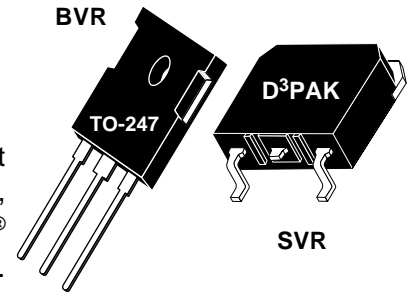
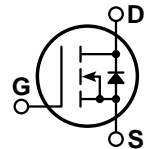


## POWER MOS V®

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
- Avalanche Energy Rated
- Popular TO-247 Package



### MAXIMUM RATINGS

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

| Symbol         | Parameter  | APT6040BVR | UNIT                |
|----------------|--|------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage   | 600        | Volts               |
| $I_D$          | Continuous Drain Current @ $T_C = 25^\circ\text{C}$            | 16         | Amps                |
| $I_{DM}$       | Pulsed Drain Current <sup>①</sup>                              | 64         |                     |
| $V_{GS}$       | 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          | 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) | 16         | Amps                |
| $E_{AR}$       | Repetitive Avalanche Energy <sup>①</sup>                       | 30         | mJ                  |
| $E_{AS}$       | Single Pulse Avalanche Energy <sup>④</sup>                     | 960        |                     |

### STATIC ELECTRICAL CHARACTERISTICS

| Symbol       | Characteristic / Test Conditions   | MIN | TYP | MAX       | UNIT          |
|--------------|--|-----|-----|-----------|---------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250\mu\text{A}$ )                             | 600 |     |           | Volts         |
| $I_{D(on)}$  | On State Drain Current <sup>②</sup> ( $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$ ) | 16  |     |           | Amps          |
| $R_{DS(on)}$ | Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, 8A$ )                               |     |     | 0.40      | Ohms          |
| $I_{DSS}$    | Zero Gate Voltage Drain Current ( $V_{DS} = 600V, V_{GS} = 0V$ )                                   |     |     | 25        | $\mu\text{A}$ |
|              | Zero Gate Voltage Drain Current ( $V_{DS} = 480V, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )          |     |     | 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.

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

**DYNAMIC CHARACTERISTICS**

**APT6040BVR**

| Symbol       | Characteristic               | Test Conditions  | MIN | TYP  | MAX  | UNIT |
|--------------|------------------------------|--|-----|------|------|------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1\text{ MHz}$                              |     | 2600 | 3120 | pF   |
| $C_{oss}$    | Output Capacitance           |  |     | 305  | 425  |      |
| $C_{rss}$    | Reverse Transfer Capacitance |  |     | 125  | 180  |      |
| $Q_g$        | Total Gate Charge ③          | $V_{GS} = 10V$<br>$V_{DD} = 300V$<br>$I_D = 16A @ 25^\circ C$                      |     | 115  | 170  | nC   |
| $Q_{gs}$     | Gate-Source Charge           |  |     | 15   | 25   |      |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge |  |     | 52   | 75   |      |
| $t_{d(on)}$  | Turn-on Delay Time           | $V_{GS} = 15V$<br>$V_{DD} = 300V$<br>$I_D = 16A @ 25^\circ C$<br>$R_G = 1.6\Omega$ |     | 10   | 20   | ns   |
| $t_r$        | Rise Time                    |  |     | 9    | 18   |      |
| $t_{d(off)}$ | Turn-off Delay Time          |  |     | 38   | 50   |      |
| $t_f$        | Fall Time                    |  |     | 6    | 12   |      |

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

| Symbol   | Characteristic / Test Conditions                               | MIN | TYP | MAX | UNIT    |
|----------|--|-----|-----|-----|---------|
| $I_S$    | Continuous Source Current (Body Diode)                         |     |     | 16  | Amps    |
| $I_{SM}$ | Pulsed Source Current ① (Body Diode)                           |     |     | 64  |         |
| $V_{SD}$ | Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -15A$ )          |     |     | 1.3 | Volts   |
| $t_{rr}$ | Reverse Recovery Time ( $I_S = -15A, di_S/dt = 100A/\mu s$ )   |     | 400 |     | ns      |
| $Q_{rr}$ | Reverse Recovery Charge ( $I_S = -15A, di_S/dt = 100A/\mu s$ ) |     | 6   |     | $\mu C$ |

**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  $T_j = +25^\circ C$ ,  $L = 7.50mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 16A$

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

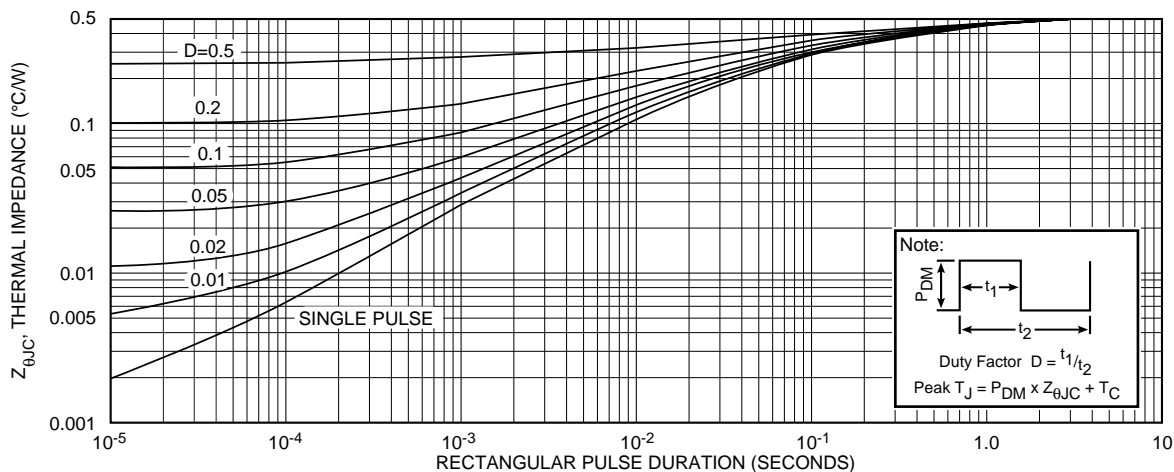


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

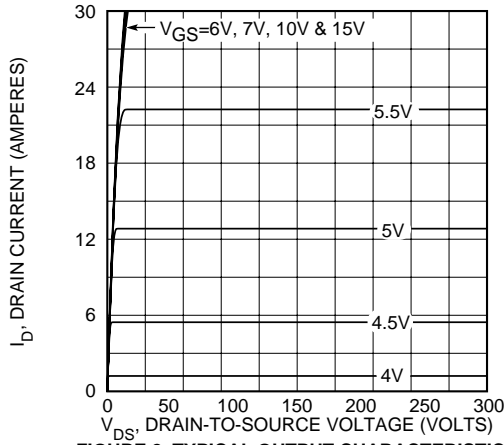


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

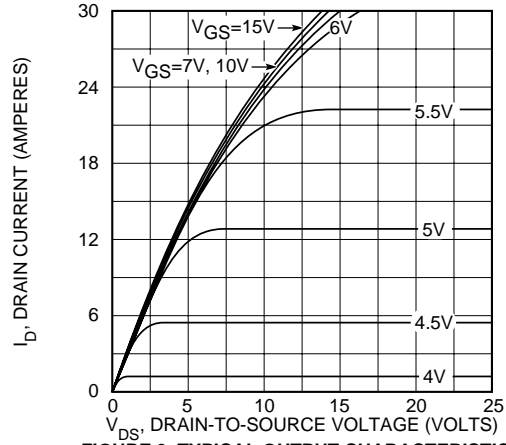


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

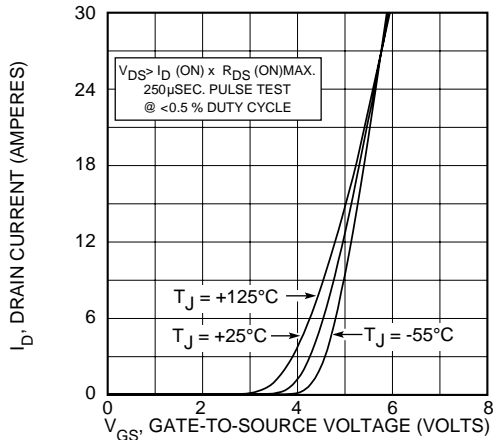


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

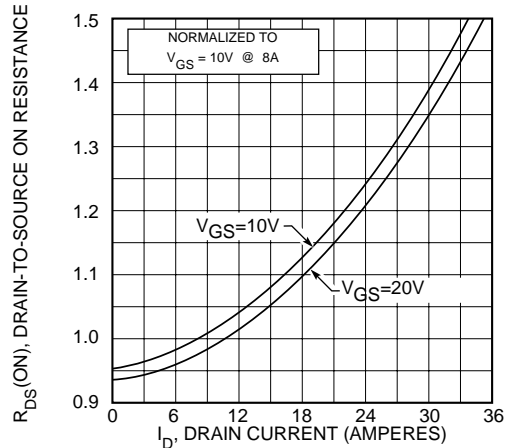


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

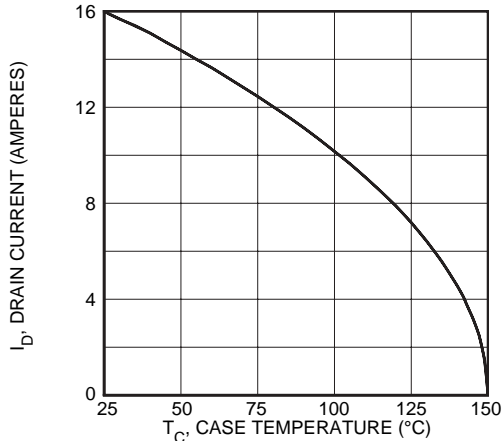


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

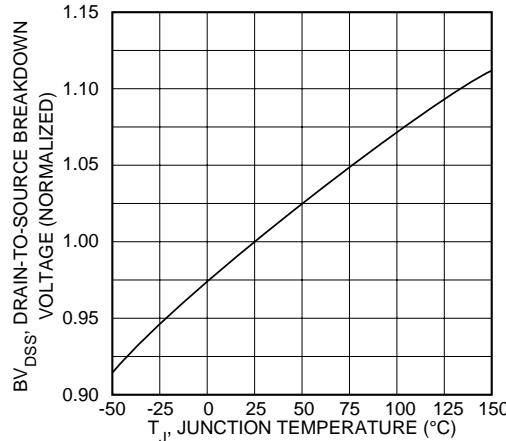


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

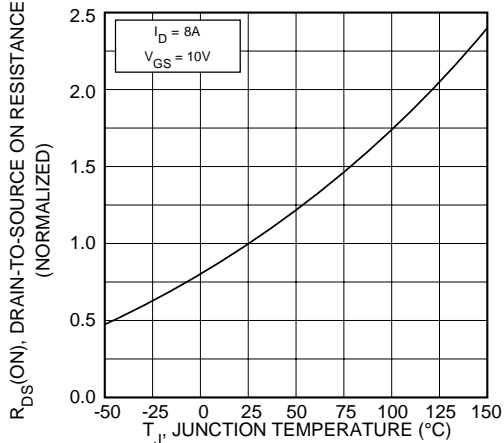


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

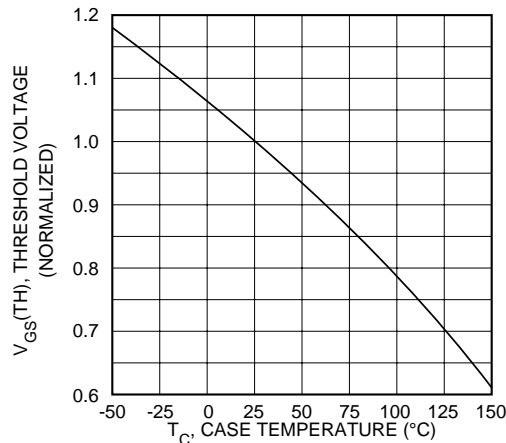


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

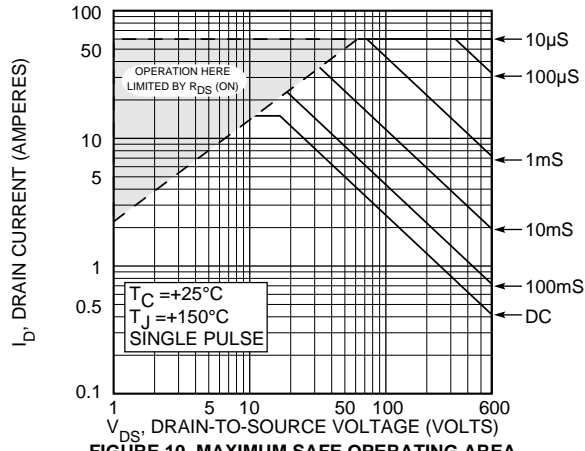


FIGURE 10, MAXIMUM SAFE OPERATING AREA

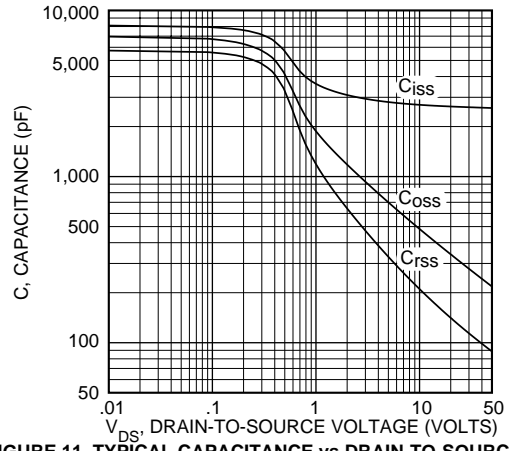


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

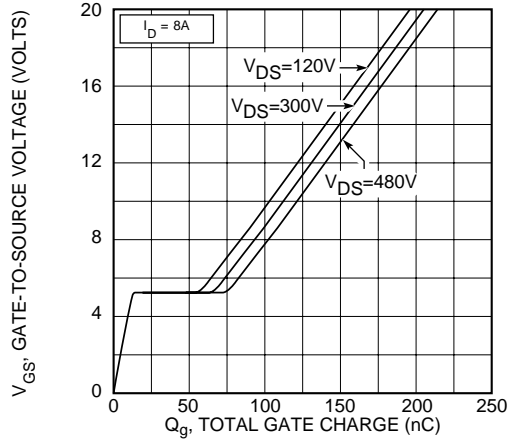


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

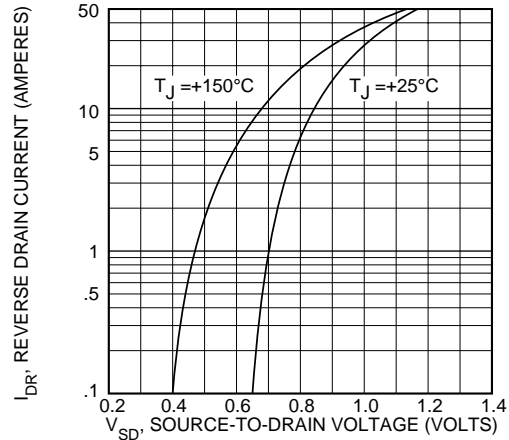
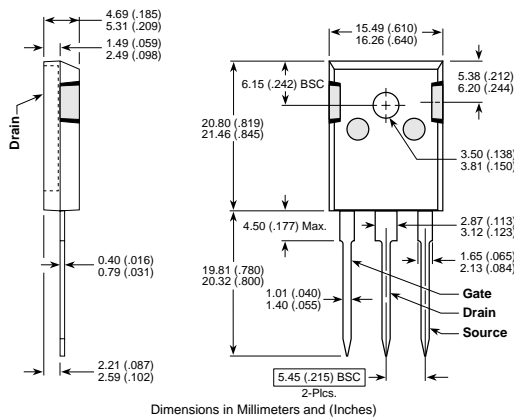
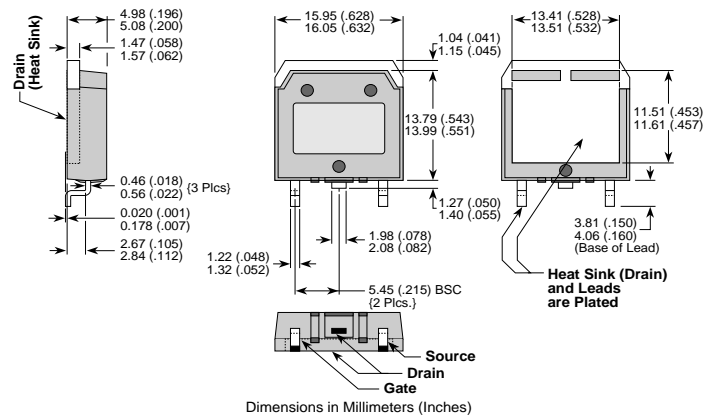


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247 Package Outline



D<sup>3</sup>PAK Package Outline



APT's devices are covered by one or more of the following U.S. patents: 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336  
 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058