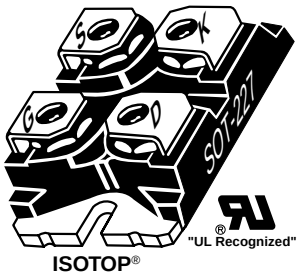
APT5010JLLU2

500V 44A 0.100Ω

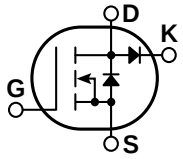
POWER MOS 7® MOSFET



ISOTOP®

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, Qg**
- **Increased Power Dissipation**
- **Easier To Drive**
- **PFC "Boost" Configuration**



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

Symbol	Parameter	APT5010JLL	UNIT
V_{DSS}	Drain-Source Voltage	500	Volts
I_D	Continuous Drain Current @ T_C = 25°C	44	Amps
I_{DM}	Pulsed Drain Current ①	176	
V_{GS}	Gate-Source Voltage Continuous	±30	Volts
V_{GSM}	Gate-Source Voltage Transient	±40	
P_D	Total Power Dissipation @ T_C = 25°C	446	Watts
	Linear Derating Factor	3.57	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 ① (Repetitive and Non-Repetitive)	44	Amps
E_{AR}	Repetitive Avalanche Energy ①	50	mJ
E_{AS}	Single Pulse Avalanche Energy ④	1600	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 250µA)	500			Volts
$I_{D(on)}$	On State Drain Current ② ($V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, V_{GS} = 10V)	44			Amps
$R_{DS(on)}$	Drain-Source On-State Resistance ② (V_{GS} = 10V, 22A)			0.100	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = 500V, V_{GS} = 0V)			100	µA
	Zero Gate Voltage Drain Current (V_{DS} = 400V, V_{GS} = 0V, T_C = 125°C)			500	
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.

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

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DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1 MHz		4360		pF
C_{oss}	Output Capacitance			894		
C_{rss}	Reverse Transfer Capacitance			60		
Q_g	Total Gate Charge ③	V_{GS} = 10V V_{DD} = 250V I_D = 44A @ 25°C		96		nC
Q_{gs}	Gate-Source Charge			24		
Q_{gd}	Gate-Drain ("Miller") Charge			49		
$t_{d(on)}$	Turn-on Delay Time	V_{GS} = 15V V_{DD} = 250V I_D = 44A @ 25°C R_G = 0.6Ω		11		ns
t_r	Rise Time			15		
$t_{d(off)}$	Turn-off Delay Time			25		
t_f	Fall Time			3		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			44	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)			176	
V_{SD}	Diode Forward Voltage ② (V_{GS} = 0V, I_S = -I_D44A)			1.3	Volts
t_{rr}	Reverse Recovery Time (I_S = -I_D44A, dI_S/dt = 100A/µs)		608		ns
Q_{rr}	Reverse Recovery Charge (I_S = -I_D44A, dI_S/dt = 100A/µs)		10.86		µC
dv/dt	Peak Diode Recovery dv/dt ⑤			8	V/ns

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.28	°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 = 1.65mH, R_G = 25Ω, Peak I_L = 44A

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \le -I_D$44A $di/dt \le$ 700A/µs $V_R \le V_{DSS}$ $T_J \le$ 150°C

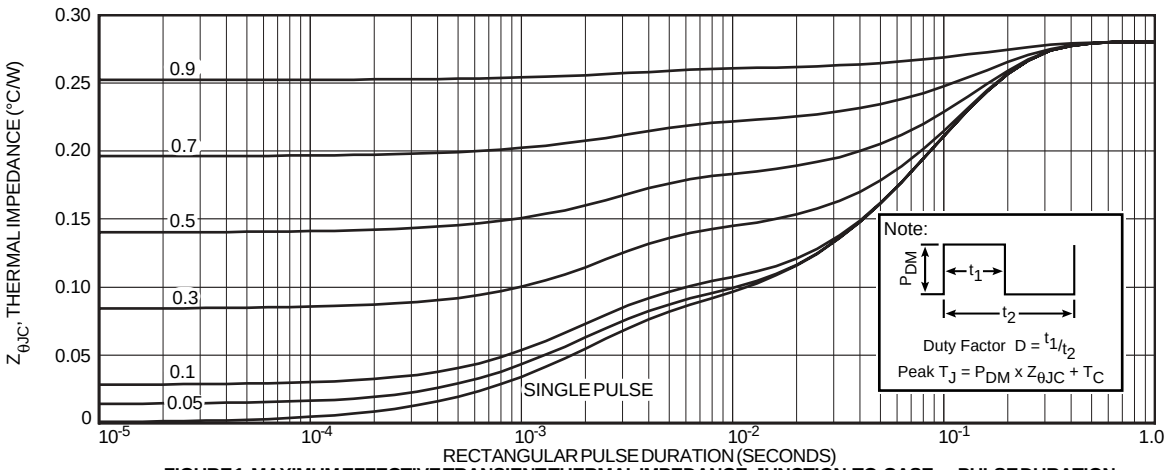

FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

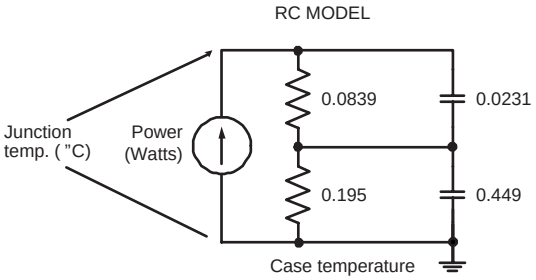

FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

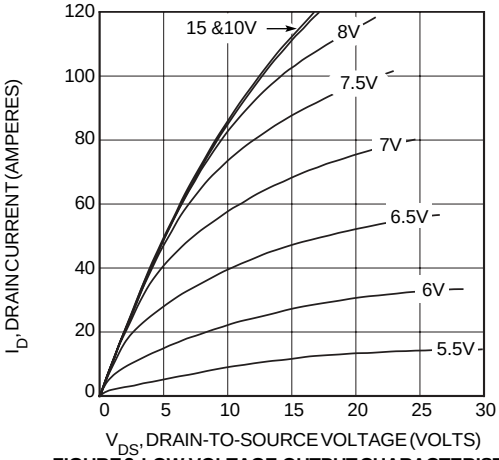

FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

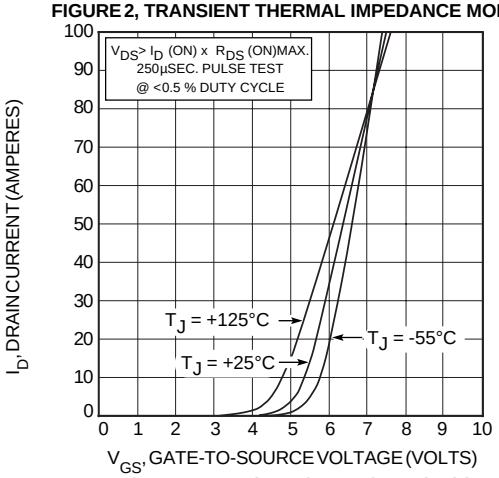

FIGURE 4, TRANSFER CHARACTERISTICS

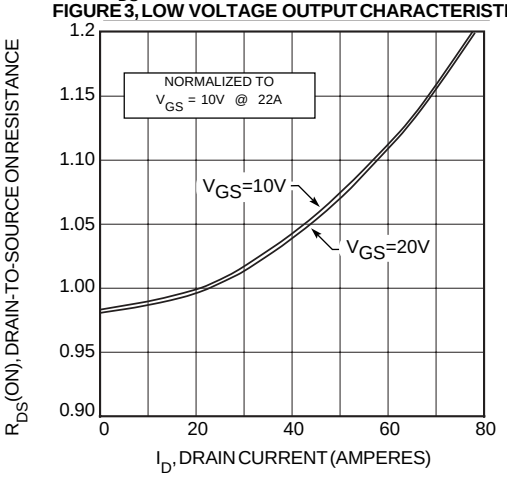

FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

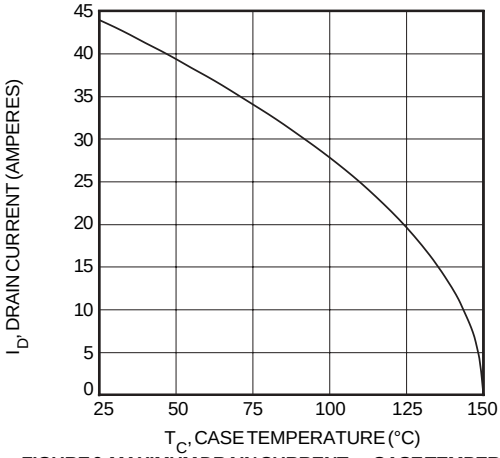

FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

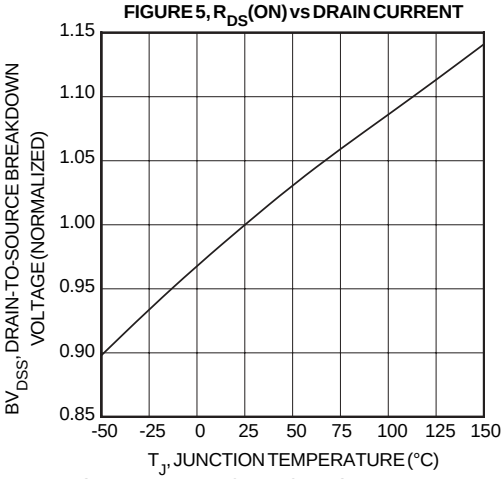

FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

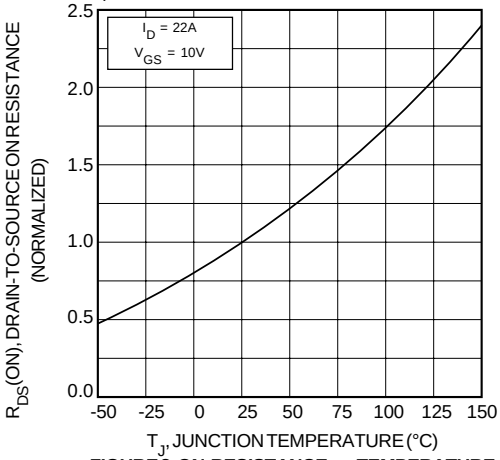

FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

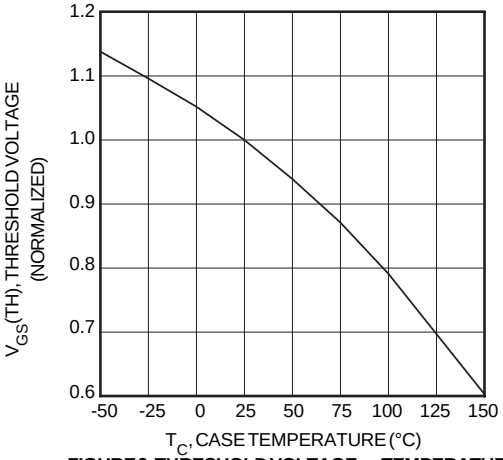

FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

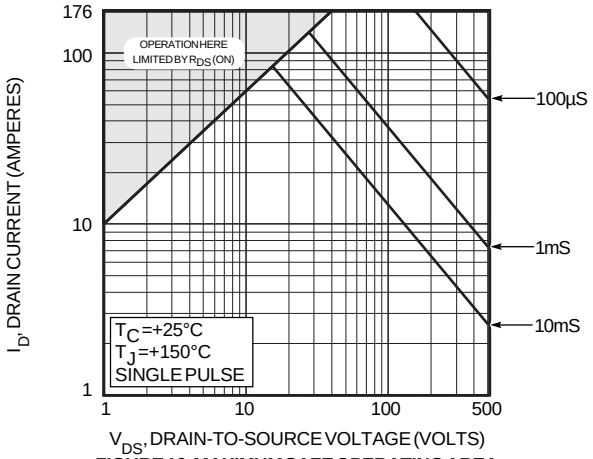

FIGURE 10, MAXIMUM SAFE OPERATING AREA

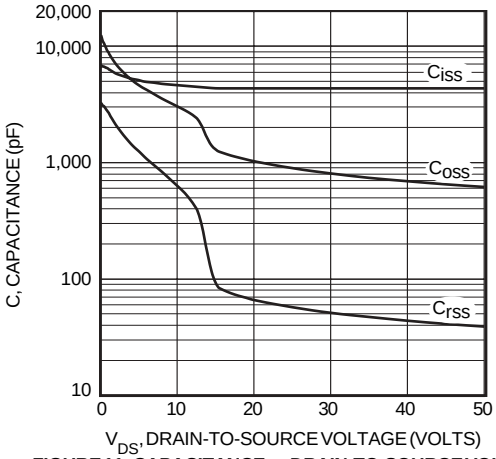

FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

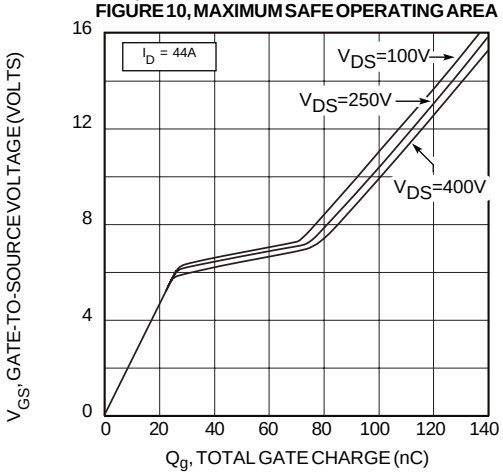

FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

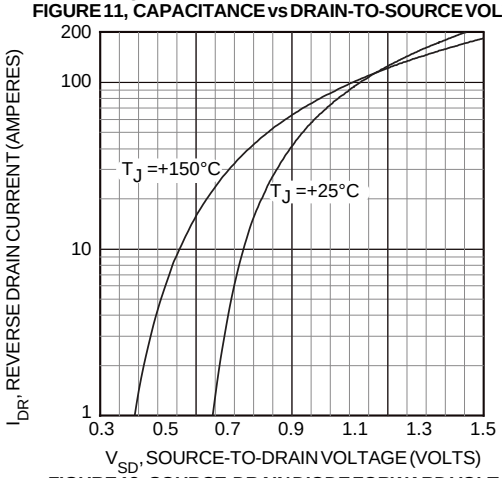

FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

$t_{d(on)}$ and $t_{d(off)}$ (ns)

E_{on} and E_{off} (µJ)

MAXIMUM RATINGS (UltraFast Recovery Diode) All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Characteristic / Test Conditions	APT5010JLLU2	UNIT
V_R	Maximum D.C. Reverse Voltage	600	Volts
V_{RRM}	Maximum Peak Repetitive Reverse Voltage		
V_{RWM}	Maximum Working Peak Reverse Voltage		
$I_F(AV)$	Maximum Average Forward Current (T_C = 80°C, Duty Cycle = 0.5)	30	Amps
$I_F(RMS)$	RMS Forward Current	60	
I_{FSM}	Non-Repetitive Forward Surge Current (T_J = 45°C, 8.3mS)	320	
T_J,T_{STG}	Operating and StorageTemperature Range	-55 to 150	°C
T_L	Lead Temperature: 0.063" from Case for 10 Sec.	300	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
V_F	Maximum Forward Voltage	I_F = 30A			1.8	Volts
		I_F = 60A		1.5		
		I_F = 30A, T_J = 150°C			1.6	
I_{RM}	Maximum Reverse Leakage Current	V_R = V_R Rated			250	µA
		V_R = V_R Rated, T_J = 125°C			500	
C_T	Junction Capacitance, V_R = 200V			40		pF

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DYNAMIC CHARACTERISTICS

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Symbol	Characteristic		MIN	TYP	MAX	UNIT
t_{rr1}	Reverse Recovery Time, I_F = 1.0A, di_F/dt = -15A/µS, V_R = 30V, T_J = 25°C			50	65	nS
t_{rr2}	Reverse Recovery Time	T_J = 25°C		50		
t_{rr3}	I_F = 30A, di_F/dt = -240A/µS, V_R = 350V	T_J = 100°C		80		
t_{fr1}	Forward Recovery Time	T_J = 25°C		155		
t_{fr2}	I_F = 30A, di_F/dt = 240A/µS, V_R = 350V	T_J = 100°C		155		
I_{RRM1}	Reverse Recovery Current	T_J = 25°C		4	10	Amps
I_{RRM2}	I_F = 30A, di_F/dt = -240A/µS, V_R = 350V	T_J = 100°C		7.5	15	
Q_{rr1}	Recovery Charge	T_J = 25°C		100		nC
Q_{rr2}	I_F = 30A, di_F/dt = -240A/µS, V_R = 350V	T_J = 100°C		300		
V_{fr1}	Forward Recovery Voltage	T_J = 25°C		5		Volts
V_{fr2}	I_F = 30A, di_F/dt = 240A/µS, V_R = 350V	T_J = 100°C		5		
diM/dt	Rate of Fall of Recovery Current	T_J = 25°C		400		A/µS
	I_F = 30A, di_F/dt = -240A/µS, V_R = 350V (See Figure 10)	T_J = 100°C		200		

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-Case Thermal Resistance			1.17	°C/W
$R_{\theta JA}$	Junction-to-Ambient Thermal Resistance			20	
W_T	Package Weight		1.03		oz.
			29.2		gm.

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

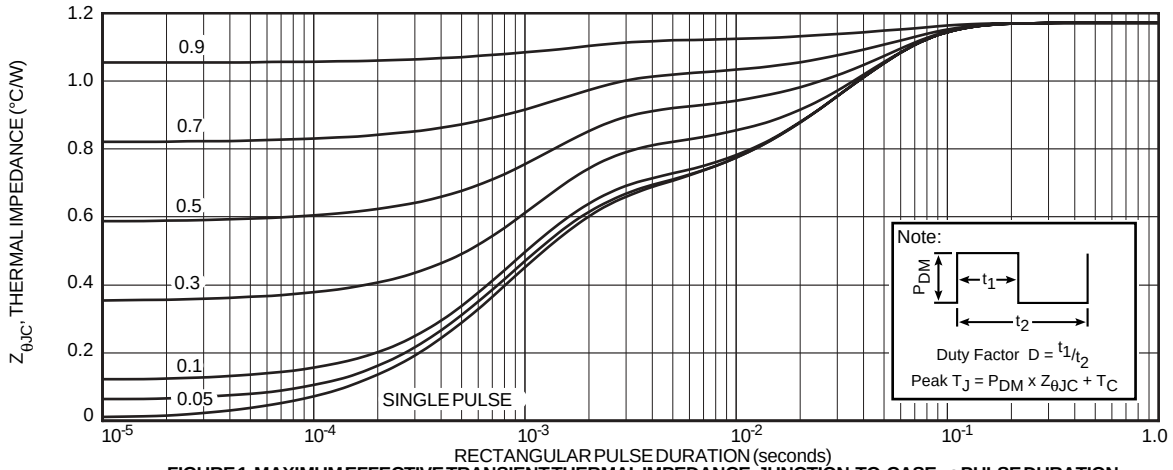


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

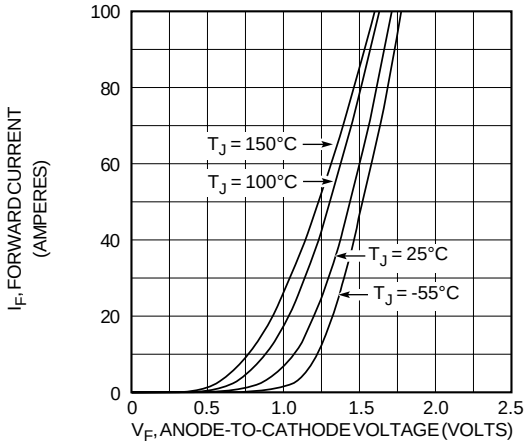


Figure 2, Forward Voltage Drop vs Forward Current

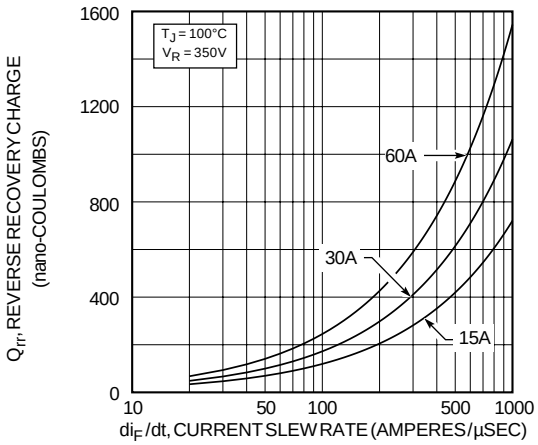


Figure 3, Reverse Recovery Charge vs Current Slew Rate

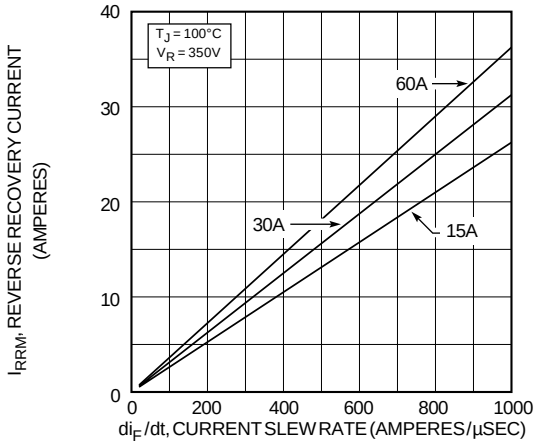


Figure 4, Reverse Recovery Current vs Current Slew Rate

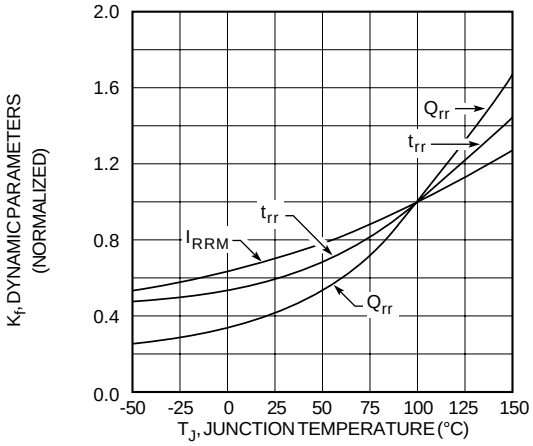


Figure 5, Dynamic Parameters vs Junction Temperature

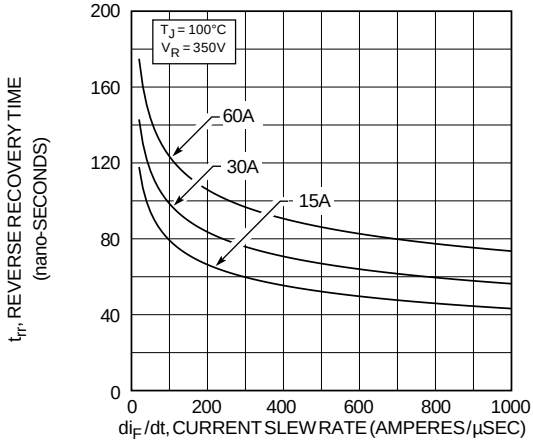


Figure 6, Reverse Recovery Time vs Current Slew Rate

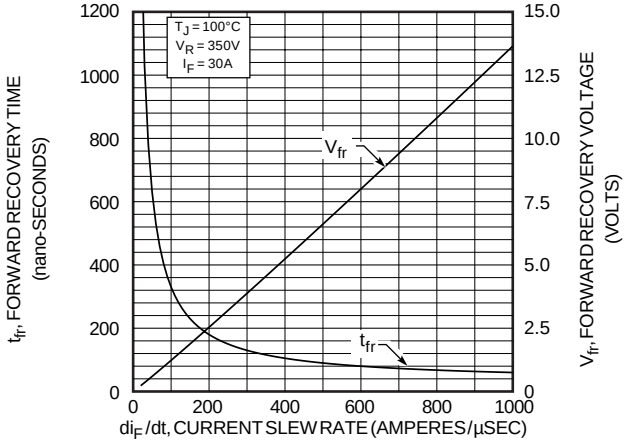


Figure 7, Forward Recovery Voltage/Time vs Current Slew Rate

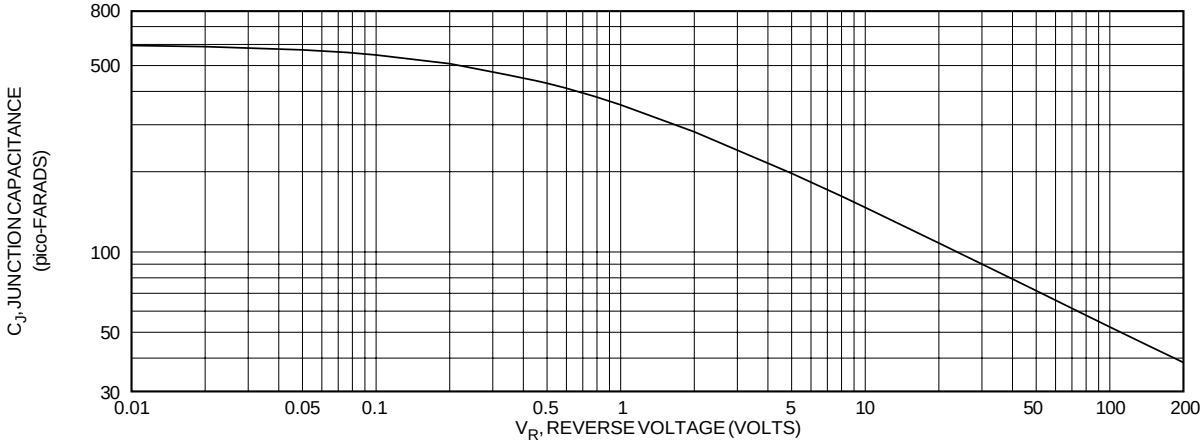


Figure 8, Junction Capacitance vs Reverse Voltage

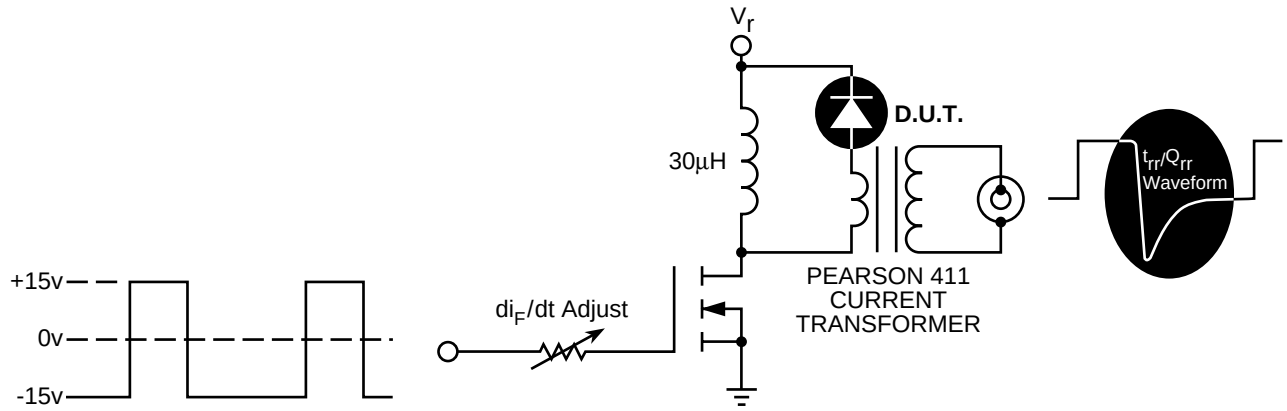


Figure 22, Diode Reverse Recovery Test Circuit and Waveforms

1. I_F - Forward Conduction Current
2. di_F/dt - Current Slew Rate, Rate of Forward Current Change Through Zero Crossing.
3. I_{RRM} - Peak Reverse Recovery Current.
4. t_{rr} - Reverse Recovery Time Measured from Point of I_F Current Falling Through Zero to a Tangent Line {6 diM/dt} Extrapolated Through Zero Defined by 0.75 and 0.50 I_{RRM}.
5. Q_{rr} - Area Under the Curve Defined by I_{RRM} and t_{rr}.
6. diM/dt - Maximum Rate of Current Change During the Trailing Portion of t_{rr}.

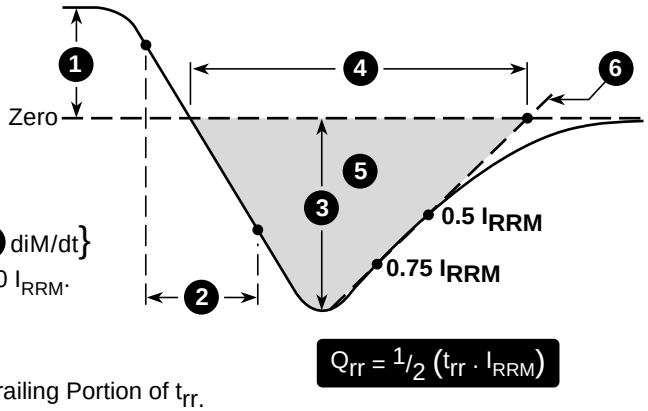
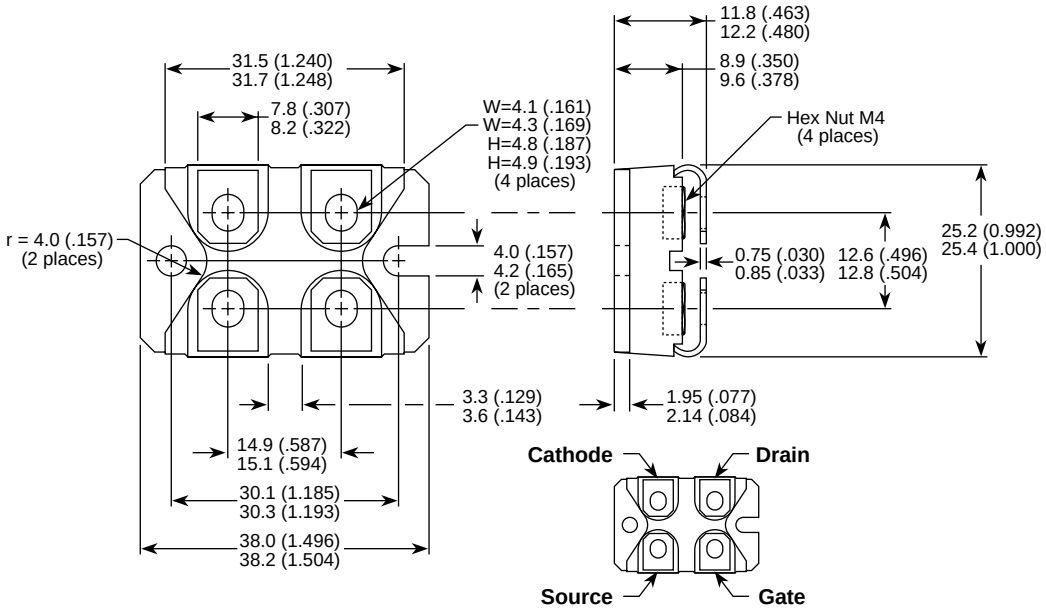


Figure 23, Diode Reverse Recovery Waveform and Definitions



Dimensions in Millimeters and (Inches)

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"UL Recognized" File No. E145592