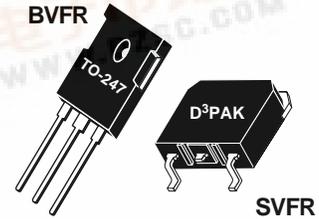




400V 23A 0.20Ω
 APT4020BVFR APT4020SVFR
 APT4020BVFRG* APT4020SVFRG*

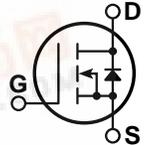
*G Denotes RoHS Compliant, Pb Free Terminal Finish.

POWER MOS V[®]



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°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°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°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 = 250μA)	400			Volts
I _{D(on)}	On State Drain Current ^② (V _{DS} > I _{D(on)} × 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)			25	μA
	Zero Gate Voltage Drain Current (V _{DS} = 320V V _{DSS} , V _{GS} = 0V, T _C = 125°C)			250	
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 = 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>

DYNAMIC CHARACTERISTICS

APT4020B_SVFR(G)

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 25V f = 1 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°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°C R _G = 1.6Ω		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/μs)	T _j = 25°C		?	ns
		T _j = 125°C		?	
Q _{rr}	Reverse Recovery Charge (I _S = -23A, di/dt = 100A/μs)	T _j = 25°C		?	μC
		T _j = 125°C		?	
I _{RRM}	Peak Recovery Current (I _S = -23A, di/dt = 100A/μs)	T _j = 25°C		?	Amps
		T _j = 125°C		?	

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
R _{θJC}	Junction to Case			0.50	°C/W
R _{θJA}	Junction to Ambient			40	

① Repetitive Rating: Pulse width limited by maximum junction temperature.

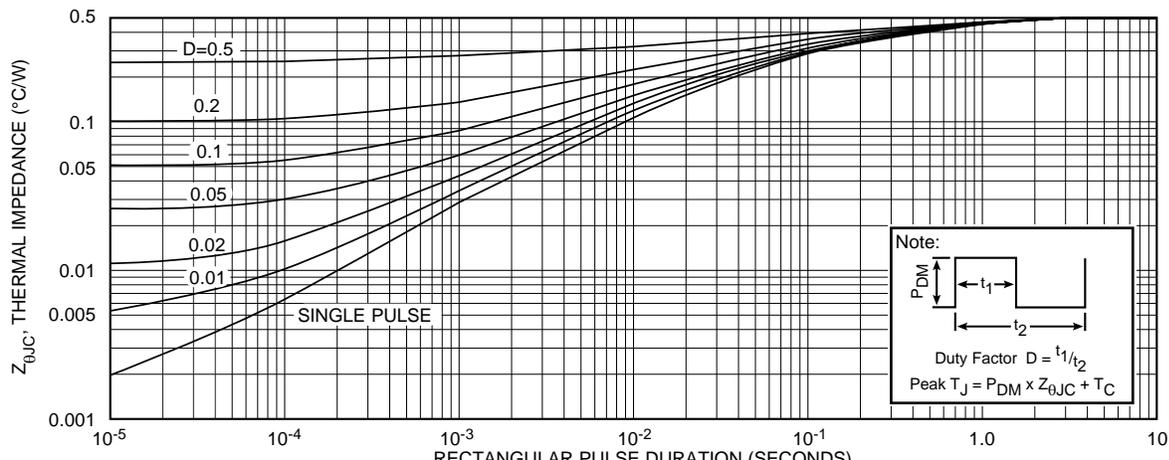
② Pulse Test: Pulse width < 380 μs, Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting T_j = +25°C, L = 3.63mH, R_G = 25Ω, Peak I_L = 23A

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. I_S ≤ -I_{D[Cont.]} di/dt ≤ 700A/μs V_R ≤ V_{DSS} T_J ≤ 150°C

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



Typical Performance Curves

APT4020B_SVFR(G)

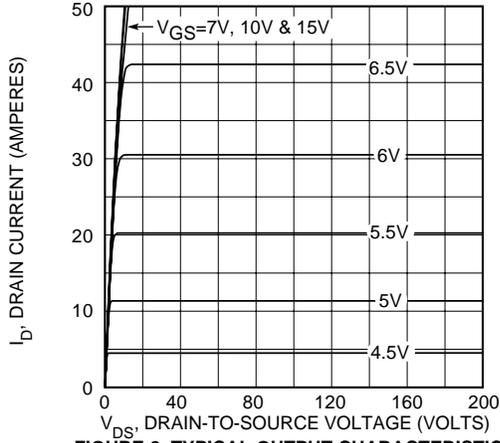


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

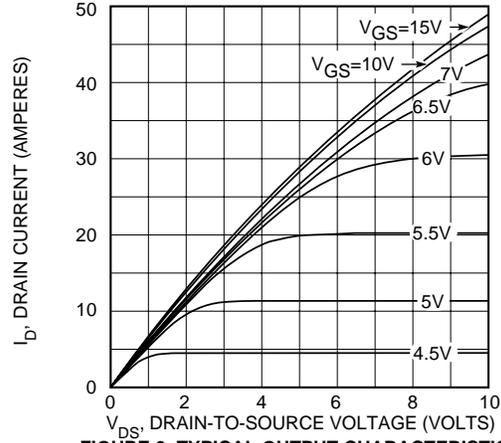


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

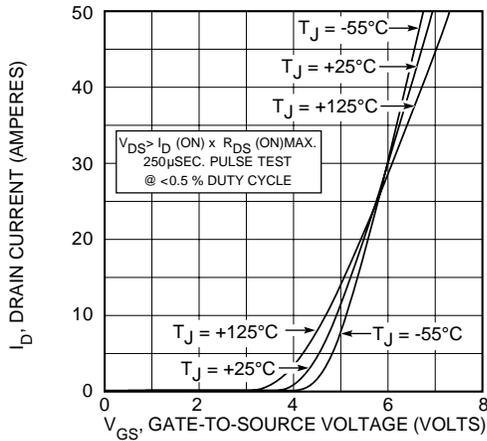


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

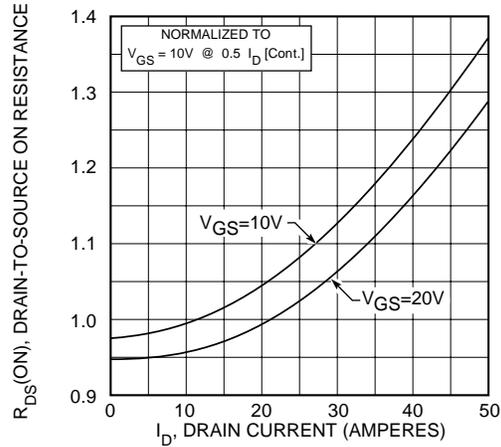


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

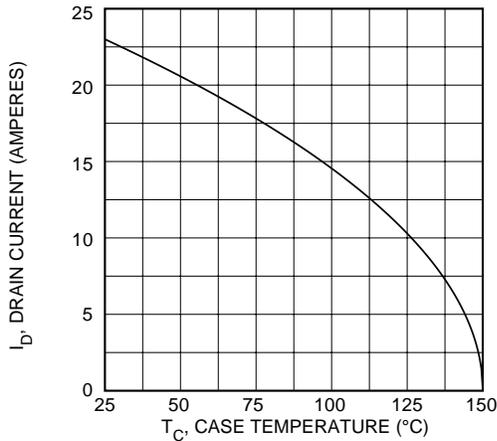


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

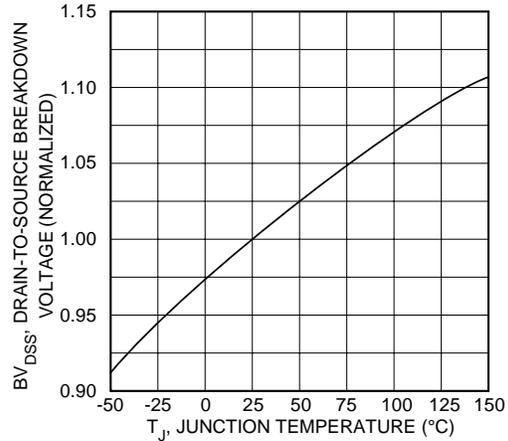


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

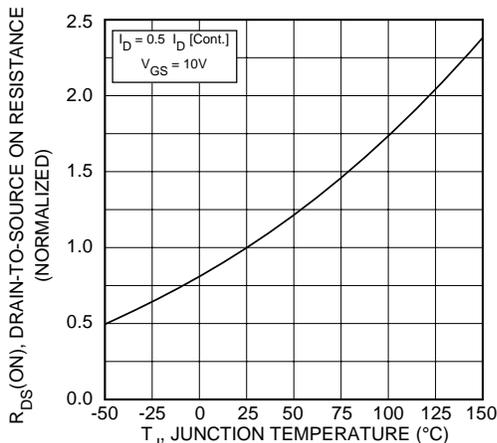


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

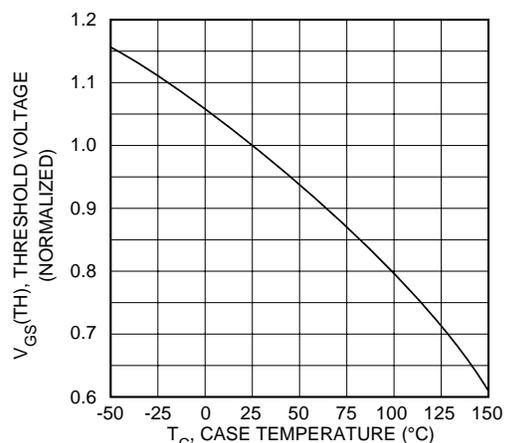


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

APT4020B_SVFR(G)

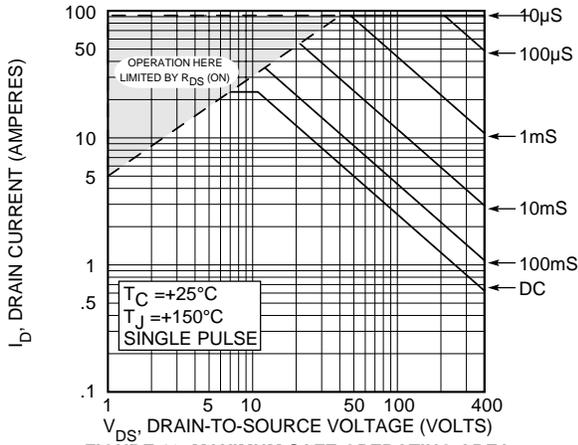


FIGURE 10, MAXIMUM SAFE OPERATING AREA

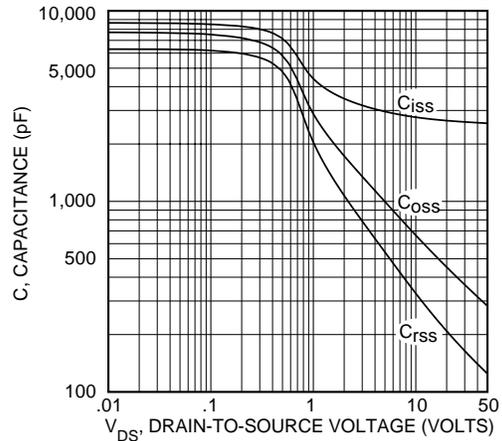


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

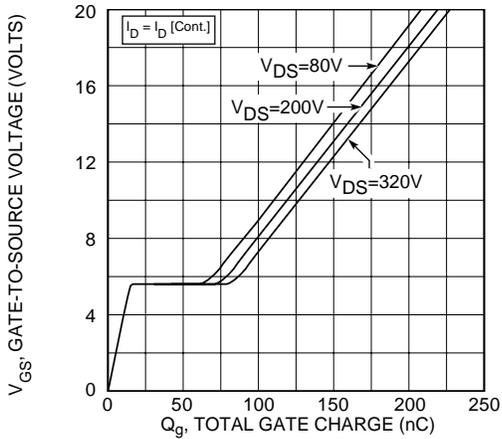


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

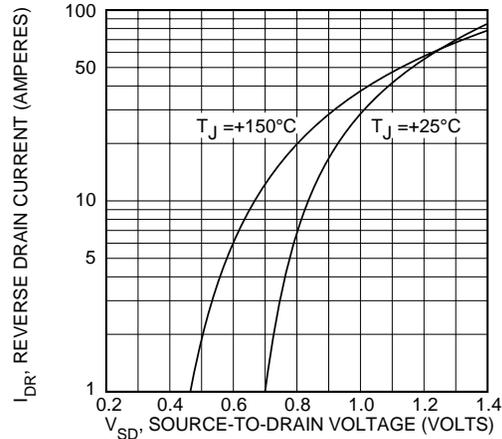
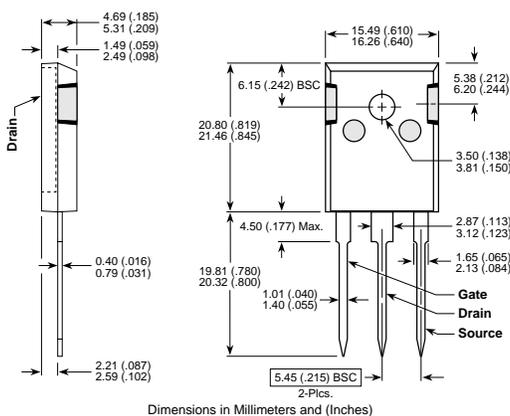


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247 (BVFR) Package Outline

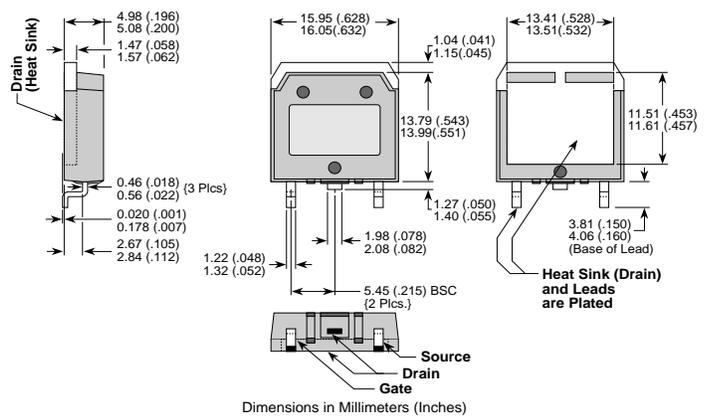
e1 SAC: Tin, Silver, Copper



Dimensions in Millimeters and (Inches)

D³PAK (SVFR) Package Outline

e3 100% Sn



Dimensions in Millimeters (Inches)