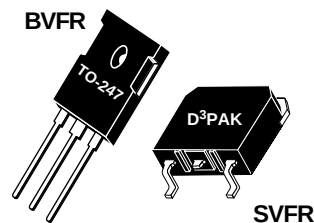


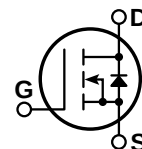
POWER MOS V®

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.



- Faster Switching
- Lower Leakage
- Fast Recovery Body Diode
- Avalanche Energy Rated
- TO-247 or Surface Mount D³Pak



MAXIMUM RATINGS

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

Symbol	Parameter	APT4020B_SVFR(G)	UNIT
V_{DSS}	Drain-Source Voltage	400	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	23	Amps
I_{DM}	Pulsed Drain Current ^①	92	
V_{GS}	Gate-Source Voltage Continuous	±30	Volts
V_{GSM}	Gate-Source Voltage Transient	±40	
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	250	Watts
	Linear Derating Factor	2	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)	23	Amps
E_{AR}	Repetitive Avalanche Energy ^①	30	mJ
E_{AS}	Single Pulse Avalanche Energy ^④	960	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu A$)	400			Volts
$I_{D(on)}$	On State Drain Current ^② ($V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$)	23			Amps
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, 11.5A$)			0.20	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 400V, V_{GS} = 0V$)			250	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 320V, V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			1000	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 1.0mA$)	2		4	Volts

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

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

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		2650		pF
C_{oss}	Output Capacitance			400		
C_{rss}	Reverse Transfer Capacitance			180		
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 200V$ $I_D = 23A @ 25^\circ C$		120		nC
Q_{gs}	Gate-Source Charge			16		
Q_{gd}	Gate-Drain ("Miller") Charge			60		
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 200V$ $I_D = 23A @ 25^\circ C$ $R_G = 1.6\Omega$		10		ns
t_r	Rise Time			11		
$t_{d(off)}$	Turn-off Delay Time			38		
t_f	Fall Time			7		

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 ($V_{GS} = 0V$, $I_S = -23A$)			1.3	Volts
dv/dt	Peak Diode Recovery dv/dt ⑤			15	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -23A$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		?	ns
		$T_j = 125^\circ C$		?	
Q_{rr}	Reverse Recovery Charge ($I_S = -23A$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ C$	?		μC
		$T_j = 125^\circ C$	?		
I_{RRM}	Peak Recovery Current ($I_S = -23A$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ C$	?		Amps
		$T_j = 125^\circ C$	?		

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.50	$^\circ C/W$
$R_{\theta JA}$	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 $T_j = +25^\circ C$, $L = 3.63mH$, $R_G = 25\Omega$, Peak $I_L = 23A$

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_{B[Cont.]}$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_j \leq 150^\circ C$

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

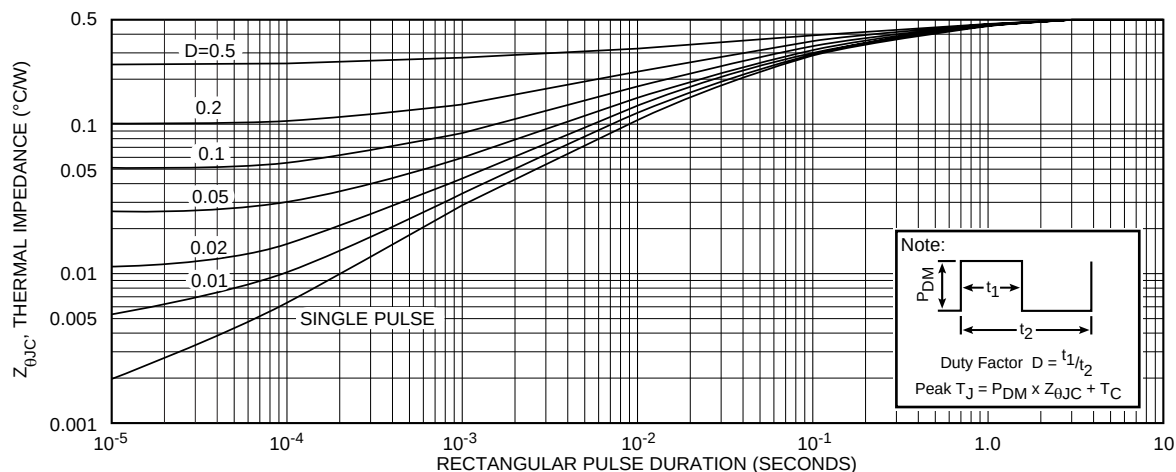


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

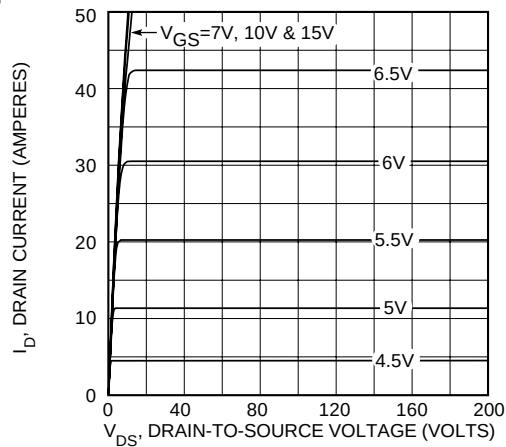


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

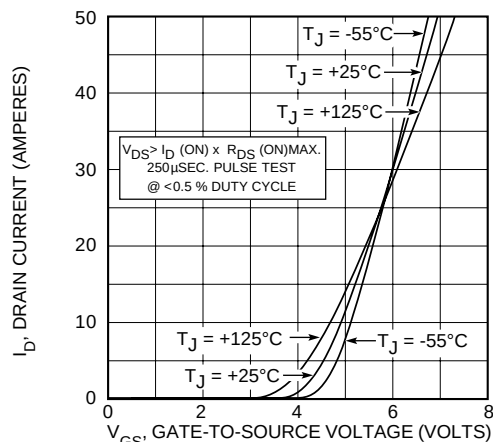


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

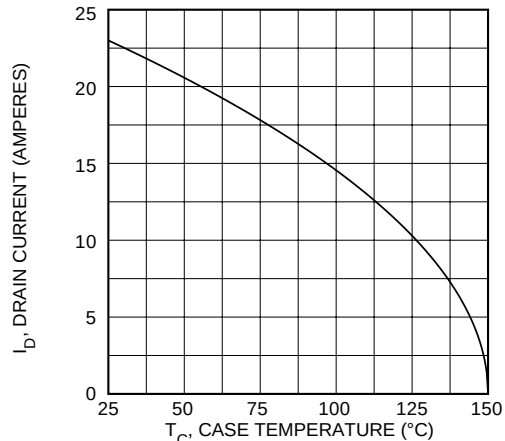


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

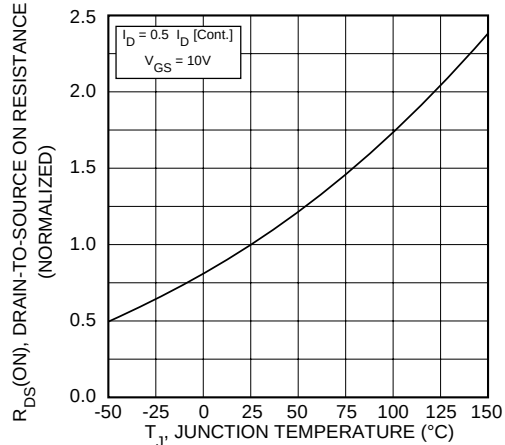


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

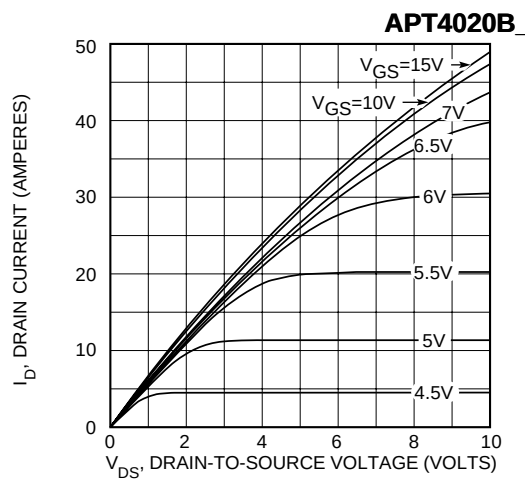


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

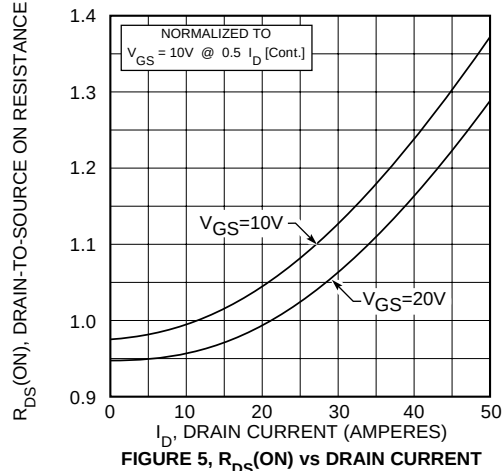


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

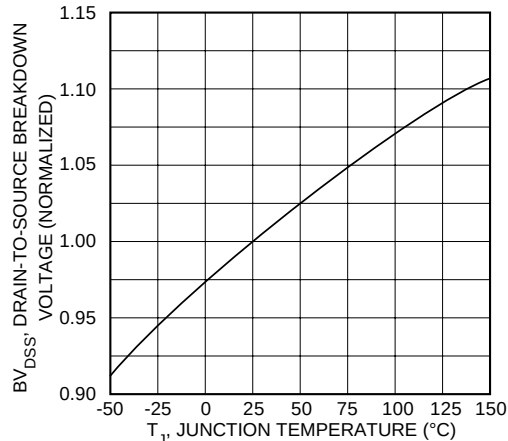


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

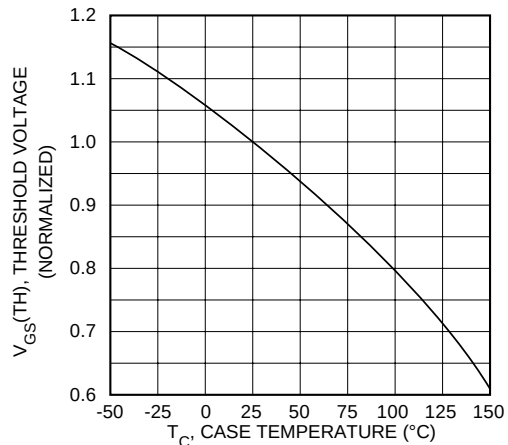


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

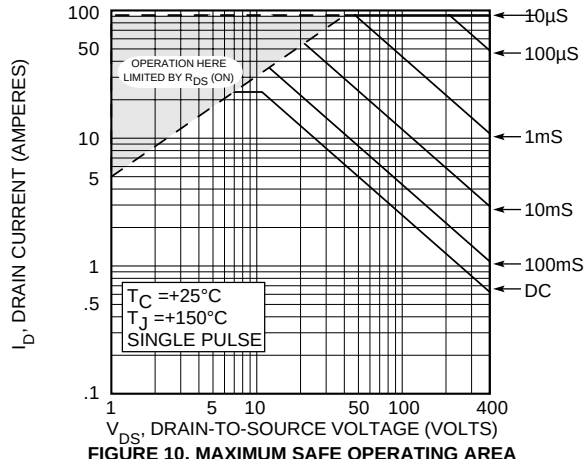


FIGURE 10, MAXIMUM SAFE OPERATING AREA

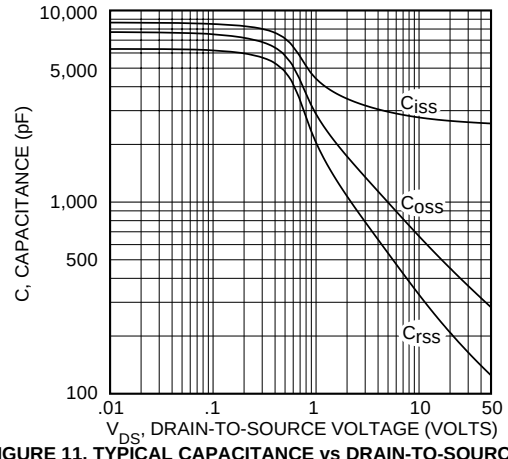


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

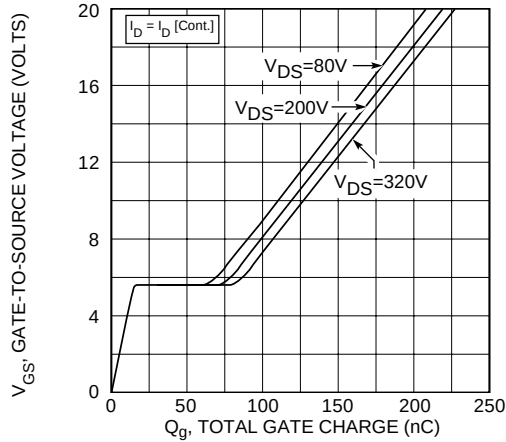


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

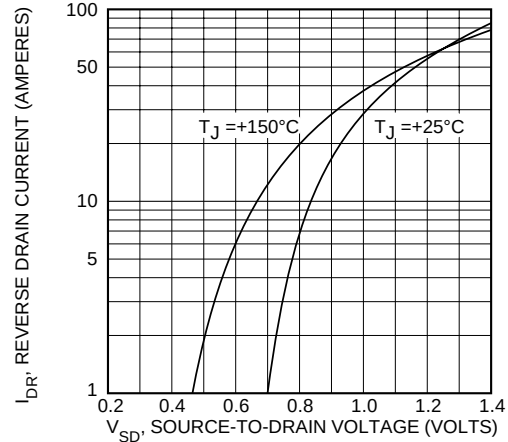
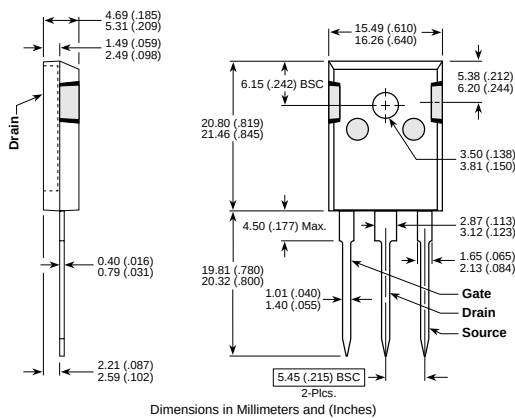


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

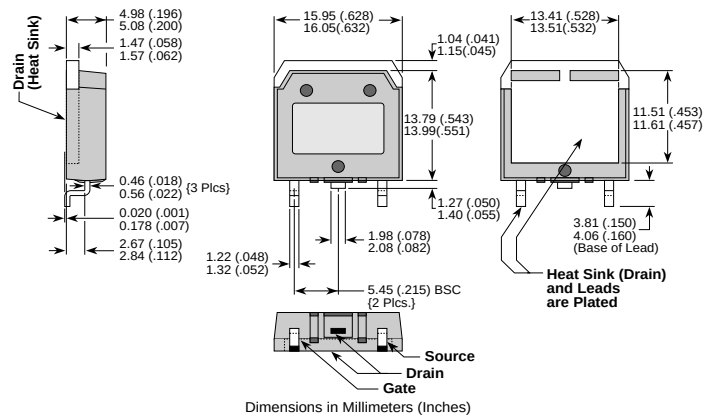
TO-247 (BVFR) Package Outline

e1 SAC: Tin, Silver, Copper



D³PAK (SVFR) Package Outline

e3 100% Sn



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