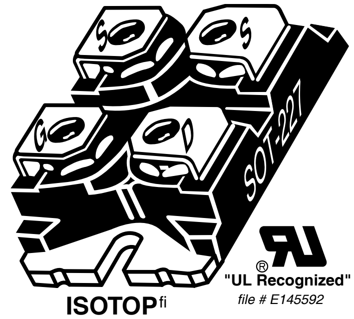
POWER PRODUCTS GROUP

APT8020JFLL

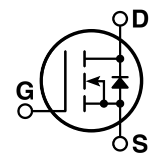
800V 33A 0.220Ω

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 Microsemi's patented metal gate structure.

- **Lower Input Capacitance**
- **Lower Miller Capacitance**
- **Lower Gate Charge, Qg**
- **Increased Power Dissipation**
- **Easier To Drive**
- **Popular SOT-227 Package**
- **FAST RECOVERY BODY DIODE**



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

Symbol	Parameter	APT8020JFLL	UNIT
V_{DSS}	Drain-Source Voltage	800	Volts
I_D	Continuous Drain Current @ T_C = 25°C	33	Amps
I_{DM}	Pulsed Drain Current ①	132	Amps
V_{GS}	Gate-Source Voltage Continuous	±30	Volts
V_{GSM}	Gate-Source Voltage Transient	±40	Volts
P_D	Total Power Dissipation @ T_C = 25°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	°C
I_{AR}	Avalanche Current ① (Repetitive and Non-Repetitive)	33	Amps
E_{AR}	Repetitive Avalanche Energy ①	50	mJ
E_{AS}	Single Pulse Avalanche Energy ④	3000	mJ

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 250μA)	800			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ② (V_{GS} = 10V, I_D = 16.5A)			0.220	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = 800V, V_{GS} = 0V)			250	μA
	Zero Gate Voltage Drain Current (V_{DS} = 640V, V_{GS} = 0V, T_C = 125°C)			1000	μA
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 = 2.5mA)	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		5200		pF
C_{oss}	Output Capacitance			1000		
C_{rss}	Reverse Transfer Capacitance			190		
Q_g	Total Gate Charge ③	V_{GS} = 10V V_{DD} = 400V I_D = 33A @ 25°C		195		nC
Q_{gs}	Gate-Source Charge			27		
Q_{gd}	Gate-Drain ("Miller") Charge			130		
$t_{d(on)}$	Turn-on Delay Time	**RESISTIVE SWITCHING** V_{GS} = 15V V_{DD} = 400V I_D = 33A @ 25°C R_G = 0.6Ω		12		ns
t_r	Rise Time			14		
$t_{d(off)}$	Turn-off Delay Time			39		
t_f	Fall Time			10		
E_{on}	Turn-on Switching Energy ⑥	**INDUCTIVE SWITCHING @ 25°C** V_{DD} = 533V, V_{GS} = 15V I_D = 33A, R_G = 5Ω		760		µJ
E_{off}	Turn-off Switching Energy			715		
E_{on}	Turn-on Switching Energy ⑥	**INDUCTIVE SWITCHING @ 125°C** V_{DD} = 533V, V_{GS} = 15V I_D = 33A, R_G = 5Ω		1250		
E_{off}	Turn-off Switching Energy			780		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)				33	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)				132	
V_{SD}	Diode Forward Voltage ② (V_{GS} = 0V, I_S = -33A)				1.3	Volts
$^{dv}/_{dt}$	Peak Diode Recovery $^{dv}/_{dt}$ ⑤				18	V/ns
t_{rr}	Reverse Recovery Time (I_S = -33A, $^{di}/_{dt}$ = 100A/µs)	T_j = 25°C			320	ns
		T_j = 125°C			650	
Q_{rr}	Reverse Recovery Charge (I_S = -33A, $^{di}/_{dt}$ = 100A/µs)	T_j = 25°C		1.4		µC
		T_j = 125°C		5.9		
I_{RRM}	Peak Recovery Current (I_S = -33A, $^{di}/_{dt}$ = 100A/µs)	T_j = 25°C		10.8		Amps
		T_j = 125°C		18.9		

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.24	°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 = 5.51mH, R_G = 25Ω, Peak I_L = 33A

⑤ $^{dv}/_{dt}$ numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_D$33A $^{di}/_{dt} \leq$ 700A/µs $V_R \leq$ 800V $T_J \leq$ 150°C

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

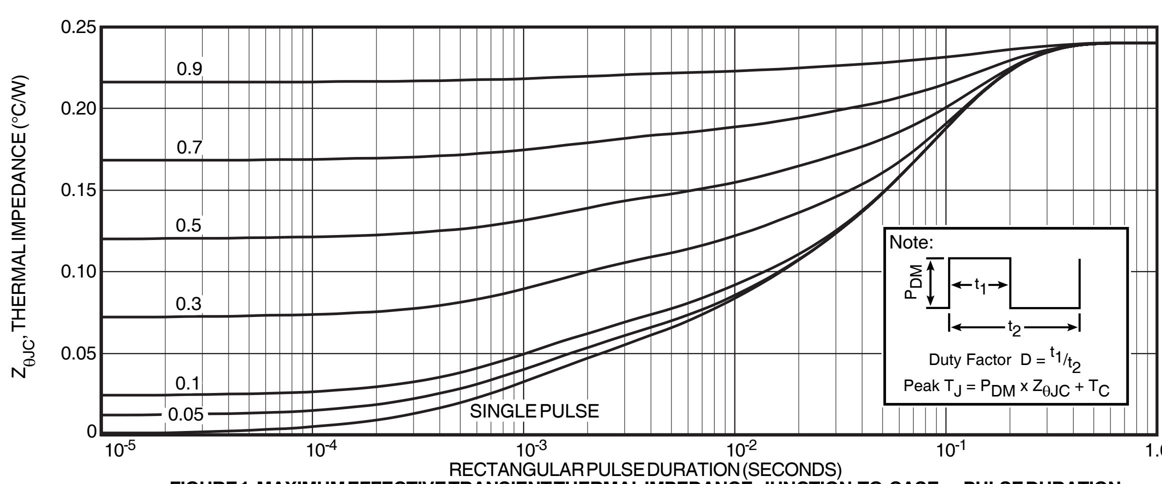


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

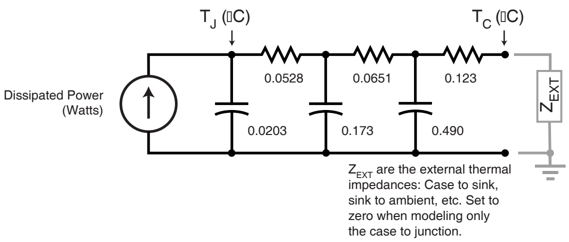


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

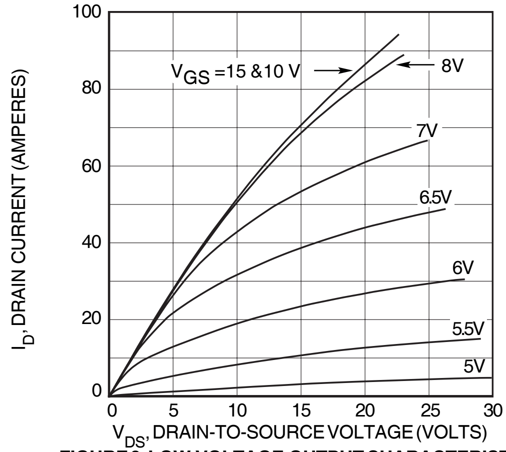


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

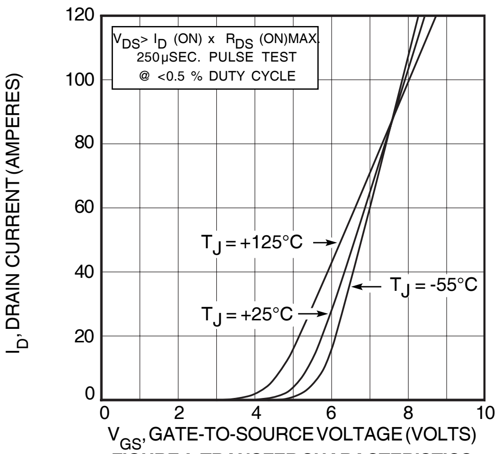


FIGURE 4, TRANSFER CHARACTERISTICS

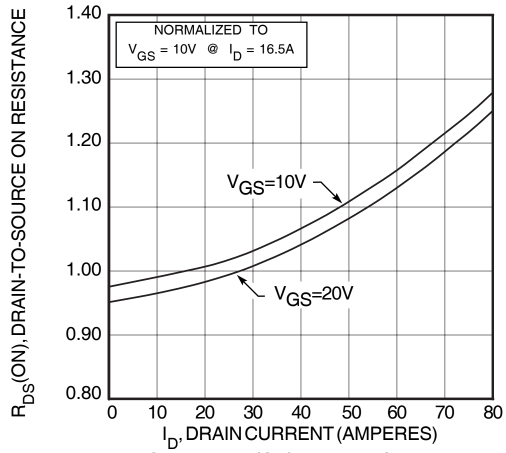


FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

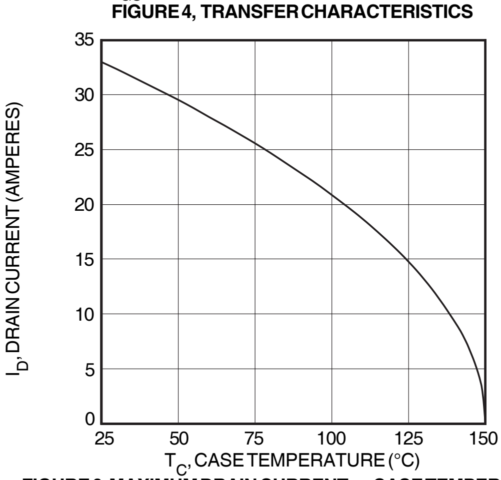


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

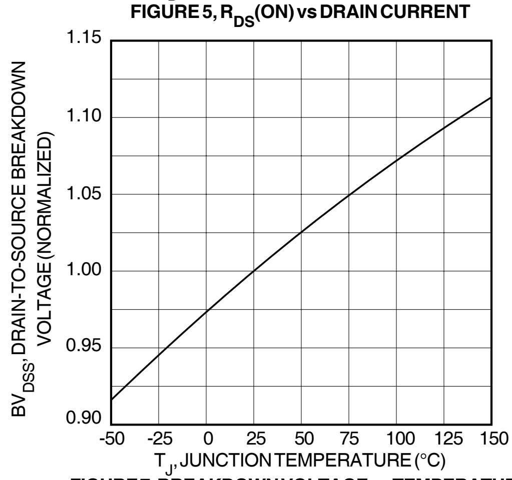
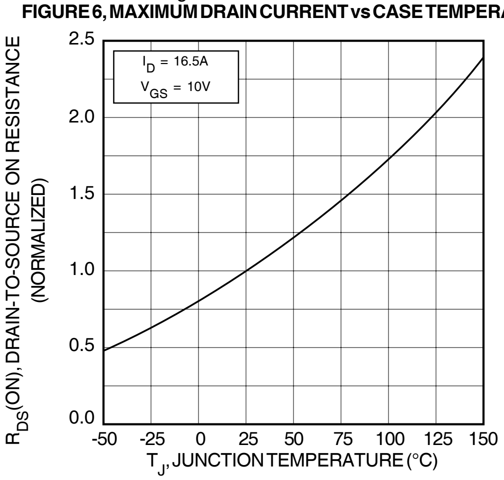
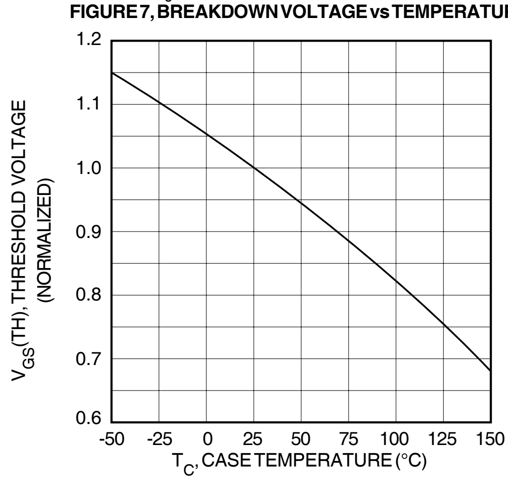


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE





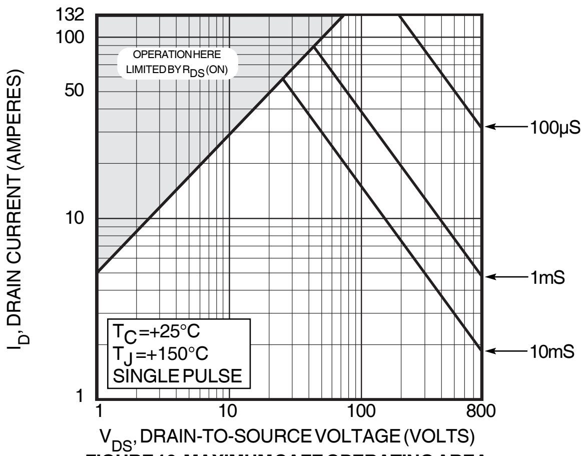


FIGURE 10, MAXIMUM SAFE OPERATING AREA

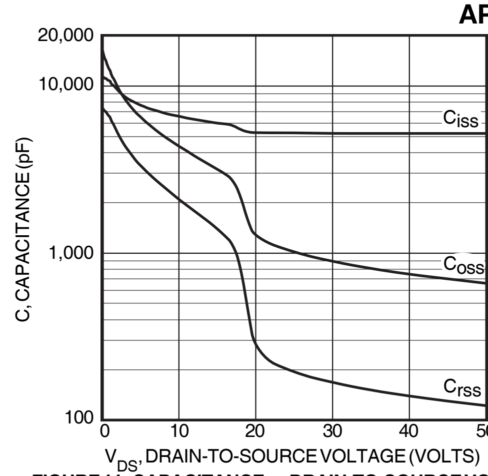


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

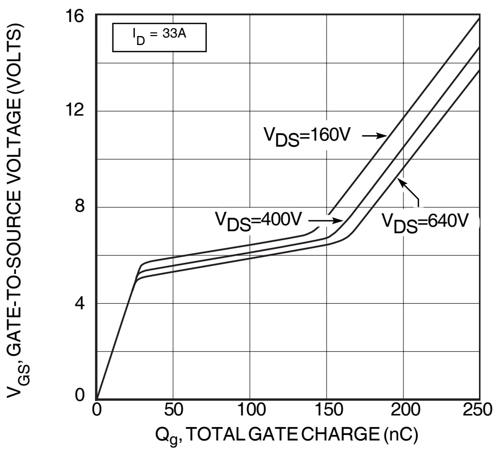


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

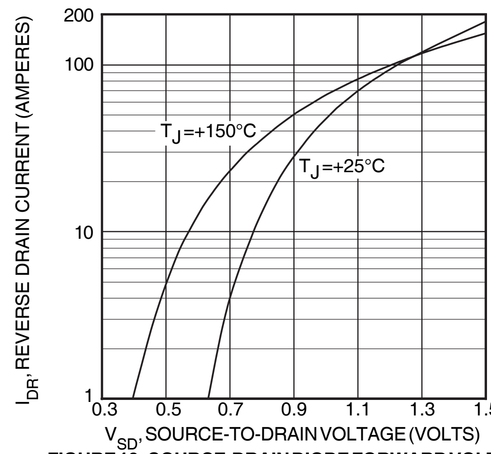


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

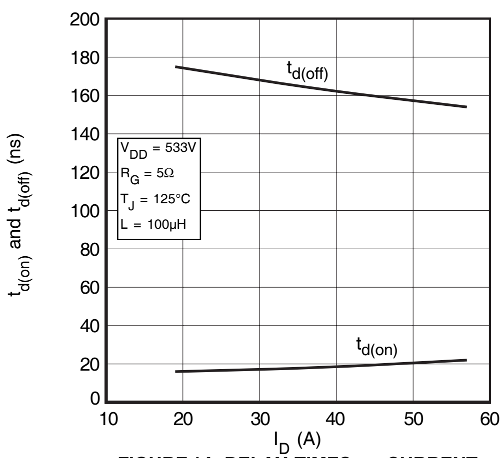


FIGURE 14, DELAY TIMES vs CURRENT

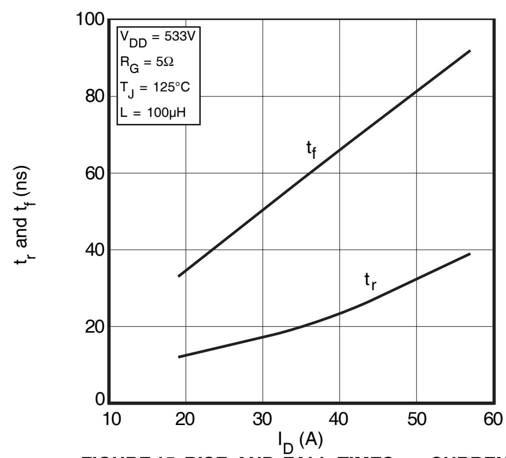


FIGURE 15, RISE AND FALL TIMES vs CURRENT

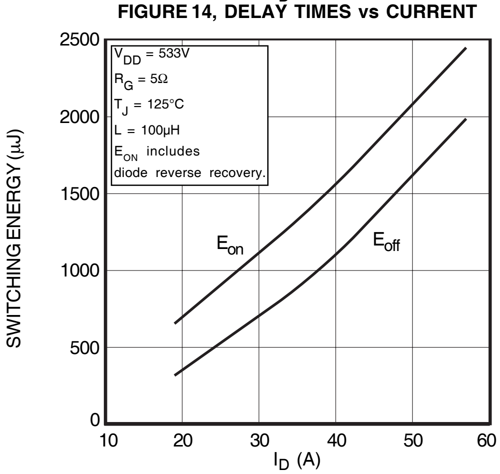


FIGURE 16, SWITCHING ENERGY vs CURRENT

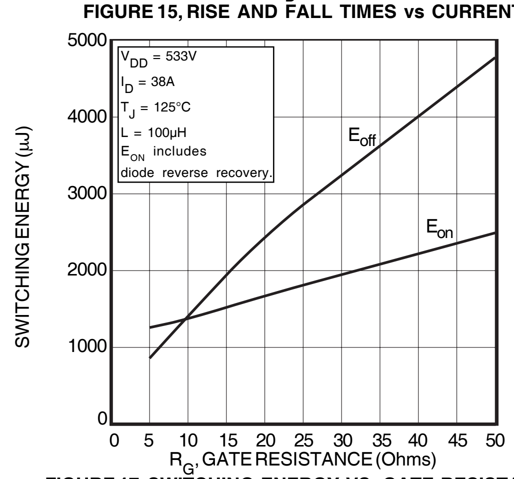


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

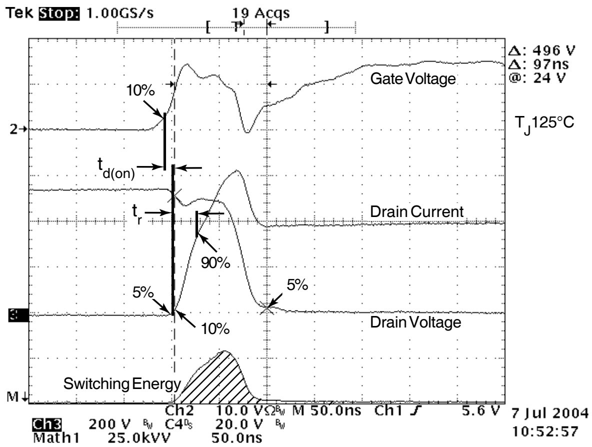


Figure 18, Turn-on Switching Waveforms and Definitions

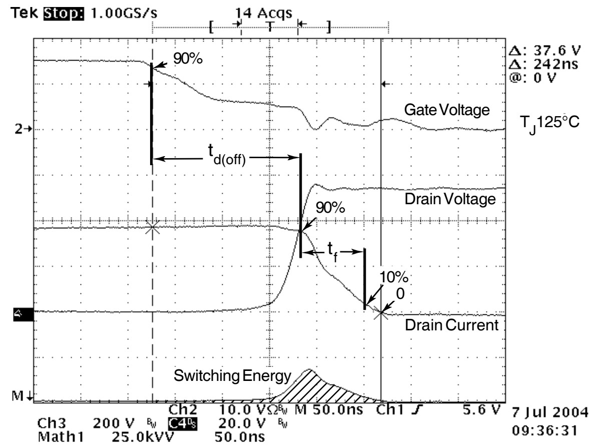


Figure 19, Turn-off Switching Waveforms and Definitions

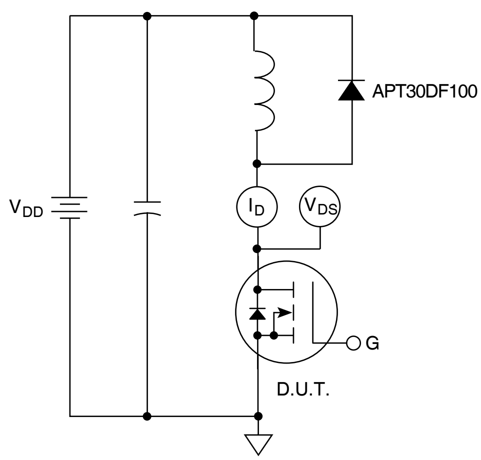
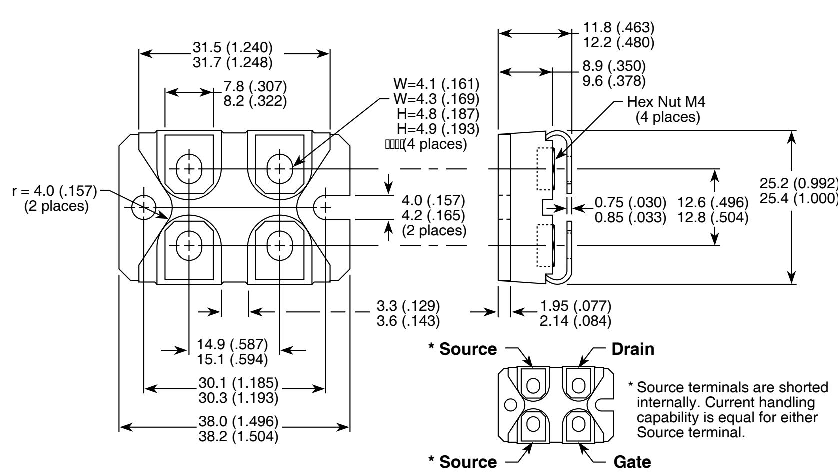


Figure 20, Inductive Switching Test Circuit

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)