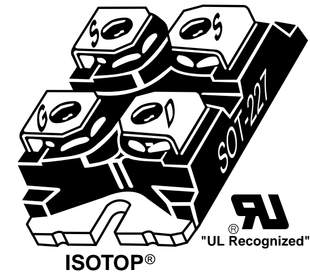
Microsemi. POWER PRODUCTS GROUP

APT50M85JVFR

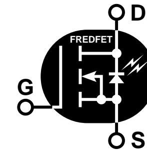
500V 50A 0.085Ω

POWER MOS V® **FREDFET**



Power MOS V® is a new generation of high voltage N-Channel enhancement mode power MOSFETs. This new technology minimizes the JFET effect, increases packing density and reduces the on-resistance. Power MOS V® also achieves faster switching speeds through optimized gate layout.

- **Fast Recovery Body Diode**
- **100% Avalanche Tested**
- **Lower Leakage**
- **Popular SOT-227 Package**
- **Faster Switching**



Unless stated otherwise, Microsemi discrete FREDFETs contain a single FREDFET die. This device is made with two parallel FREDFET die. It is intended for switch-mode operation. It is not suitable for linear mode operation.

MAXIMUM RATINGS

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

Symbol	Parameter	APT50M85JVFR	UNIT
V_{DSS}	Drain-Source Voltage	500	Volts
I_D	Continuous Drain Current @ T_C = 25°C	50	Amps
I_{DM}	Pulsed Drain Current ①	200	
V_{GS}	Gate-Source Voltage Continuous	±30	Volts
V_{GSM}	Gate-Source Voltage Transient	±40	
P_D	Total Power Dissipation @ T_C = 25°C	500	Watts
	Linear Derating Factor	4	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)	30	Amps
E_{AR}	Repetitive Avalanche Energy ①	30	mJ
E_{AS}	Single Pulse Avalanche Energy ④	1300	

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} > $I_{D(on)}$ x $R_{DS(on)}$ Max, V_{GS} = 10V)	50			Amps
$R_{DS(on)}$	Drain-Source On-State Resistance ② (V_{GS} = 10V, 0.5 $I_{D[Cont.]}$)			0.085	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = V_{DSS}, V_{GS} = 0V)			500	μA
	Zero Gate Voltage Drain Current (V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125°C)			2000	
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 = 1mA)	2		4	Volts

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V		9000	10800	pF
C_{oss}	Output Capacitance	V_{DS} = 25V		1240	1740	
C_{rss}	Reverse Transfer Capacitance	f = 1 MHz		500	750	
Q_g	Total Gate Charge ③	V_{GS} = 10V		390	535	nC
Q_{gs}	Gate-Source Charge	V_{DD} = 0.5 V_{DSS}		42	65	
Q_{gd}	Gate-Drain ("Miller") Charge	I_D = I_D [Cont.] @ 25°C		170	255	
t_d(on)	Turn-on Delay Time	V_{GS} = 15V		15	30	ns
t_r	Rise Time	V_{DD} = 0.5 V_{DSS}		17	34	
t_d(off)	Turn-off Delay Time	I_D = I_D [Cont.] @ 25°C		52	80	
t_f	Fall Time	R_G = 0.6Ω		7	14	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)				50	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)				200	
V_{SD}	Diode Forward Voltage ② (V_{GS} = 0V, I_S = -I_D [Cont.])				1.3	Volts
$^{dv}/_{dt}$	Peak Diode Recovery $^{dv}/_{dt}$ ⑤				5	V/ns
t_{rr}	Reverse Recovery Time (I_S = -I_D [Cont.], $^{di}/_{dt}$ = 100A/µs)	T_j = 25°C			300	ns
		T_j = 125°C			600	
Q_{rr}	Reverse Recovery Charge (I_S = -I_D [Cont.], $^{di}/_{dt}$ = 100A/µs)	T_j = 25°C		2.5		µC
		T_j = 125°C		8		
I_{RRM}	Peak Recovery Current (I_S = -I_D [Cont.], $^{di}/_{dt}$ = 100A/µs)	T_j = 25°C		16		Amps
		T_j = 125°C		28		

THERMAL/PACKAGE CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.25	°C/W
$R_{\theta JA}$	Junction to Ambient			40	
$V_{Isolation}$	RMS Voltage (50-60 Hz Sinusoidal Waveform From Terminals to Mounting Base for 1 Min.)	2500			Volts
Torque	Maximum Torque for Device Mounting Screws and Electrical Terminations.			13	lb•in

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 = 2.89mH, R_G = 25Ω, Peak I_L = 30A

⑤ I_S - -I_D [Cont.], $^{di}/_{dt}$ = 100A/µs, V_{DD} - V_{DSS}, T_j - 150°C, R_G = 2.0Ω, V_R = 200V

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

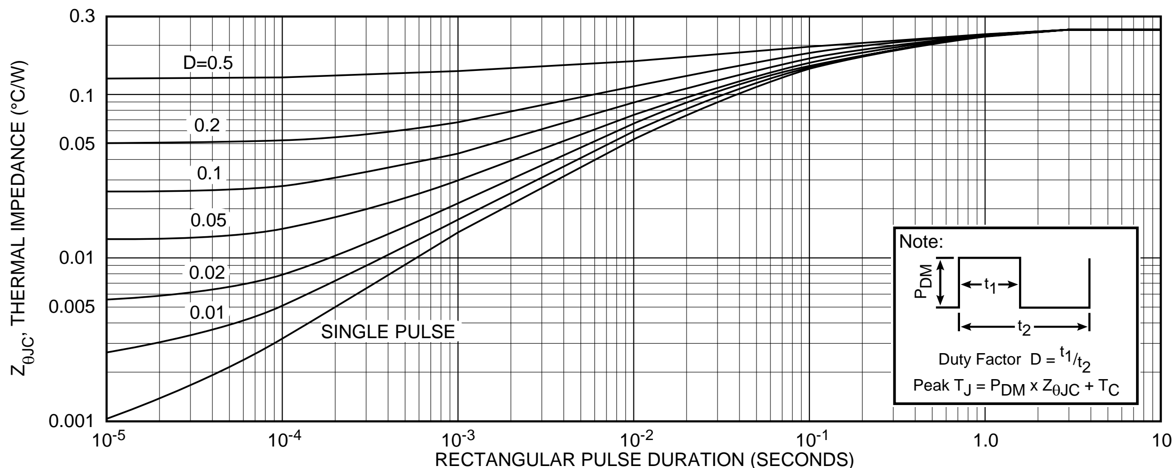

FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

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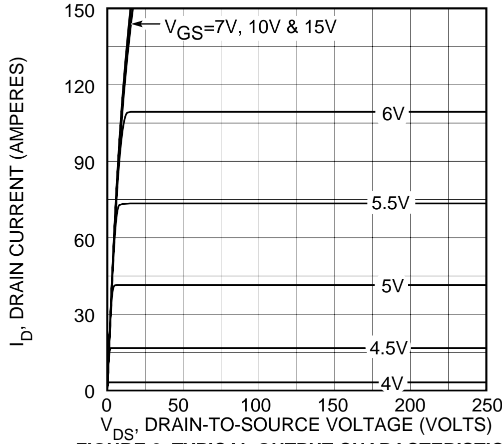

FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

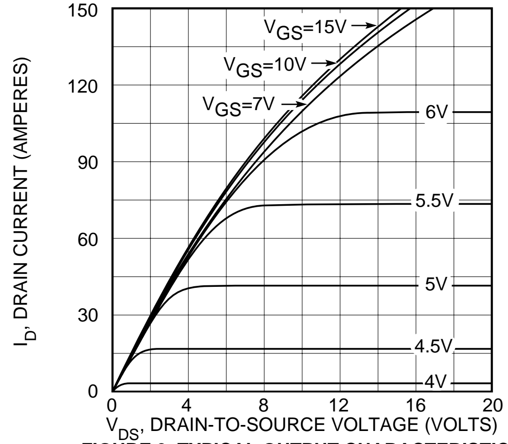

FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

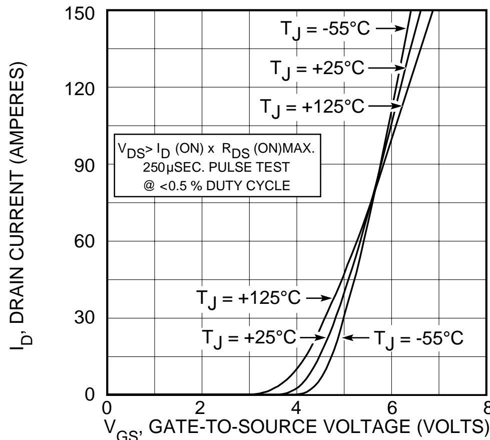

FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

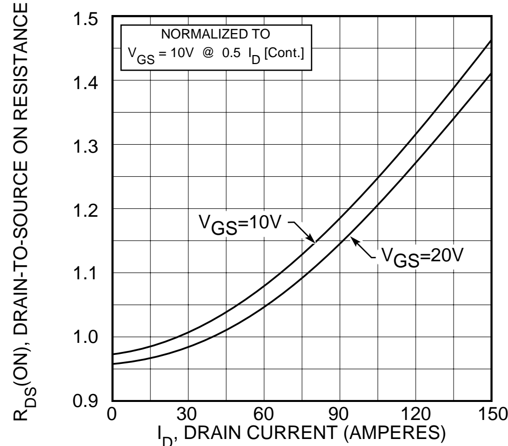

FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

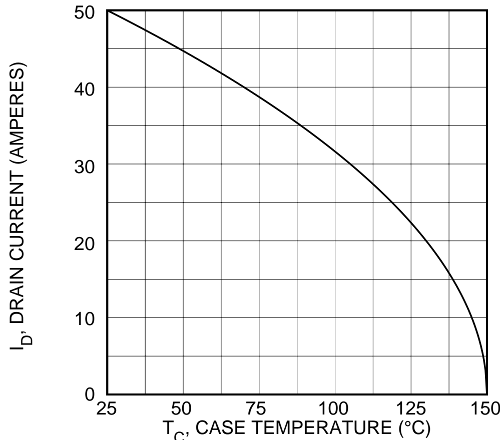

FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

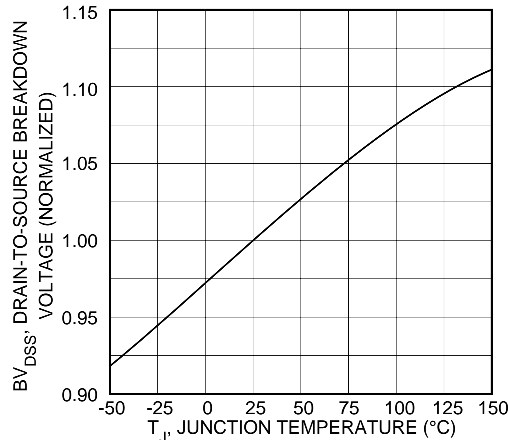

FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

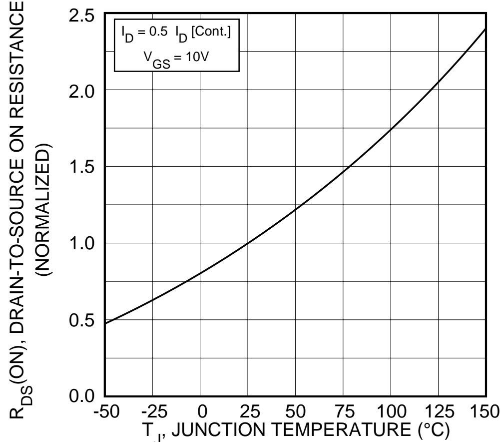

FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

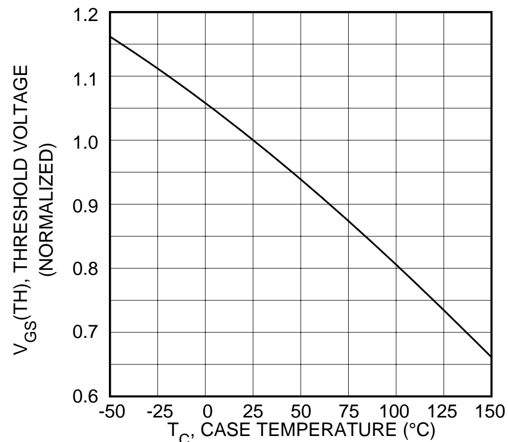

FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

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I_D, DRAIN CURRENT (AMPERES)

Graph removed

V_{DS}, DRAIN-TO-SOURCE VOLTAGE (VOLTS)

FIGURE 10, MAXIMUM SAFE OPERATING AREA

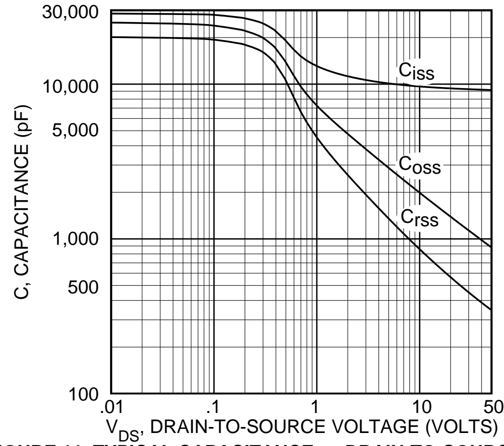


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

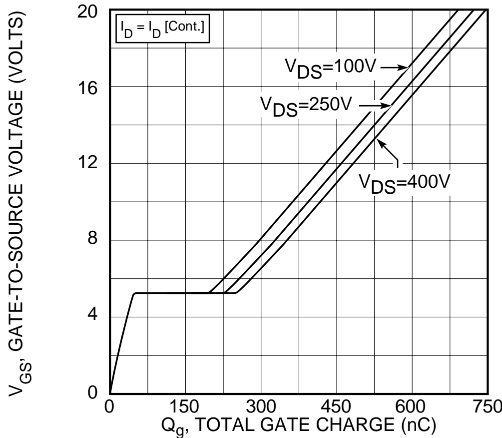


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

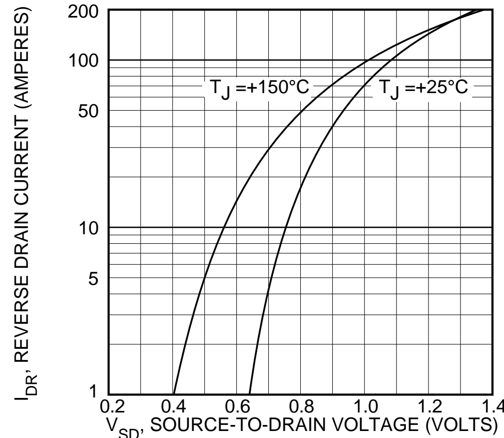
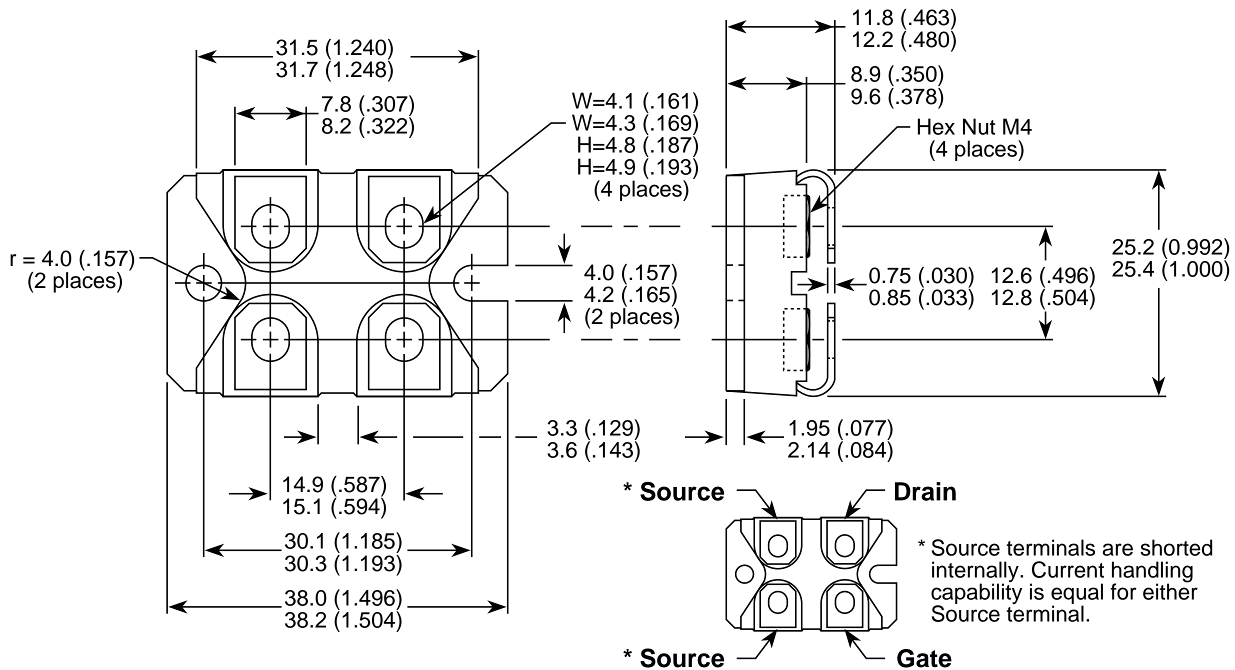


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

"UL Recognized" File No. E145592

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