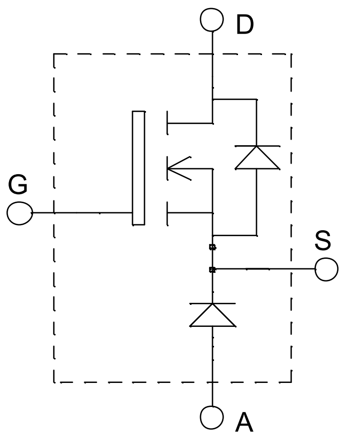
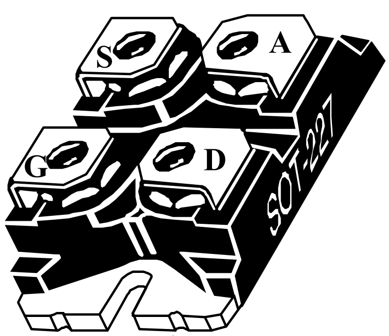
POWER PRODUCTS GROUP

APT10M11JVRU3

ISOTOP® Buck chopper MOSFET Power Module

V_{DSS} = 100V
R_{DSon} = 11mΩ max @ Tj = 25°C
I_D = 142A @ Tc = 25°C





ISOTOP®

Application

- AC and DC motor control
- Switched Mode Power Supplies

Features

- Power MOS V® MOSFETs
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic diode
  - Avalanche energy rated
  - Very rugged
- ISOTOP® Package (SOT-227)
- Very low stray inductance
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Very rugged
- Low profile
- RoHS Compliant

Absolute maximum ratings

Symbol	*Parameter*			*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage			100	V
I_D	Continuous Drain Current		T_c = 25°C	142	A
			T_c = 80°C	106	
I_{DM}	Pulsed Drain current			576	
V_{GS}	Gate - Source Voltage			±30	V
R_{DSon}	Drain - Source ON Resistance			11	mΩ
P_D	Maximum Power Dissipation		T_c = 25°C	450	W
I_{AR}	Avalanche current (repetitive and non repetitive)			144	A
E_{AR}	Repetitive Avalanche Energy			50	mJ
E_{AS}	Single Pulse Avalanche Energy			2500	
IF_{AV}	Maximum Average Forward Current	Duty cycle=0.5	Tc = 90°C	30	A
IF_{RMS}	RMS Forward Current (Square wave, 50% duty)			47	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed.

All ratings @ $T_j = 25°C$ unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 100V$	$T_j = 25°C$			250	µA
		$V_{GS} = 0V, V_{DS} = 80V$	$T_j = 125°C$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 71A$				11	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5mA$		2		4	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 20\ V, V_{DS} = 0V$				±100	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1MHz		8600		pF
C_{oss}	Output Capacitance			3200		
C_{rss}	Reverse Transfer Capacitance			1180		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 50V$ $I_D = 50A$ @ $T_J=25°C$		300		nC
Q_{gs}	Gate – Source Charge			95		
Q_{gd}	Gate – Drain Charge			110		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{Bus} = 50V$ $I_D = 142A$ @ $T_J=25°C$ $R_G = 0.6Ω$		16		ns
T_r	Rise Time			48		
$T_{d(off)}$	Turn-off Delay Time			51		
T_f	Fall Time			9		

Chopper diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_F	Diode Forward Voltage	$I_F = 30A$			1.1	1.15	V
		$I_F = 60A$			1.4		
		$I_F = 30A$	$T_j = 125°C$		0.9		
I_{RM}	Maximum Reverse Leakage Current	$V_R = 200V$	$T_j = 25°C$			250	µA
		$V_R = 200V$	$T_j = 125°C$			500	
C_T	Junction Capacitance	$V_R = 200V$			94		pF
t_{rr}	Reverse Recovery Time	$I_F=1A, V_R=30V$ di/dt =200A/µs	$T_j = 25°C$		21		ns
	Reverse Recovery Time	$I_F = 30A$ $V_R = 133V$ di/dt =200A/µs	$T_j = 25°C$		24		
			$T_j = 125°C$		48		
I_{RRM}	Maximum Reverse Recovery Current		$T_j = 25°C$		3		A
			$T_j = 125°C$		6		
Q_{rr}	Reverse Recovery Charge		$T_j = 25°C$		33		nC
			$T_j = 125°C$		150		
t_{rr}	Reverse Recovery Time	$I_F = 30A$ $V_R = 133V$ di/dt =1000A/µs	$T_j = 125°C$		31		ns
Q_{rr}	Reverse Recovery Charge				335		nC
I_{RRM}	Maximum Reverse Recovery Current				19		A

Thermal and package characteristics

Symbol	*Characteristic*		*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance	MOSFET			0.28	°C/W
		Diode			1.21	
R_{thJA}	Junction to Ambient (IGBT & Diode)				20	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz		2500			V
T_J,T_{STG}	Storage Temperature Range		-55		150	°C
T_L	Max Lead Temp for Soldering:0.063” from case for 10 sec				300	
Torque	Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine)				1.5	N.m
Wt	Package Weight			29.2		g

Typical MOSFET Performance Curve

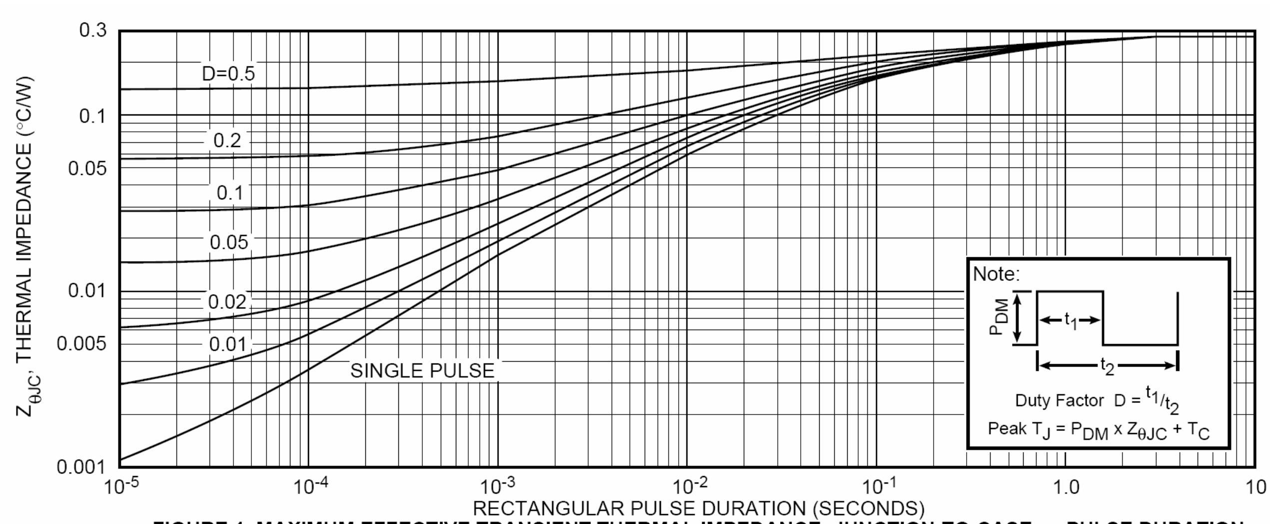


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

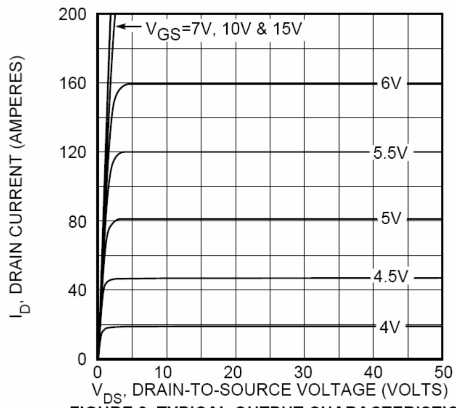


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

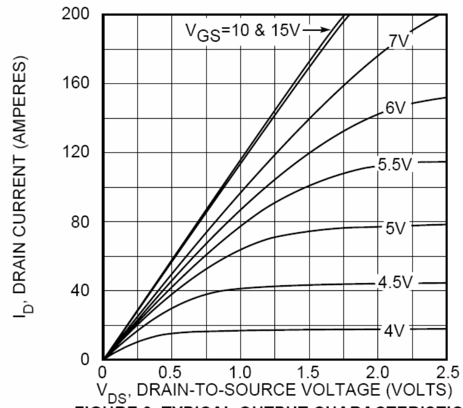


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

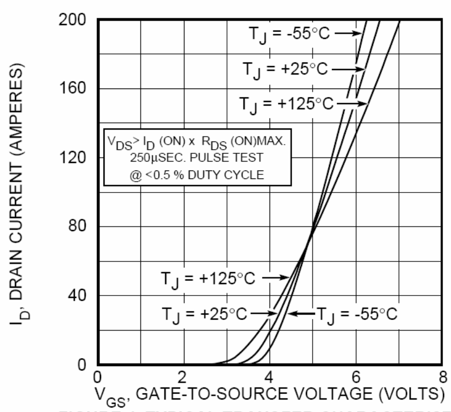


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

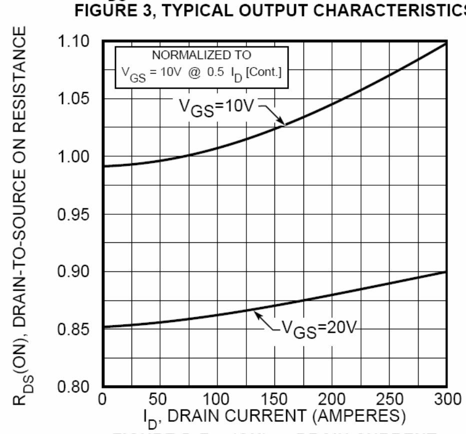


FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

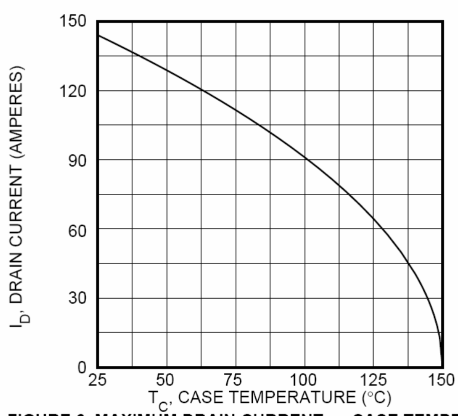


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

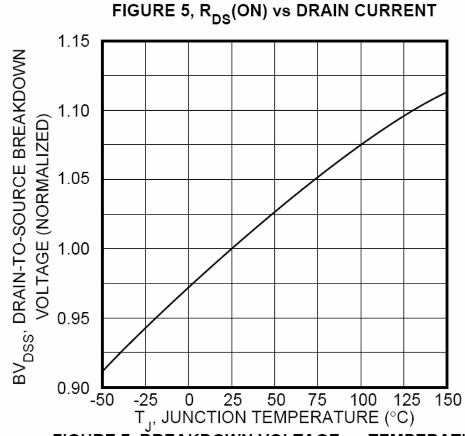


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

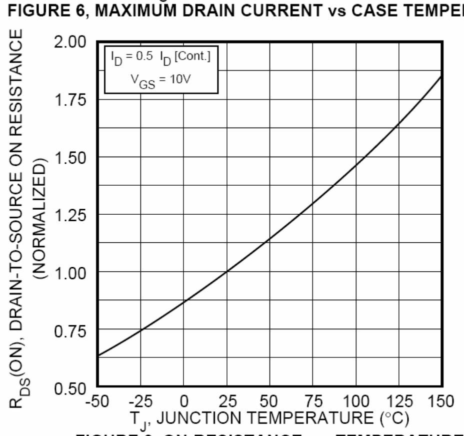


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

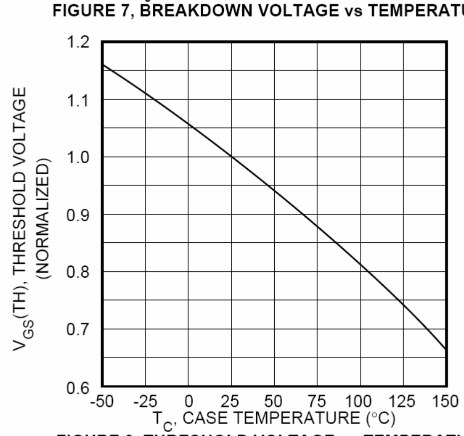


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

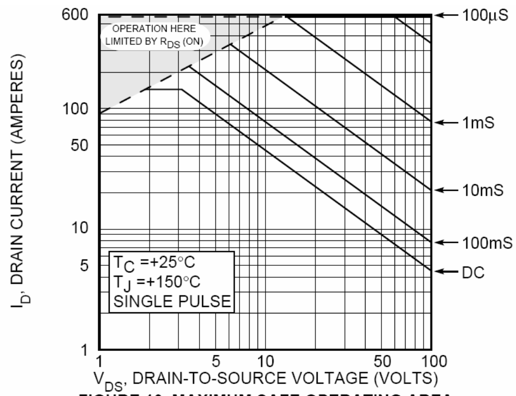


FIGURE 10, MAXIMUM SAFE OPERATING AREA

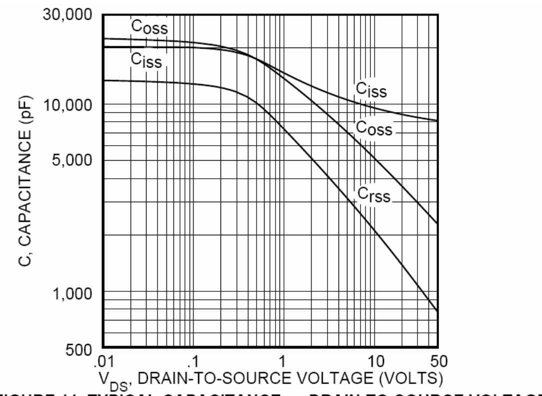


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

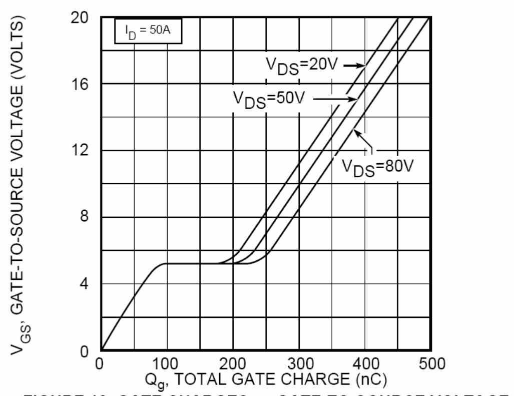


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

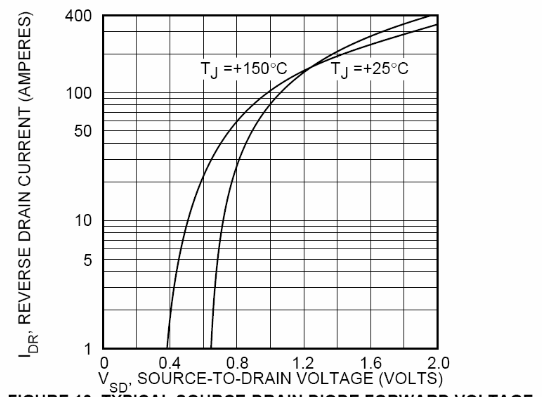


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

Typical Diode Performance Curve

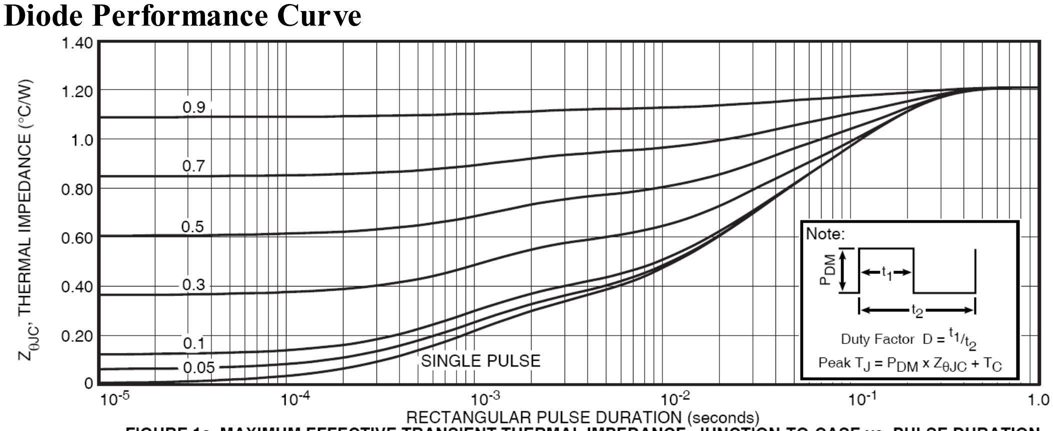


FIGURE 1a. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION

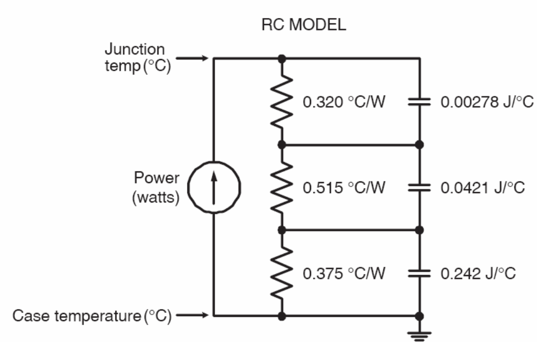


FIGURE 1b, TRANSIENT THERMAL IMPEDANCE MODEL

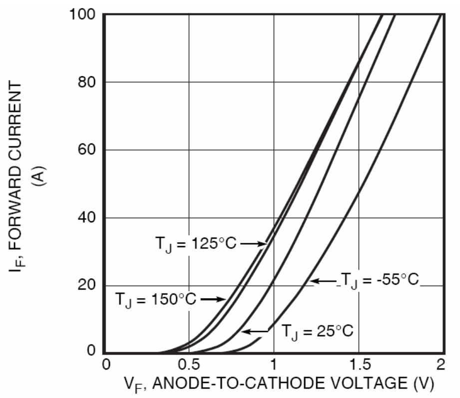


Figure 2. Forward Current *vs.* Forward Voltage

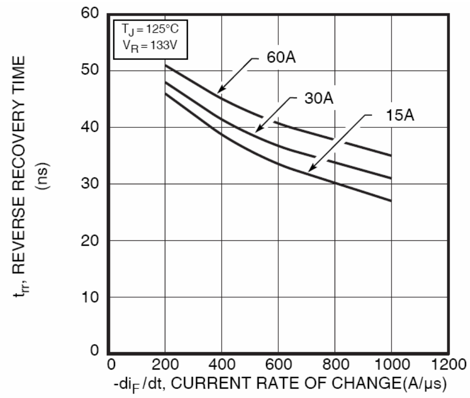


Figure 3. Reverse Recovery Time *vs.* Current Rate of Change

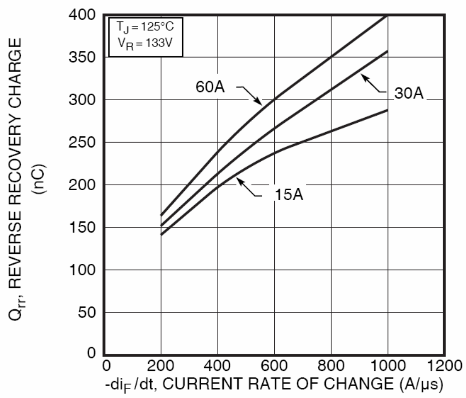


Figure 4. Reverse Recovery Charge *vs.* Current Rate of Change

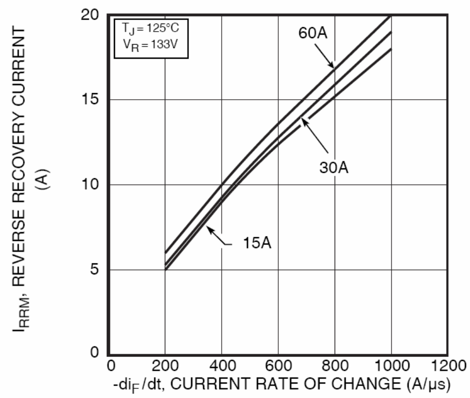


Figure 5. Reverse Recovery Current *vs.* Current Rate of Change

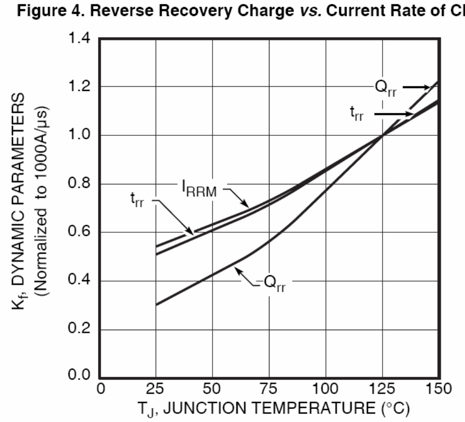


Figure 6. Dynamic Parameters *vs.* Junction Temperature

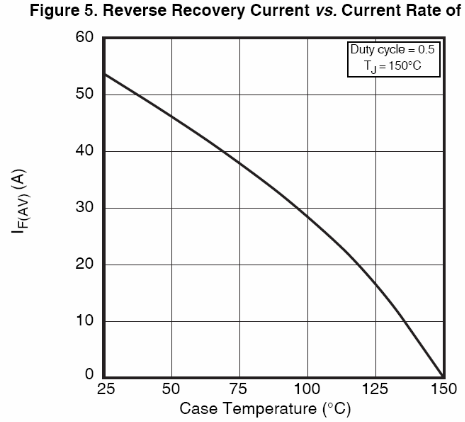


Figure 7. Maximum Average Forward Current *vs.* CaseTemperature

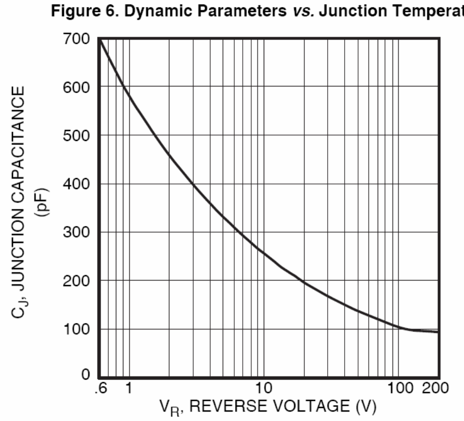


Figure 8. Junction Capacitance *vs.* Reverse Voltage

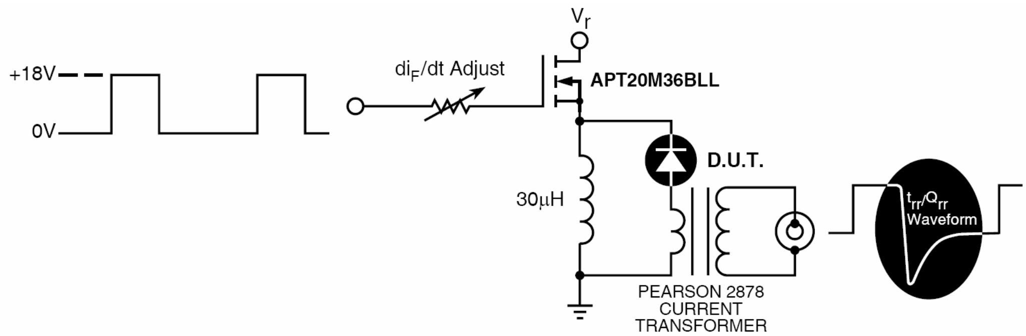


Figure 9. Diode Test Circuit

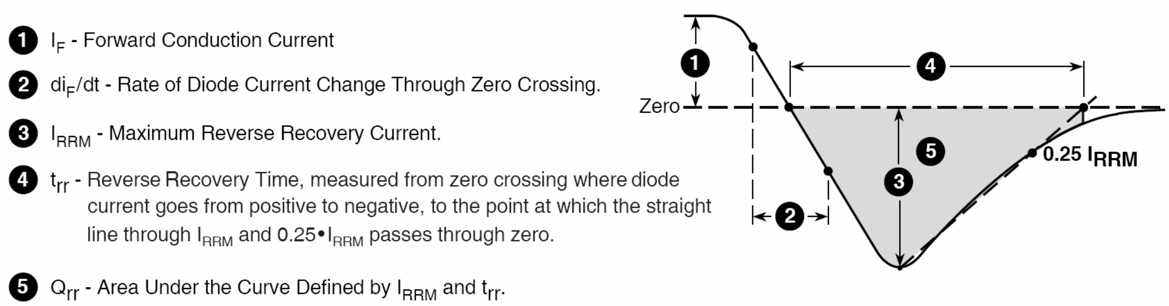
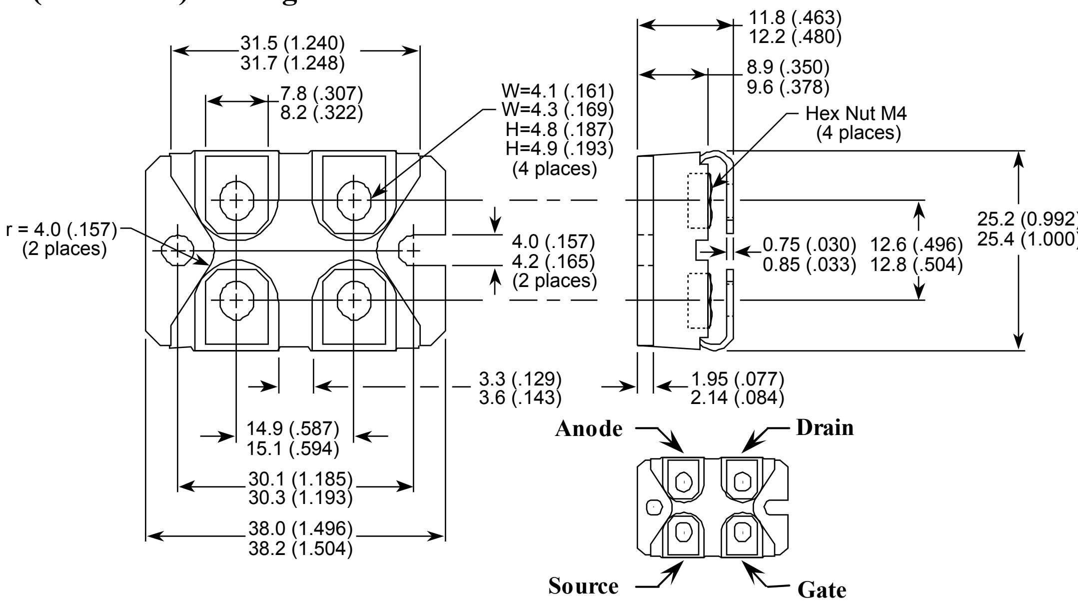


Figure 10, Diode Reverse Recovery Waveform and Definitions

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)