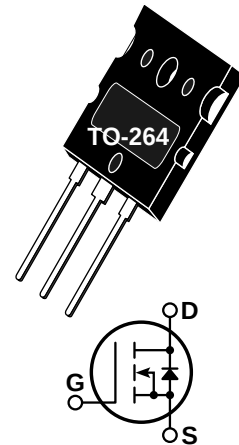


### POWER MOS V®

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-264 Package



#### MAXIMUM RATINGS

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

| Symbol         | Parameter                                             | APT20M22LVR | UNIT  |
|----------------|-------------------------------------------------------|-------------|-------|
| $V_{DSS}$      | Drain-Source Voltage                                  | 200         | Volts |
| $I_D$          | Continuous Drain Current @ $T_C = 25^\circ\text{C}$ ⑤ | 100         | Amps  |
| $I_{DM}$       | Pulsed Drain Current ① ⑤                              | 400         |       |
| $V_{GS}$       | Gate-Source Voltage Continuous                        | $\pm 30$    | Volts |
| $V_{GSM}$      | Gate-Source Voltage Transient                         | $\pm 40$    |       |
| $P_D$          | Total Power Dissipation @ $T_C = 25^\circ\text{C}$    | 520         | Watts |
|                | Linear Derating Factor                                | 4.16        | 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 ⑤ (Repetitive and Non-Repetitive) | 100         | Amps  |
| $E_{AR}$       | Repetitive Avalanche Energy ①                         | 50          | mJ    |
| $E_{AS}$       | Single Pulse Avalanche Energy ④                       | 2500        |       |

#### STATIC ELECTRICAL CHARACTERISTICS

| Symbol       | Characteristic / Test Conditions                                                                 | MIN | TYP | MAX       | UNIT    |
|--------------|--------------------------------------------------------------------------------------------------|-----|-----|-----------|---------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250\mu A$ )                                 | 200 |     |           | Volts   |
| $I_{D(on)}$  | On State Drain Current ② ⑤ ( $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$ )        | 100 |     |           | Amps    |
| $R_{DS(on)}$ | Drain-Source On-State Resistance ② ( $V_{GS} = 10V, 0.5 I_{D[Cont.]}$ )                          |     |     | 0.022     | Ohms    |
| $I_{DSS}$    | Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )                              |     |     | 25        | $\mu A$ |
|              | 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 ( $V_{DS} = V_{GS}, I_D = 2.5mA$ )                                        | 2   |     | 4         | Volts   |



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

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# DYNAMIC CHARACTERISTICS

APT20M22LVR

| Symbol       | Characteristic               | Test Conditions                                                                                    | MIN | TYP  | MAX   | UNIT |
|--------------|------------------------------|----------------------------------------------------------------------------------------------------|-----|------|-------|------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1 \text{ MHz}$                                             |     | 8500 | 10200 | pF   |
| $C_{oss}$    | Output Capacitance           |                                                                                                    |     | 1950 | 2730  |      |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                                                                    |     | 560  | 840   |      |
| $Q_g$        | Total Gate Charge ③          | $V_{GS} = 10V$<br>$V_{DD} = 0.5 V_{DSS}$<br>$I_D = I_{D[Cont.]} @ 25^\circ C$                      |     | 290  | 435   | nC   |
| $Q_{gs}$     | Gate-Source Charge           |                                                                                                    |     | 66   | 100   |      |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge |                                                                                                    |     | 120  | 180   |      |
| $t_{d(on)}$  | Turn-on Delay Time           | $V_{GS} = 15V$<br>$V_{DD} = 0.5 V_{DSS}$<br>$I_D = I_{D[Cont.]} @ 25^\circ C$<br>$R_G = 0.6\Omega$ |     | 16   | 32    | ns   |
| $t_r$        | Rise Time                    |                                                                                                    |     | 25   | 50    |      |
| $t_{d(off)}$ | Turn-off Delay Time          |                                                                                                    |     | 48   | 72    |      |
| $t_f$        | Fall Time                    |                                                                                                    |     | 5    | 10    |      |

# SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol   | Characteristic / Test Conditions                                           | MIN | TYP | MAX | UNIT    |
|----------|----------------------------------------------------------------------------|-----|-----|-----|---------|
| $I_S$    | Continuous Source Current ⑤ (Body Diode)                                   |     |     | 100 | Amps    |
| $I_{SM}$ | Pulsed Source Current ① ⑤ (Body Diode)                                     |     |     | 400 |         |
| $V_{SD}$ | Diode Forward Voltage ② ( $V_{GS} = 0V$ , $I_S = -I_{D[Cont.]}$ )          |     |     | 1.3 | Volts   |
| $t_{rr}$ | Reverse Recovery Time ( $I_S = -I_{D[Cont.]}$ , $dI_S/dt = 100A/\mu s$ )   |     | 330 |     | ns      |
| $Q_{rr}$ | Reverse Recovery Charge ( $I_S = -I_{D[Cont.]}$ , $dI_S/dt = 100A/\mu s$ ) |     | 5.8 |     | $\mu C$ |

# THERMAL CHARACTERISTICS

| Symbol          | Characteristic      | MIN | TYP | MAX  | UNIT         |
|-----------------|---------------------|-----|-----|------|--------------|
| $R_{\theta JC}$ | Junction to Case    |     |     | 0.24 | $^\circ C/W$ |
| $R_{\theta JA}$ | Junction to Ambient |     |     | 40   |              |

① Repetitive Rating: Pulse width limited by maximum  $T_j$

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

③ See MIL-STD-750 Method 3471

④ Starting  $T_j = +25^\circ C$ ,  $L = 500\mu H$ ,  $R_G = 25\Omega$ , Peak  $I_L = 100A$

⑤ The maximum current is limited by lead temperature.

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

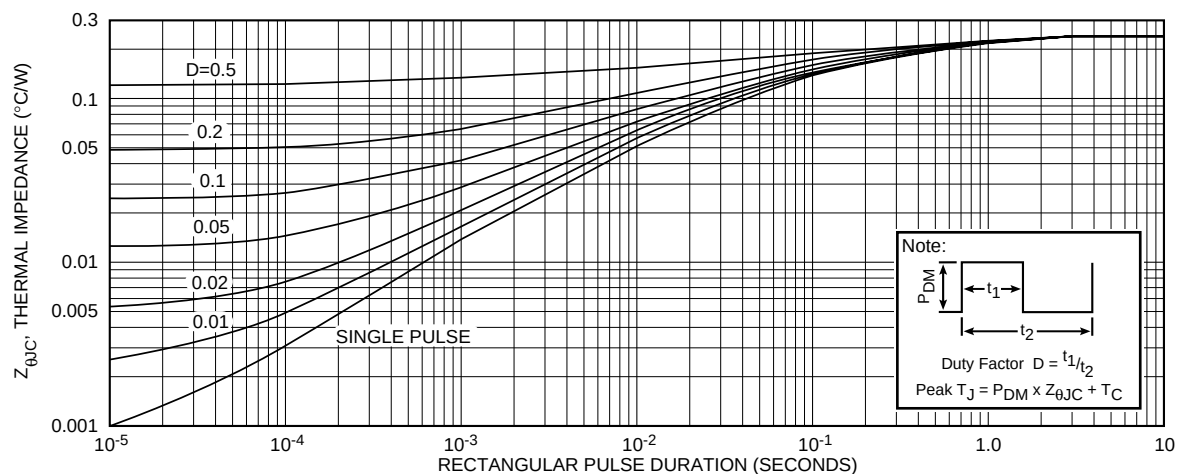


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

# APT20M22LVR

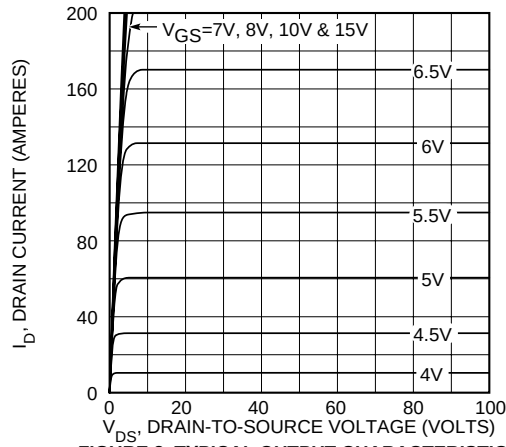


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

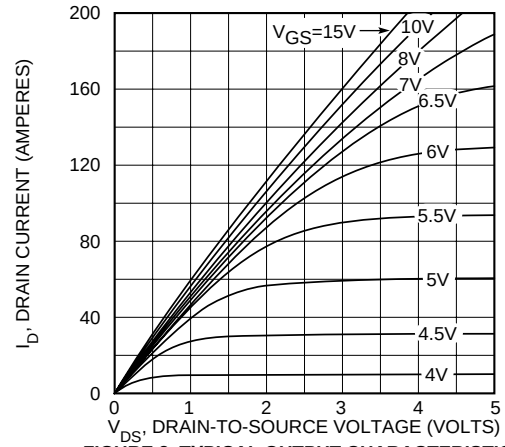


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

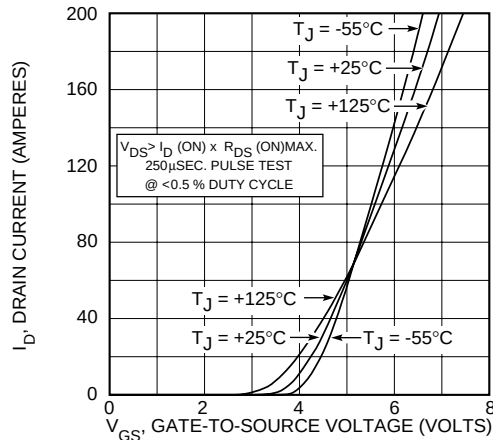


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

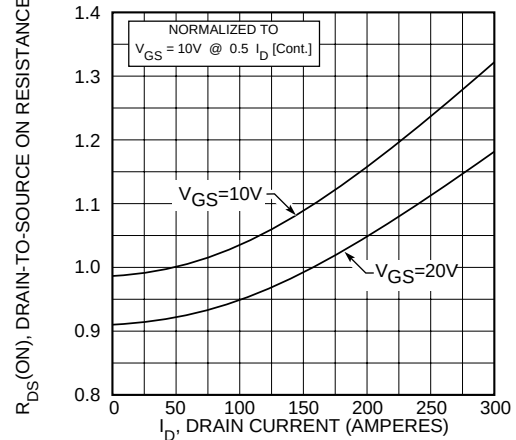


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

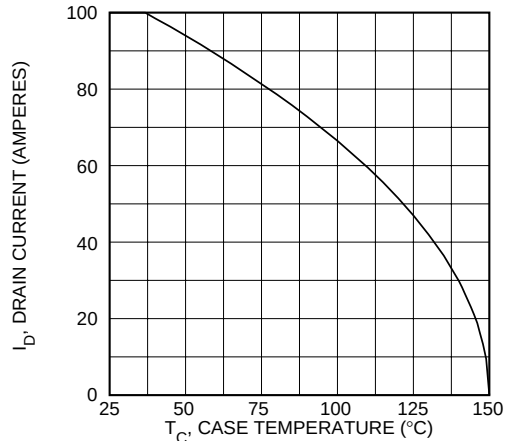


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

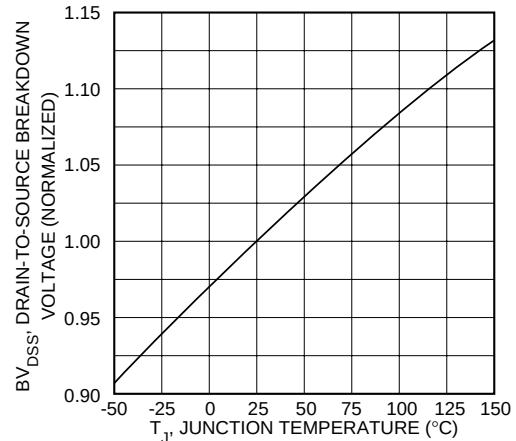


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

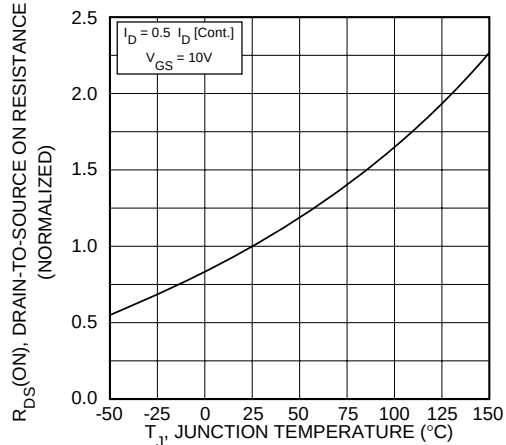


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

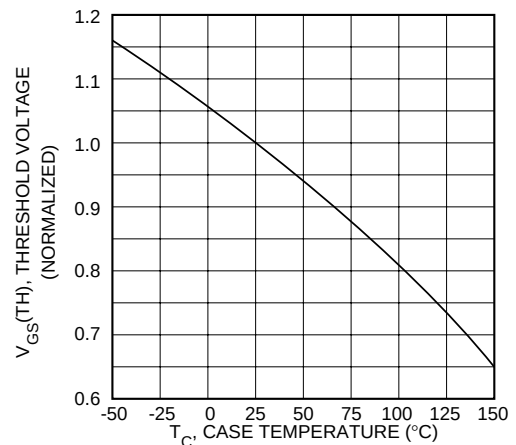


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

# APT20M22LVR

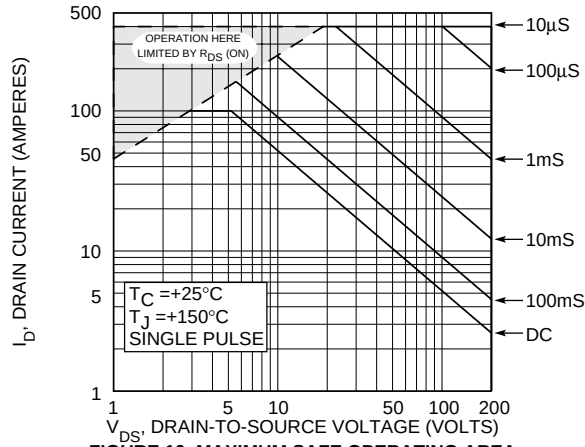


FIGURE 10, MAXIMUM SAFE OPERATING AREA

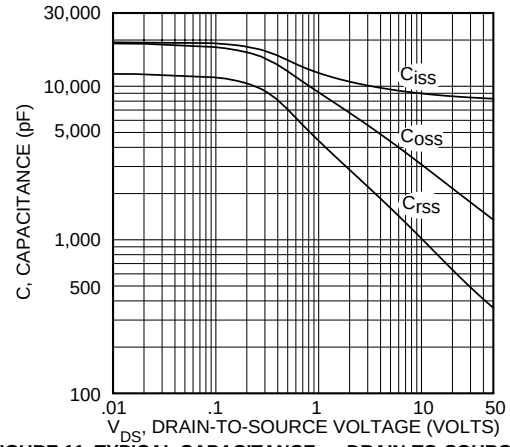


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

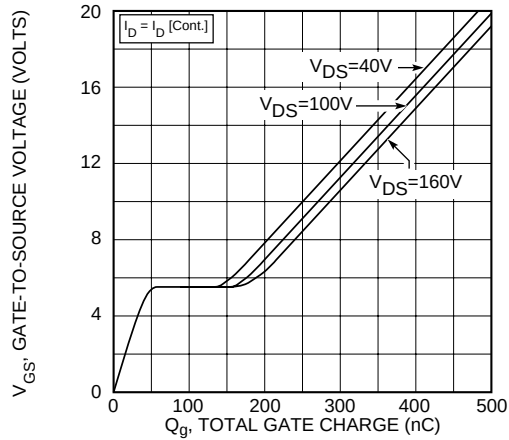


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

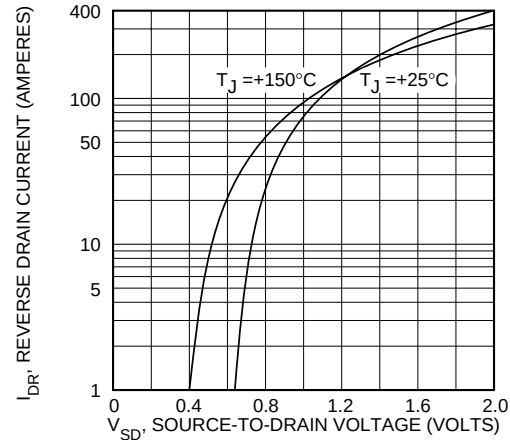
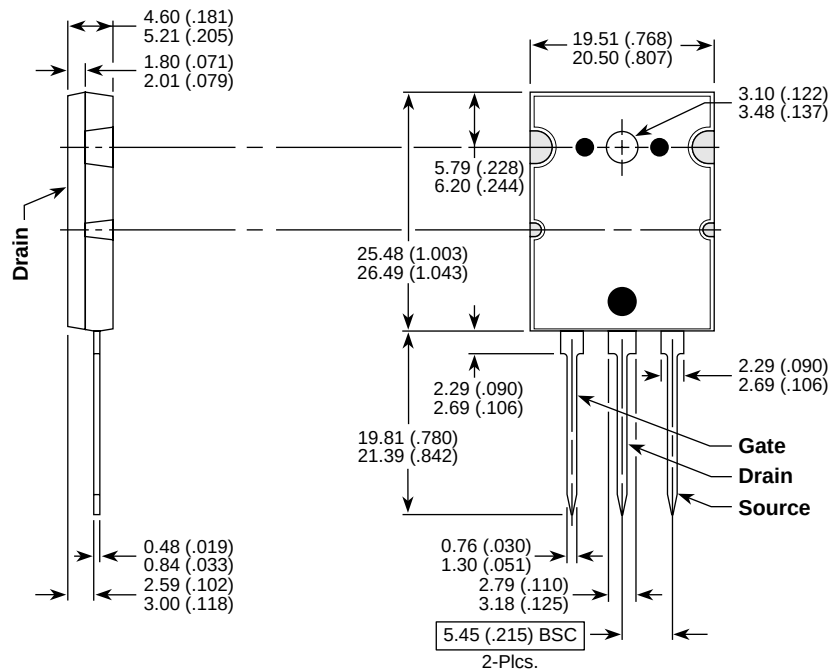


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

## TO-264 Package Outline



Dimensions in Millimeters and (Inches)