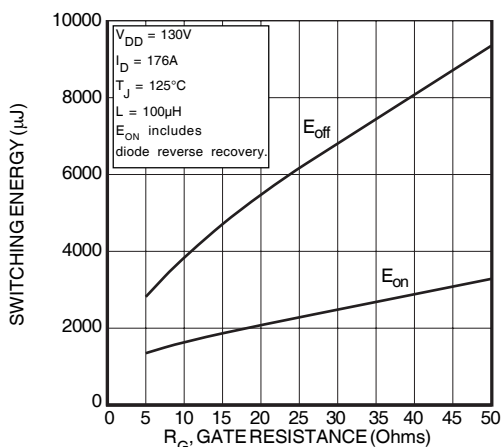


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

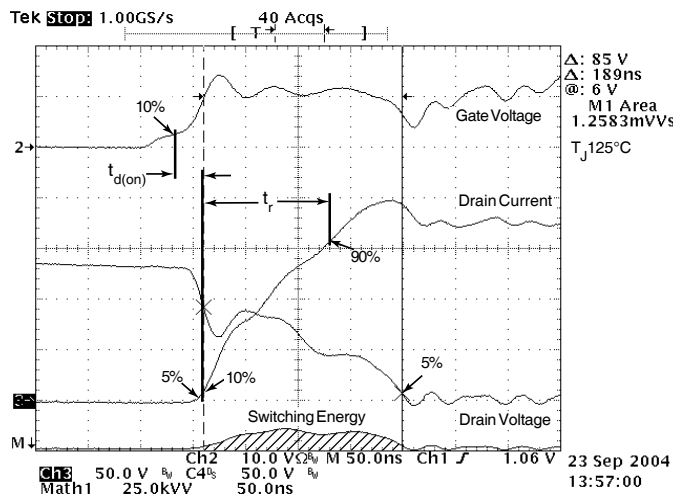


Figure 18, Turn-on Switching Waveforms and Definitions

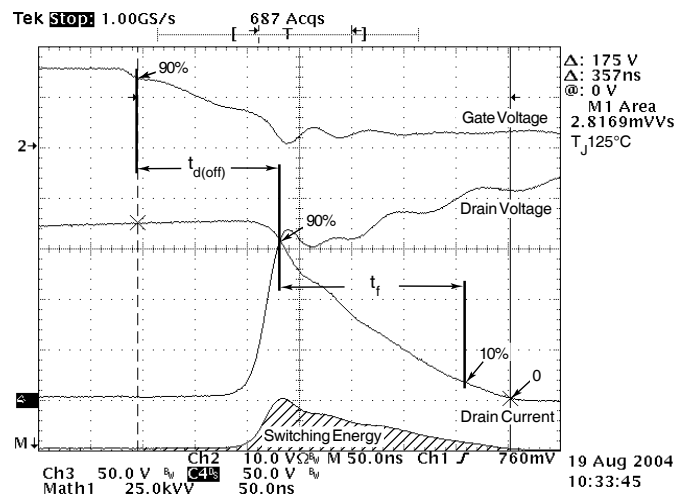


Figure 19, Turn-off Switching Waveforms and Definitions

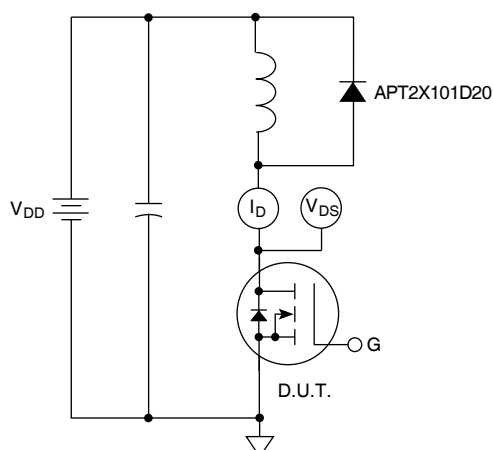
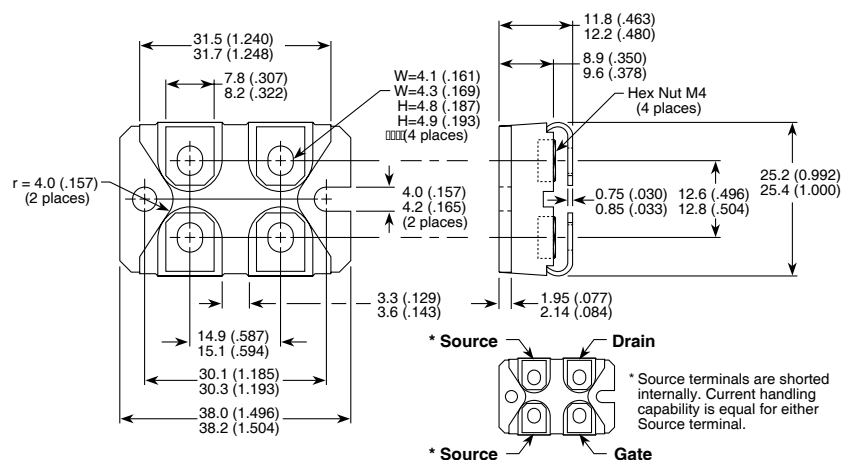


Figure 20, Inductive Switching Test Circuit

## SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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