



# APT14050JVFR

1400V 23A 0.500Ω

**POWER MOS V<sup>®</sup>**

**FREDFET**



Power MOS V<sup>®</sup> 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<sup>®</sup> also achieves faster switching speeds through optimized gate layout.

- Fast Recovery Body Diode
- Avalanche Energy Rated
- Lower Leakage
- Popular SOT-227 Package
- Faster Switching



### MAXIMUM RATINGS

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

Symbol	Parameter	APT14050JVFR	UNIT
$V_{DSS}$	Drain-Source Voltage	1400	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	23	Amps
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	92	
$V_{GS}$	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)	23	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 ( $V_{GS} = 0V, I_D = 250\mu\text{A}$ )	1400			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, I_D = 11.5A$ )			0.500	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 1400V, V_{GS} = 0V$ )			250	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 1120V, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			1000	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 5mA$ )	2		4	Volts

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

### DYNAMIC CHARACTERISTICS

APT14050JVFR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		13500		pF
$C_{oss}$	Output Capacitance			1150		
$C_{rss}$	Reverse Transfer Capacitance			600		
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 700V$ $I_D = 23A @ 25^\circ C$		820		nC
$Q_{gs}$	Gate-Source Charge			55		
$Q_{gd}$	Gate-Drain ("Miller") Charge			375		
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 700V$ $I_D = 23A @ 25^\circ C$ $R_G = 0.6\Omega$		20		ns
$t_r$	Rise Time			18		
$t_{d(off)}$	Turn-off Delay Time			110		
$t_f$	Fall Time			20		

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)			23	Amps
$I_{SM}$	Pulsed Source Current ① (Body Diode)			92	
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = I_D - 23A$ )			1.3	Volts
$dv/dt$	Peak Diode Recovery $dv/dt$ ⑤			18	V/ns
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D 23A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		300	ns
		$T_j = 125^\circ C$		600	
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -I_D 23A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		1.8	$\mu C$
		$T_j = 125^\circ C$		7.4	
$I_{FRM}$	Peak Recovery Current ( $I_S = -I_D 23A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		16	Amps
		$T_j = 125^\circ C$		30	

### THERMAL/PACKAGE 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	
$V_{Isolation}$	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			10	lb•in

① Repetitive Rating: Pulse width limited by maximum junction temperature

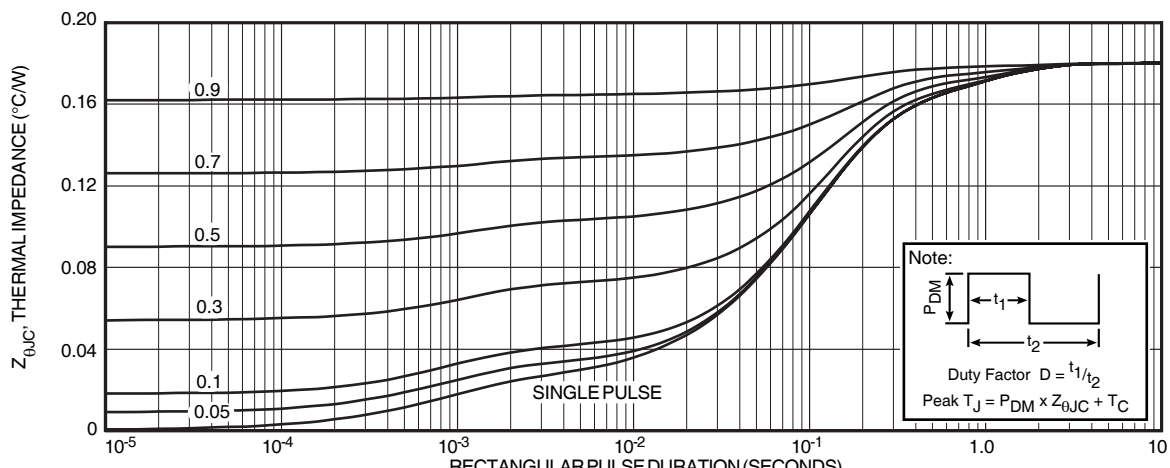
② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting  $T_j = +25^\circ C$ ,  $L = 13.61mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 23A$

⑤  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_D 23A$   $di/dt \leq 700A/\mu s$   $v_R \leq 1400$   $T_j \leq 150^\circ C$

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



# Typical Performance Curves

APT14050JVFR

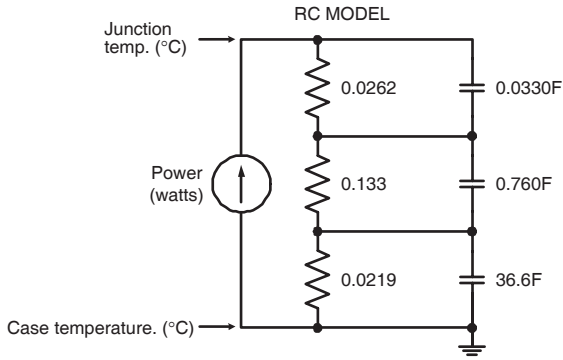


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

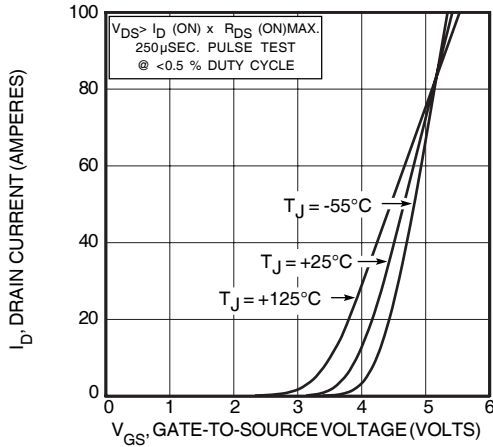


FIGURE 4, TRANSFER CHARACTERISTICS

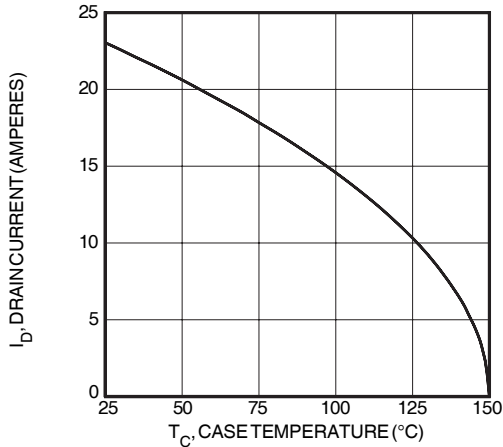


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

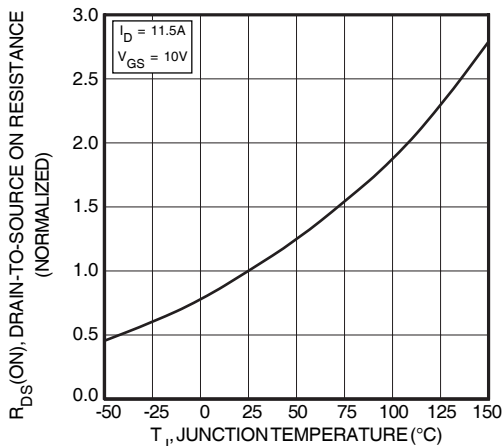


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE



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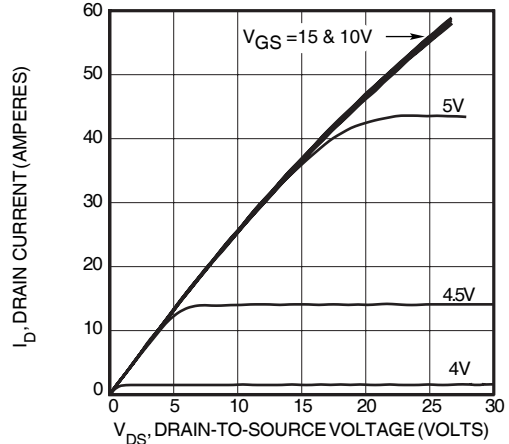


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

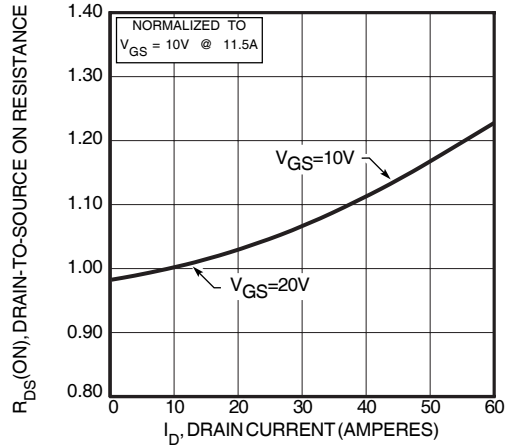


FIGURE 5,  $R_{DS}(ON)$  vs DRAIN CURRENT

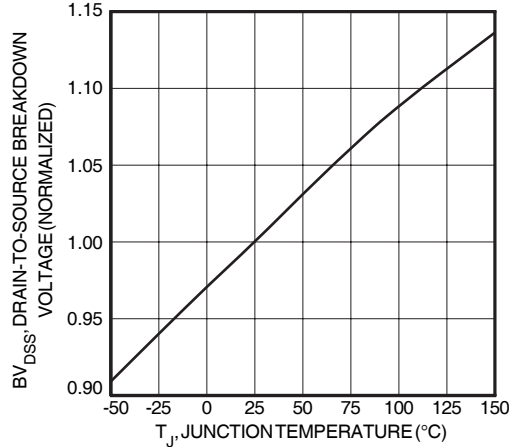


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

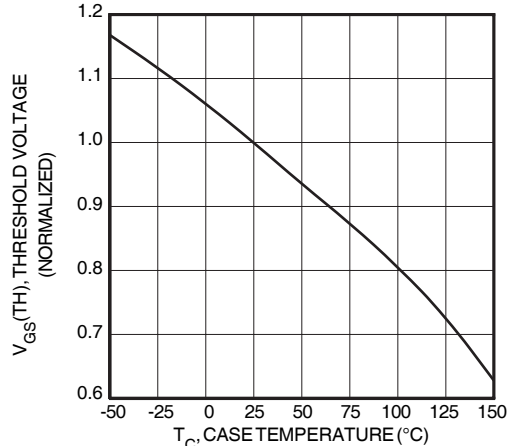


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

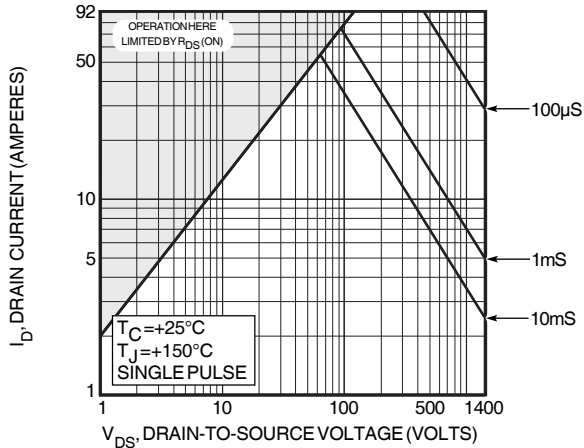


FIGURE 10, MAXIMUM SAFE OPERATING AREA

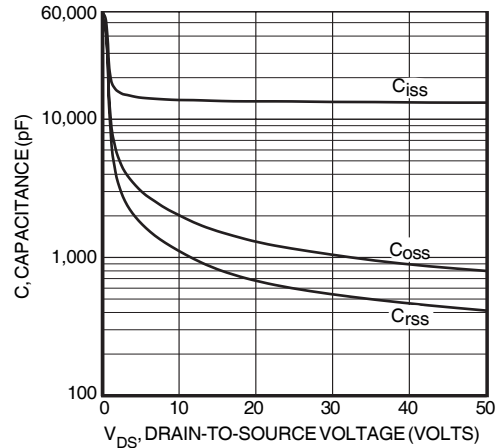


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

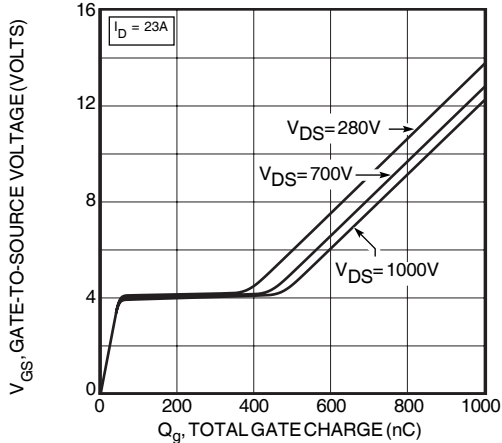


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

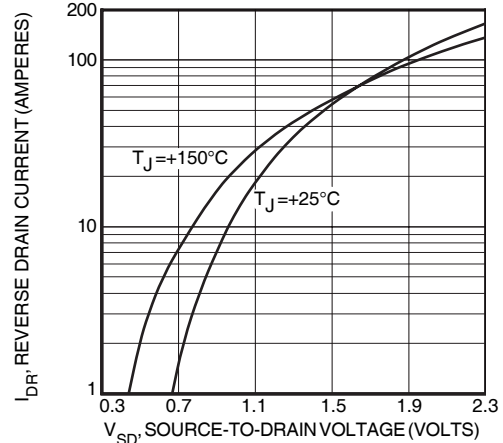
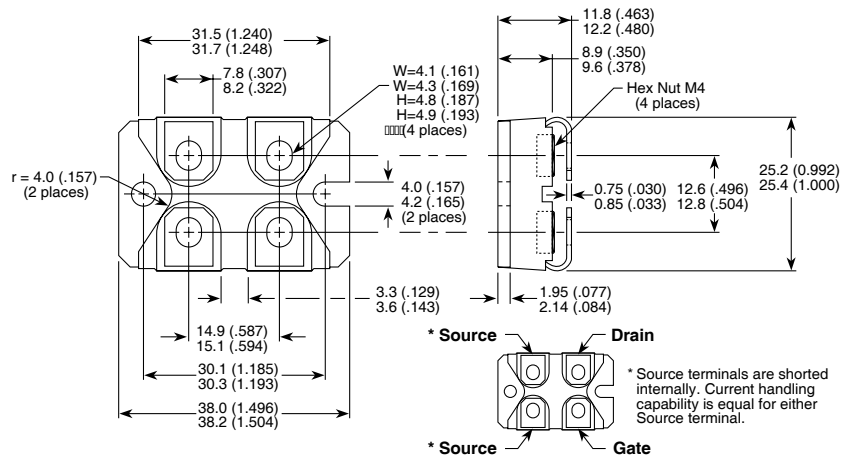


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)