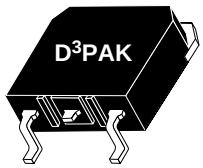
# APT20M45SVFR(G)

*G Denotes RoHS Compliant, Pb Free Terminal Finish.

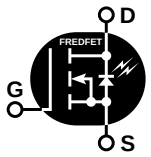
**200V 56A 0.045Ω**

## 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**
- **Surface Mount D³PAK Package**
- **Faster Switching**




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

| Symbol | Parameter | APT20M45SVFR(G) | UNIT |
|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 200 | Volts |
| $I_D$ | Continuous Drain Current @ $T_C$ = 25°C | 56 | Amps |
| $I_{DM}$ | Pulsed Drain Current ① | 224 | |
| $V_{GS}$ | Gate-Source Voltage Continuous | ±30 | Volts |
| $V_{GSM}$ | Gate-Source Voltage Transient | ±40 | |
| $P_D$ | Total Power Dissipation @ $T_C$ = 25°C | 300 | Watts |
| | Linear Derating Factor | 2.4 | 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) | 56 | 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) | 200 | | | Volts |
| $I_{D(on)}$ | On State Drain Current ② ($V_{DS}$ > $I_{D(on)}$ x $R_{DS(on)}$ Max, $V_{GS}$ = 10V) | 56 | | | Amps |
| $R_{DS(on)}$ | Drain-Source On-State Resistance ② ($V_{GS}$ = 10V, 0.5 $I_{D[Cont.]}$) | | | 0.045 | Ohms |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{DS}$ = $V_{DSS}$, $V_{GS}$ = 0V) | | | 250 | μA |
| | Zero Gate Voltage Drain Current ($V_{DS}$ = 0.8 $V_{DSS}$, $V_{GS}$ = 0V, $T_C$ = 125°C) | | | 1000 | |
| $I_{GSS}$ | 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*

**USA**
**405 S.W. Columbia Street** **Bend, Oregon 97702-1035** **Phone: (541) 382-8028** **FAX: (541) 388-0364**
**EUROPE**
**Avenue J.F. Kennedy Bât B4 Parc Cadéra Nord** **F-33700 Merignac - France** **Phone: (33) 5 57 92 15 15** **FAX: (33) 5 56 47 97 61**


050-5568 Rev B

## DYNAMIC CHARACTERISTICS

**APT20M45SVFR(G)**

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V | | 4050 | 4860 | pF |
| $C_{oss}$ | Output Capacitance | $V_{DS}$ = 25V | | 980 | 1375 | |
| $C_{rss}$ | Reverse Transfer Capacitance | f = 1 MHz | | 300 | 450 | |
| $Q_g$ | Total Gate Charge ③ | $V_{GS}$ = 10V | | 130 | 195 | nC |
| $Q_{gs}$ | Gate-Source Charge | $V_{DD}$ = 0.5 $V_{DSS}$ | | 30 | 45 | |
| $Q_{gd}$ | Gate-Drain ("Miller") Charge | $I_D$ = $I_D$ [Cont.] @ 25°C | | 55 | 80 | |
| $t_d(on)$ | Turn-on Delay Time | $V_{GS}$ = 15V | | 12 | 24 | ns |
| $t_r$ | Rise Time | $V_{DD}$ = 0.5 $V_{DSS}$ | | 14 | 28 | |
| $t_d(off)$ | Turn-off Delay Time | $I_D$ = $I_D$ [Cont.] @ 25°C | | 43 | 70 | |
| $t_f$ | Fall Time | $R_G$ = 1.6Ω | | 7 | 14 | |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | | | | 56 | Amps |
| $I_{SM}$ | Pulsed Source Current ① (Body Diode) | | | | 224 | |
| $V_{SD}$ | 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 | | | 200 | ns |
| | | $T_j$ = 125°C | | | 300 | |
| $Q_{rr}$ | Reverse Recovery Charge ($I_S$ = -$I_D$ [Cont.], $^{di}/_{dt}$ = 100A/µs) | $T_j$ = 25°C | | 0.7 | | µC |
| | | $T_j$ = 125°C | | 2.4 | | |
| $I_{RRM}$ | Peak Recovery Current ($I_S$ = -$I_D$ [Cont.], $^{di}/_{dt}$ = 100A/µs) | $T_j$ = 25°C | | 10 | | Amps |
| | | $T_j$ = 125°C | | 18 | | |

## THERMAL CHARACTERISTICS

| Symbol | Characteristic | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction to Case | | | 0.42 | °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 = 0.83mH, $R_G$ = 25Ω, Peak $I_L$ = 56A

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

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

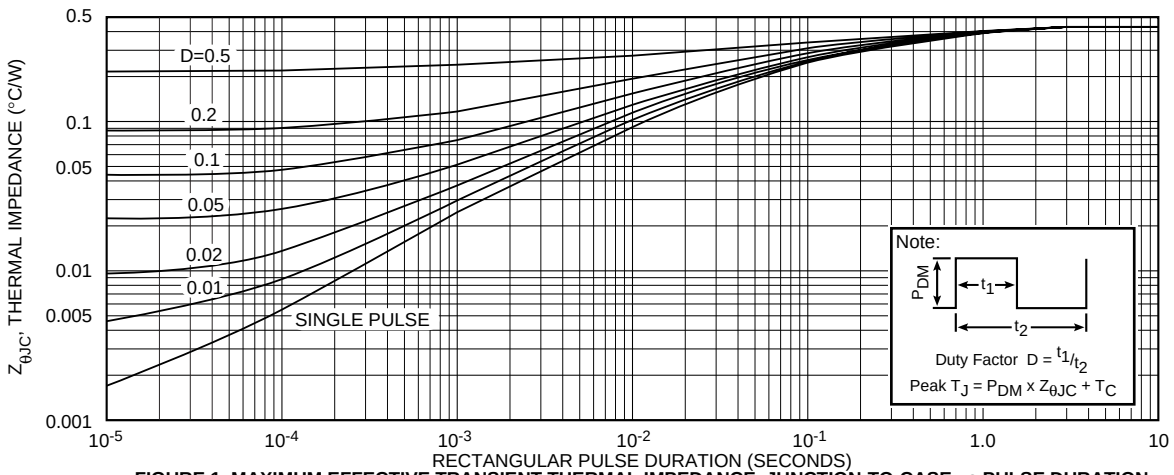



**FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION**

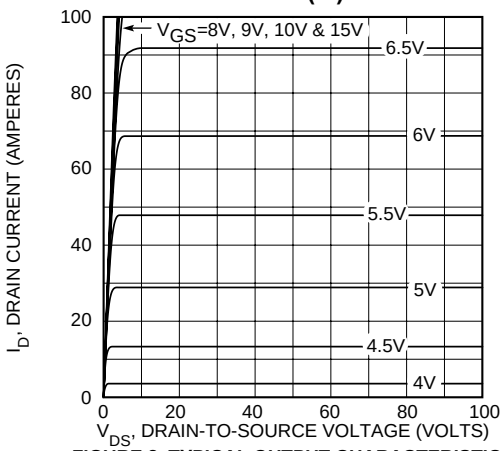



**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**

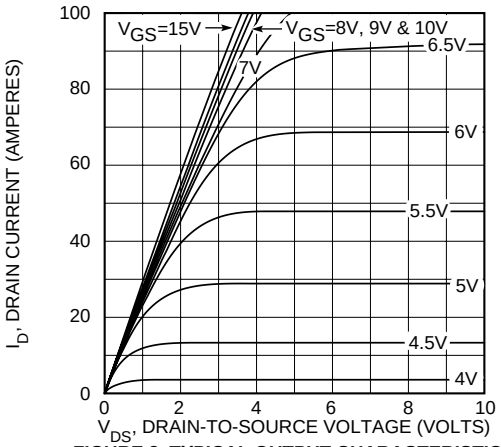



**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**

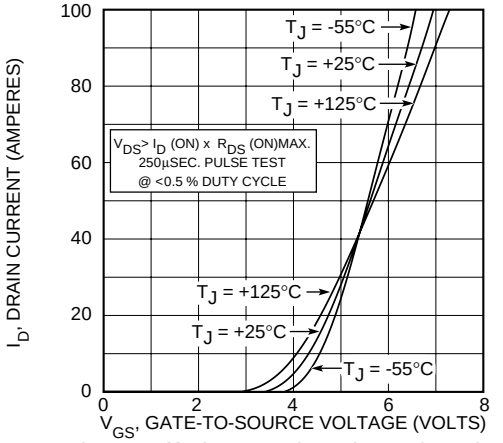



**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**

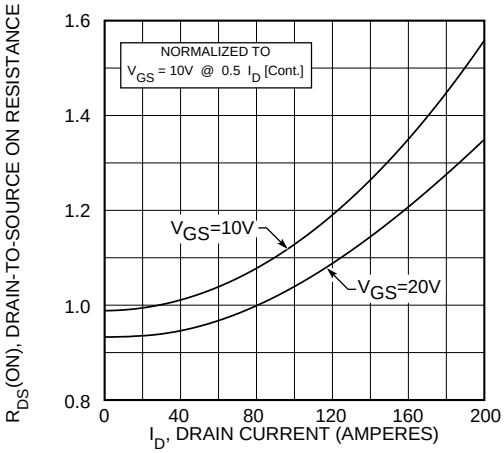



**FIGURE 5, $R_{DS}$(ON) vs DRAIN CURRENT**

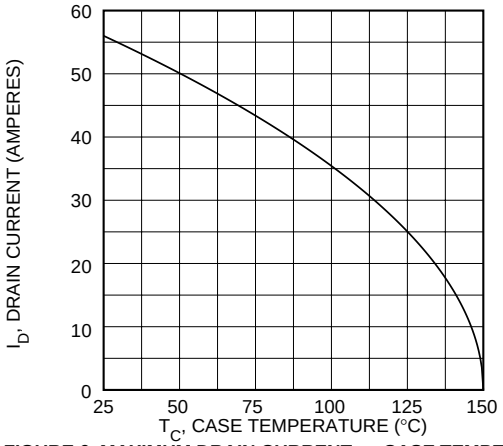



**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**

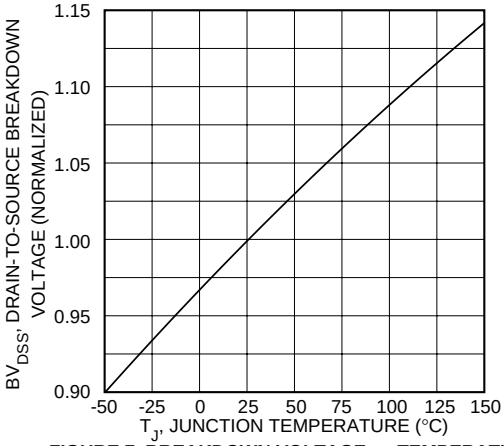



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**

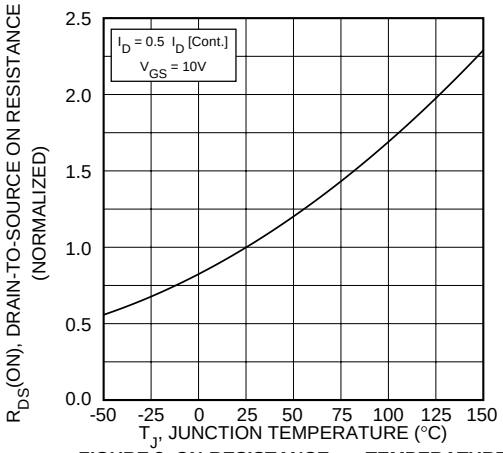



**FIGURE 8, ON-RESISTANCE vs. TEMPERATURE**

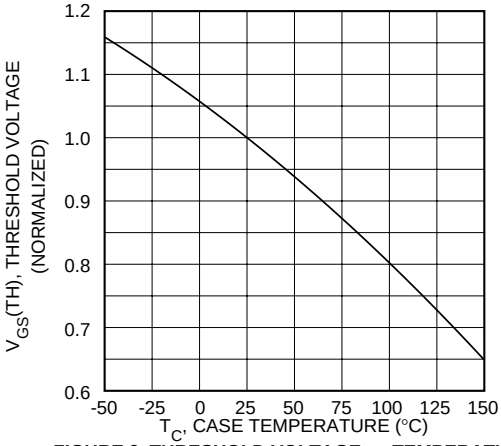



**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

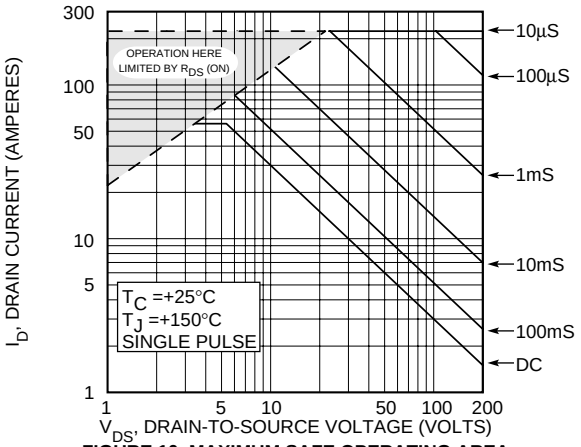



**FIGURE 10, MAXIMUM SAFE OPERATING AREA**

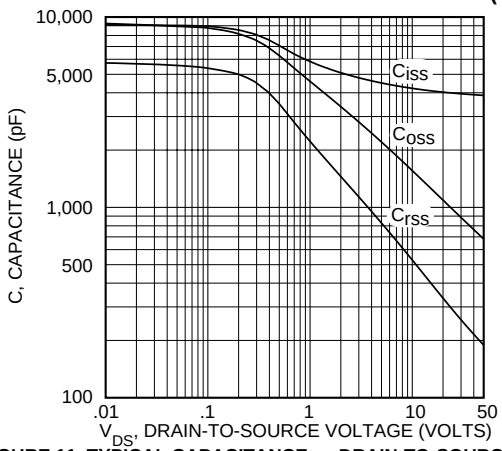



**FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE**

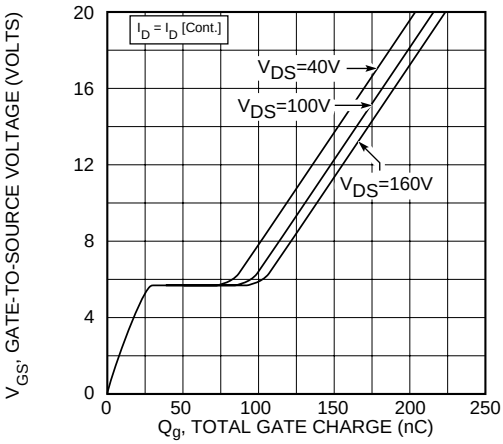



**FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE**

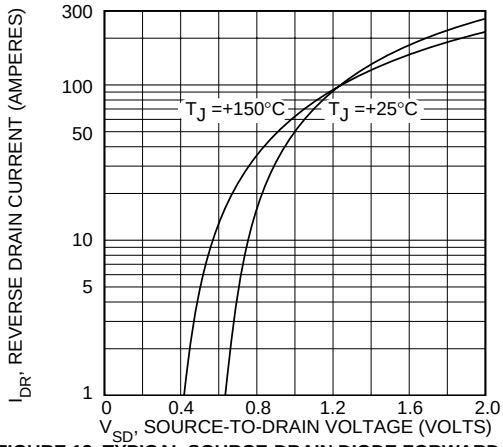
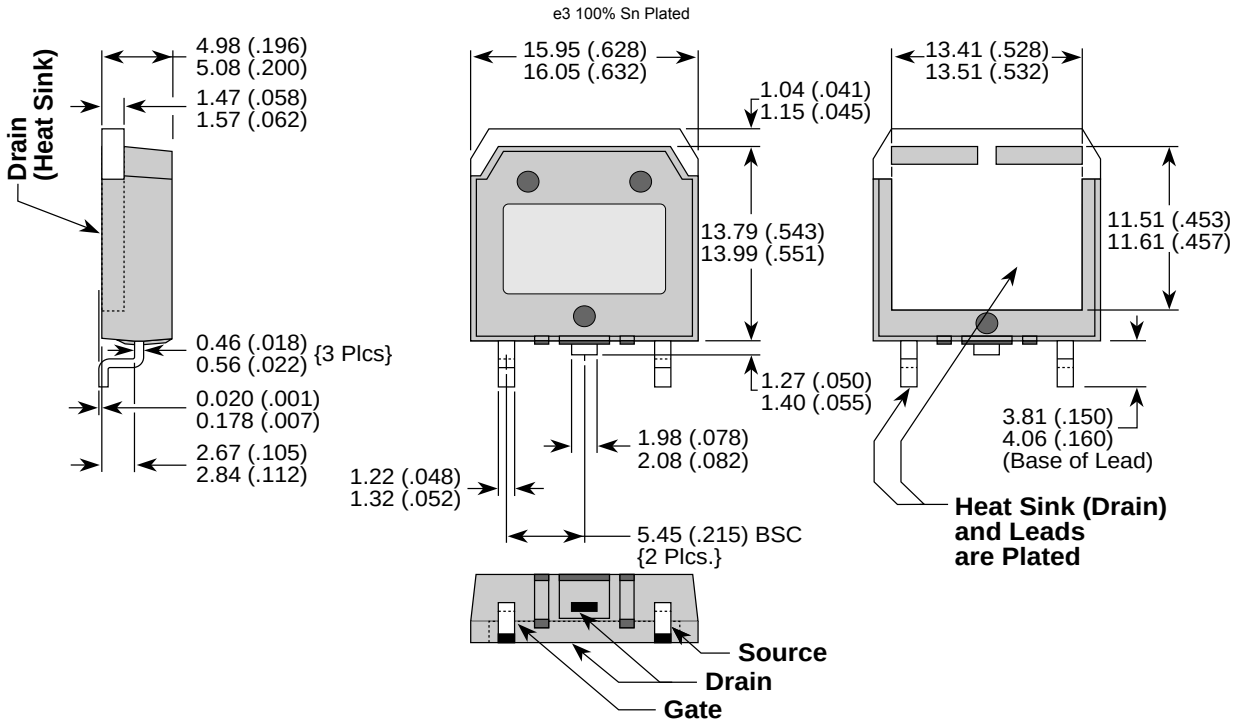



**FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE**

## D³PAK Package Outline




Dimensions in Millimeters (Inches)