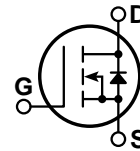
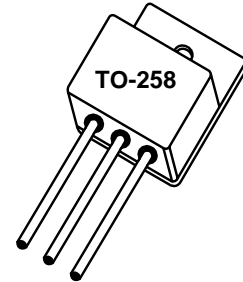


### POWER MOS V®

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**
- **100% Avalanche Tested**
- **Lower Leakage**
- **Popular TO-258 Package**

#### MAXIMUM RATINGS

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

| Symbol         | Parameter  | APT20M40HVR | UNIT                |
|----------------|--|-------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage   | 200         | Volts               |
| $I_D$          | Continuous Drain Current @ $T_C = 25^\circ\text{C}$            | 45          | Amps                |
| $I_{DM}$       | Pulsed Drain Current <sup>①</sup>                              | 180         |                     |
| $V_{GS}$       | Gate-Source Voltage Continuous                                 | $\pm 30$    | Volts               |
| $V_{GSM}$      | Gate-Source Voltage Transient                                  | $\pm 40$    |                     |
| $P_D$          | Total Power Dissipation @ $T_C = 25^\circ\text{C}$             | 250         | Watts               |
|                | Linear Derating Factor   | 2.0         | 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) | 45          | Amps                |
| $E_{AR}$       | Repetitive Avalanche Energy <sup>①</sup>                       | 30          | mJ                  |
| $E_{AS}$       | Single Pulse Avalanche Energy <sup>④</sup>                     | 1300        |                     |

#### STATIC ELECTRICAL CHARACTERISTICS

| Symbol       | Characteristic / Test Conditions   | MIN | TYP | MAX       | UNIT          |
|--------------|--|-----|-----|-----------|---------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250\mu\text{A}$ )                             | 200 |     |           | Volts         |
| $I_{D(on)}$  | On State Drain Current <sup>②</sup> ( $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$ ) | 45  |     |           | Amps          |
| $R_{DS(on)}$ | Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, 0.5 I_{D[Cont.]}$ )                 |     |     | 0.040     | Ohms          |
| $I_{DSS}$    | Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )                                |     |     | 25        | $\mu\text{A}$ |
|              | Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )   |     |     | 250       |               |
| $I_{GSS}$    | Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )                                    |     |     | $\pm 100$ | nA            |
| $V_{GS(th)}$ | Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 1.0\text{mA}$ )                                   | 2   |     | 4         | Volts         |

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

**USA**  
405 S.W. Columbia Street

**EUROPE**  
Avenue J.F. Kennedy Bât B4 Parc Cadéra Nord

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

Bend, Oregon 97702-1035

Phone: (541) 382-8028

FAX: (541) 388-0364

F-33700 Merignac - France

Phone: (33) 5 57 92 15 15

FAX: (33) 5 56 47 97 61

**DYNAMIC CHARACTERISTICS**

**APT20M40HVR**

| Symbol       | Characteristic               | Test Conditions  | MIN | TYP  | MAX  | UNIT |
|--------------|------------------------------|--|-----|------|------|------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1\text{ MHz}$  |     | 5100 | 6120 | pF   |
| $C_{oss}$    | Output Capacitance           |  |     | 1145 | 1600 |      |
| $C_{rss}$    | Reverse Transfer Capacitance |  |     | 390  | 585  |      |
| $Q_g$        | Total Gate Charge ③          | $V_{GS} = 10V$<br>$V_{DD} = 0.5 V_{DSS}$<br>$I_D = I_{D[Cont.]} @ 25^\circ C$                      |     | 148  | 225  | nC   |
| $Q_{gs}$     | Gate-Source Charge           |  |     | 47   | 75   |      |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge |  |     | 75   | 110  |      |
| $t_{d(on)}$  | Turn-on Delay Time           | $V_{GS} = 15V$<br>$V_{DD} = 0.5 V_{DSS}$<br>$I_D = I_{D[Cont.]} @ 25^\circ C$<br>$R_G = 1.6\Omega$ |     | 14   | 28   | ns   |
| $t_r$        | Rise Time                    |  |     | 21   | 42   |      |
| $t_{d(off)}$ | Turn-off Delay Time          |  |     | 48   | 75   |      |
| $t_f$        | Fall Time                    |  |     | 10   | 20   |      |

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

| Symbol   | Characteristic / Test Conditions  | MIN | TYP | MAX | UNIT    |
|----------|---|-----|-----|-----|---------|
| $I_S$    | Continuous Source Current (Body Diode)                                  |     |     | 45  | Amps    |
| $I_{SM}$ | Pulsed Source Current ① (Body Diode)                                    |     |     | 180 |         |
| $V_{SD}$ | Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -I_{D[Cont.]}$ )          |     |     | 1.5 | Volts   |
| $t_{rr}$ | Reverse Recovery Time ( $I_S = -I_{D[Cont.]}, di_S/dt = 100A/\mu s$ )   |     | 160 |     | ns      |
| $Q_{rr}$ | Reverse Recovery Charge ( $I_S = -I_{D[Cont.]}, di_S/dt = 100A/\mu s$ ) |     | 1.3 |     | $\mu C$ |

**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.

③ See MIL-STD-750 Method 3471

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

④ Starting  $T_j = +25^\circ C$ ,  $L = 1.28mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 45A$

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

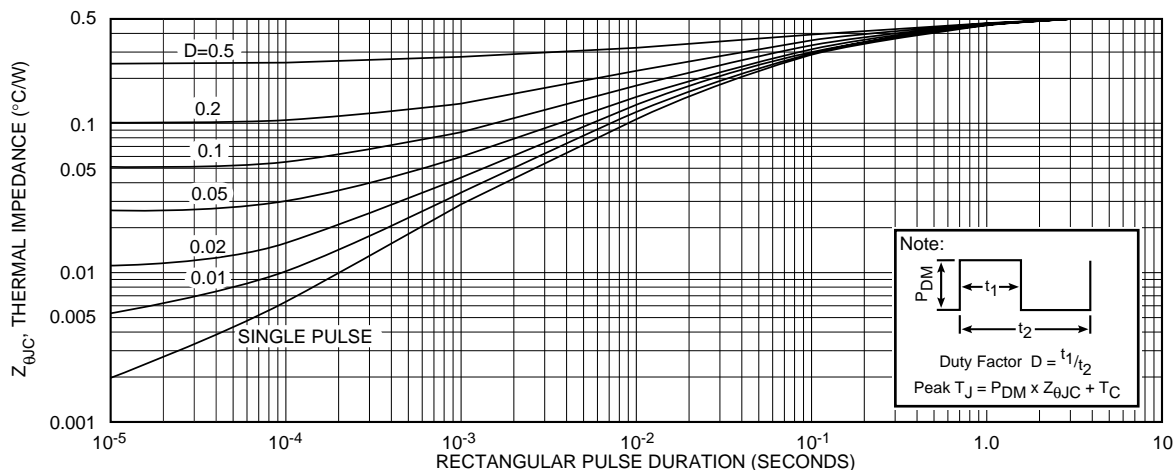
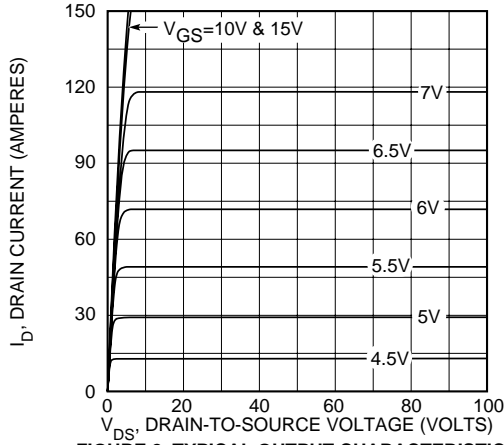
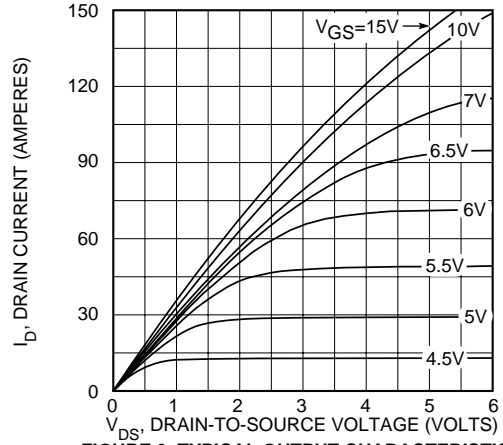


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

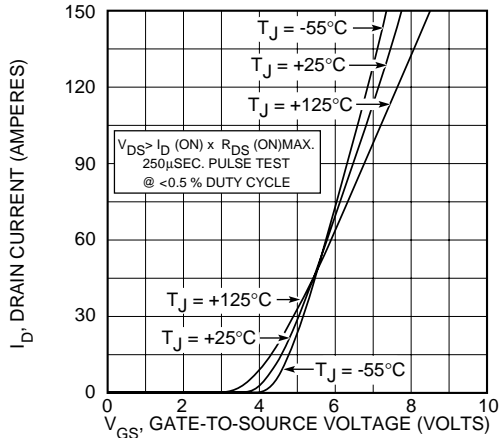
**APT20M40HVR**



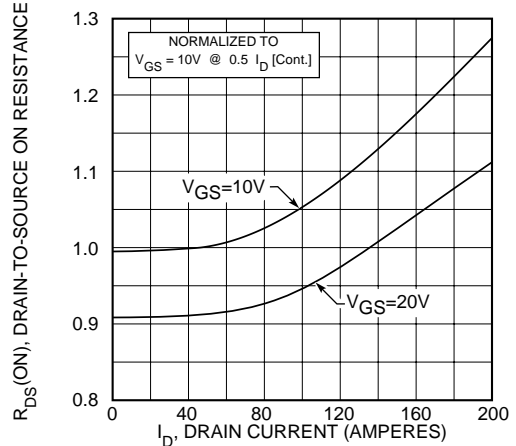
**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**



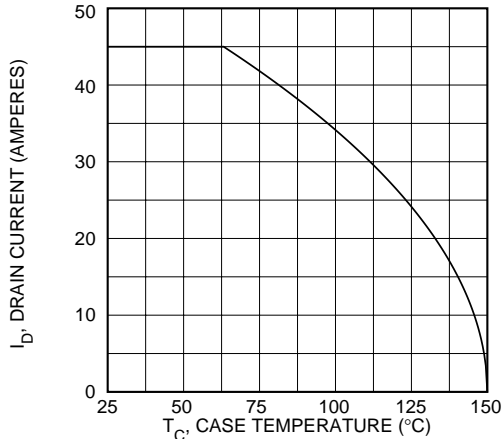
**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**



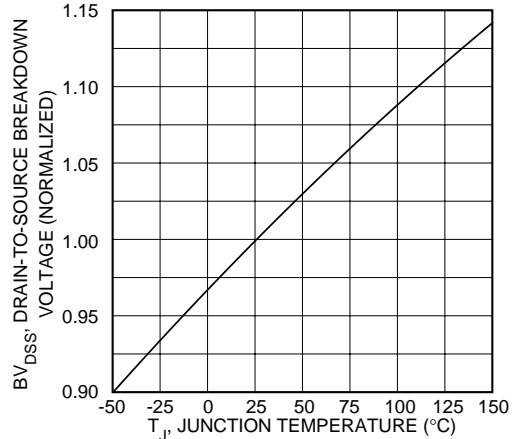
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



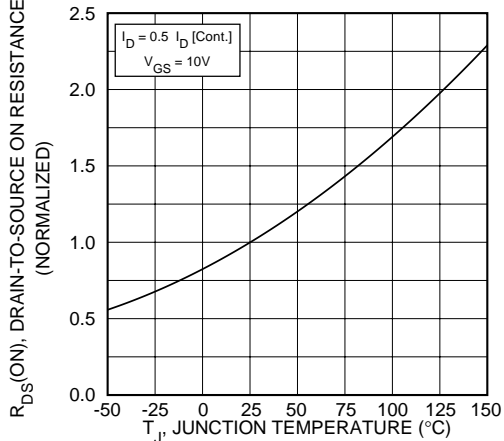
**FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT**



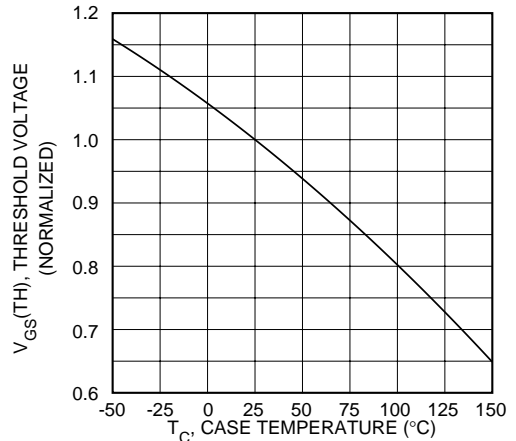
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**

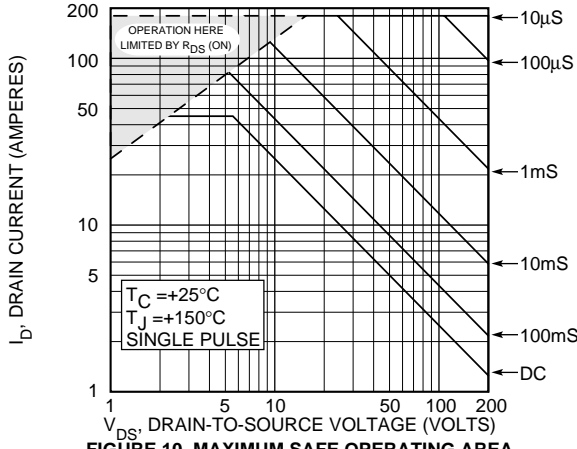


**FIGURE 8, ON-RESISTANCE vs. TEMPERATURE**

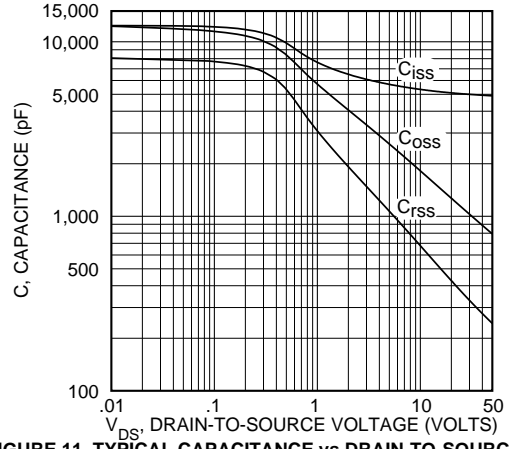


**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

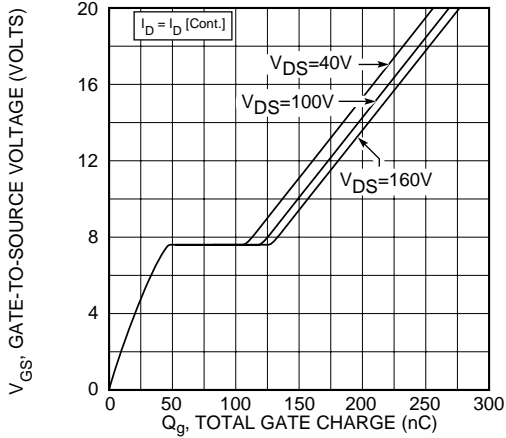
**APT20M40HVR**



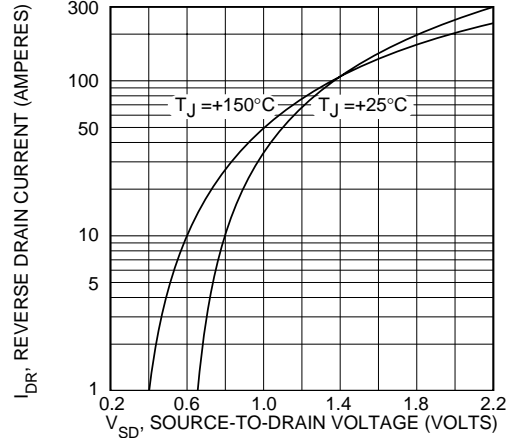
**FIGURE 10, MAXIMUM SAFE OPERATING AREA**



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

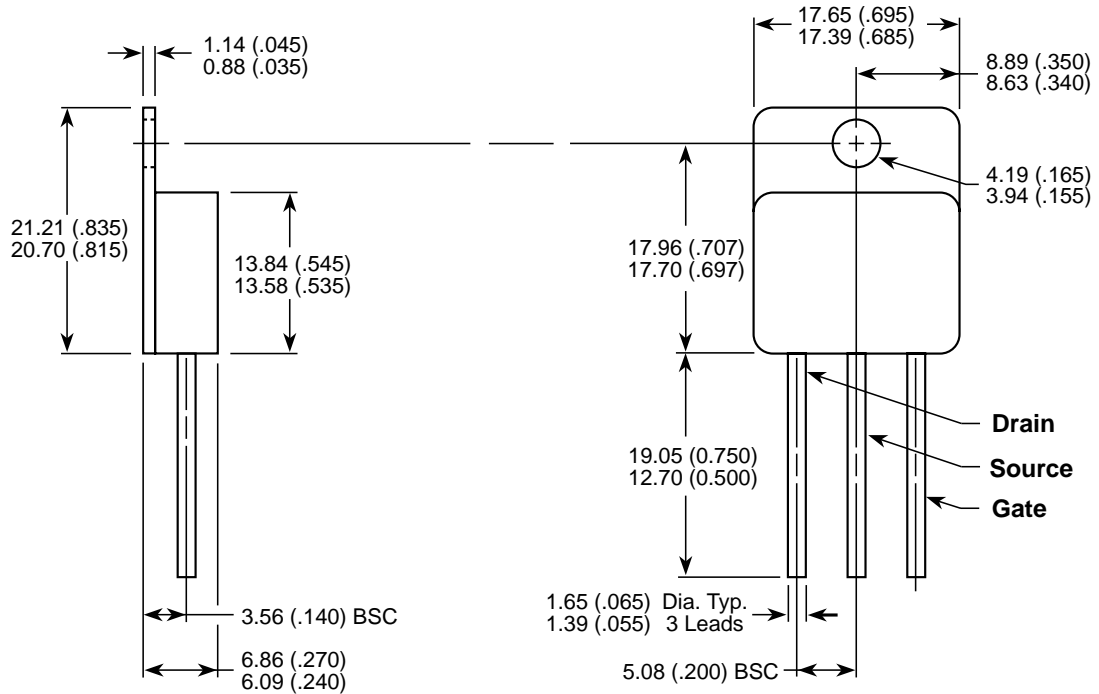


**FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE**



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

**TO-258 Package Outline**



Dimensions in Millimeters and (Inches)