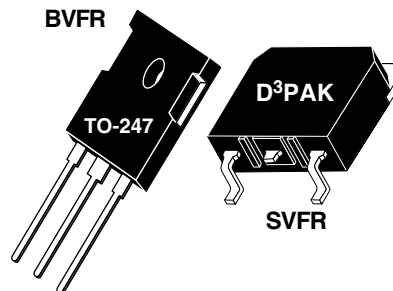
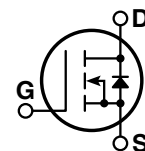


## POWER MOS V®

**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.

- Faster Switching
- Avalanche Energy Rated
- Lower Leakage
- TO-247 or Surface Mount D<sup>3</sup>PAK Package
- Fast Recovery Body Diode



### MAXIMUM RATINGS

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

| Symbol         | Parameter                                                      | APT5015BVFR_SVFR | UNIT                |
|----------------|----------------------------------------------------------------|------------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage                                           | 500              | Volts               |
| $I_D$          | Continuous Drain Current @ $T_C = 25^\circ\text{C}$            | 32               | Amps                |
| $I_{DM}$       | Pulsed Drain Current <sup>①</sup>                              | 128              |                     |
| $V_{GS}$       | Gate-Source Voltage Continuous                                 | $\pm 30$         | Volts               |
| $V_{GSM}$      | Gate-Source Voltage Transient                                  | $\pm 40$         |                     |
| $P_D$          | Total Power Dissipation @ $T_C = 25^\circ\text{C}$             | 370              | Watts               |
|                | Linear Derating Factor                                         | 2.96             | 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) | 30               | 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 ( $V_{GS} = 0V, I_D = 250\mu A$ )                                   | 500 |     |           | Volts   |
| $I_{D(on)}$  | On State Drain Current <sup>②</sup> ( $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$ ) | 32  |     |           | Amps    |
| $R_{DS(on)}$ | Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, 0.5 I_{D[Cont.]}$ )                 |     |     | 0.15      | Ohms    |
| $I_{DSS}$    | Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )                                |     |     | 250       | $\mu A$ |
|              | Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )   |     |     | 1000      |         |
| $I_{GSS}$    | Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )                                    |     |     | $\pm 100$ | nA      |
| $V_{GS(th)}$ | Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 1.0mA$ )                                          | 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

APT5015BVFR\_SVFR

| Symbol       | Characteristic                 | Test Conditions                                                                                                | MIN | TYP  | MAX  | UNIT |
|--------------|--------------------------------|----------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| $C_{iss}$    | Input Capacitance              | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1 \text{ MHz}$                                                         |     | 4400 | 5280 | pF   |
| $C_{oss}$    | Output Capacitance             |                                                                                                                |     | 600  | 840  |      |
| $C_{rss}$    | Reverse Transfer Capacitance   |                                                                                                                |     | 230  | 350  |      |
| $Q_g$        | Total Gate Charge <sup>③</sup> | $V_{GS} = 10V$<br>$V_{DD} = 0.5 V_{DSS}$<br>$I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$                      |     | 200  | 300  | nC   |
| $Q_{gs}$     | Gate-Source Charge             |                                                                                                                |     | 30   | 45   |      |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge   |                                                                                                                |     | 80   | 120  |      |
| $t_{d(on)}$  | Turn-on Delay Time             | $V_{GS} = 15V$<br>$V_{DD} = 0.5 V_{DSS}$<br>$I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$<br>$R_G = 1.6\Omega$ |     | 12   | 25   | ns   |
| $t_r$        | Rise Time                      |                                                                                                                |     | 14   | 30   |      |
| $t_{d(off)}$ | Turn-off Delay Time            |                                                                                                                |     | 55   | 80   |      |
| $t_f$        | Fall Time                      |                                                                                                                |     | 11   | 20   |      |

# SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol    | Characteristic / Test Conditions                                                   | MIN                       | TYP | MAX | UNIT    |
|-----------|------------------------------------------------------------------------------------|---------------------------|-----|-----|---------|
| $I_S$     | Continuous Source Current (Body Diode)                                             |                           |     | 32  | Amps    |
| $I_{SM}$  | Pulsed Source Current <sup>①</sup> (Body Diode)                                    |                           |     | 128 |         |
| $V_{SD}$  | Diode Forward Voltage <sup>②</sup> ( $V_{GS} = 0V$ , $I_S = -I_D [\text{Cont.}]$ ) |                           |     | 1.3 | Volts   |
| $dv/dt$   | Peak Diode Recovery $dv/dt$ <sup>⑤</sup>                                           |                           |     | 15  | V/ns    |
| $t_{rr}$  | Reverse Recovery Time<br>( $I_S = -I_D [\text{Cont.}]$ , $di/dt = 100A/\mu s$ )    | $T_j = 25^\circ\text{C}$  |     | 250 | ns      |
|           |                                                                                    | $T_j = 125^\circ\text{C}$ |     | 525 |         |
| $Q_{rr}$  | Reverse Recovery Charge<br>( $I_S = -I_D [\text{Cont.}]$ , $di/dt = 100A/\mu s$ )  | $T_j = 25^\circ\text{C}$  | 1.6 |     | $\mu C$ |
|           |                                                                                    | $T_j = 125^\circ\text{C}$ | 6.0 |     |         |
| $I_{RRM}$ | Peak Recovery Current<br>( $I_S = -I_D [\text{Cont.}]$ , $di/dt = 100A/\mu s$ )    | $T_j = 25^\circ\text{C}$  | 13  |     | Amps    |
|           |                                                                                    | $T_j = 125^\circ\text{C}$ | 21  |     |         |

# THERMAL CHARACTERISTICS

| Symbol          | Characteristic      | MIN | TYP | MAX  | UNIT               |
|-----------------|---------------------|-----|-----|------|--------------------|
| $R_{\theta JC}$ | Junction to Case    |     |     | 0.34 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction to Ambient |     |     | 40   |                    |

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

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

③ See MIL-STD-750 Method 3471

④ Starting  $T_j = +25^\circ\text{C}$ ,  $L = 2.54\text{mH}$ ,  $R_G = 25\Omega$ , Peak  $I_L = 32A$

⑤  $I_S = -I_D [\text{Cont.}]$ ,  $di/dt = 100A/\mu s$ ,  $V_{DD} = V_{DSS}$ ,  $T_j = 150^\circ\text{C}$ ,  $R_G = 2.0\Omega$ ,  $V_R = 200V$ .

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

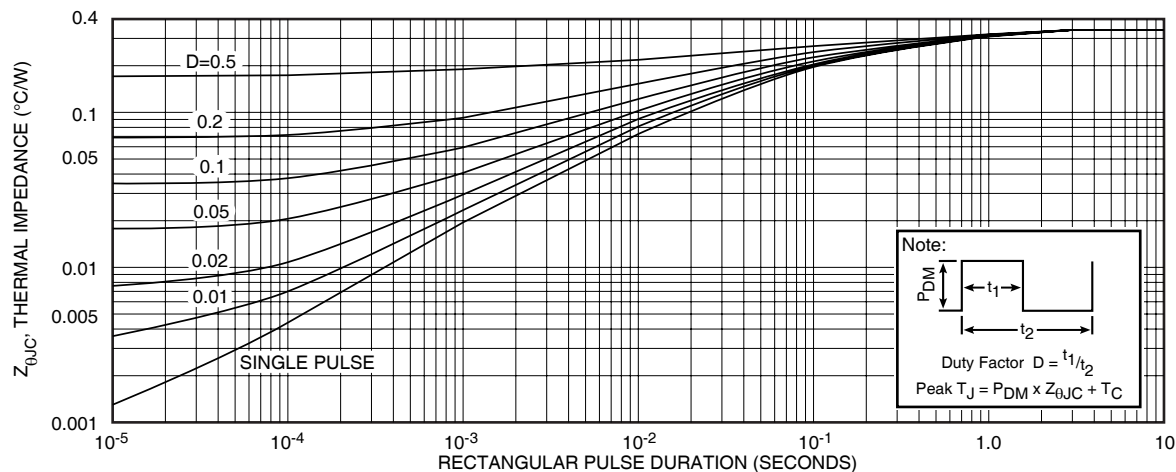


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

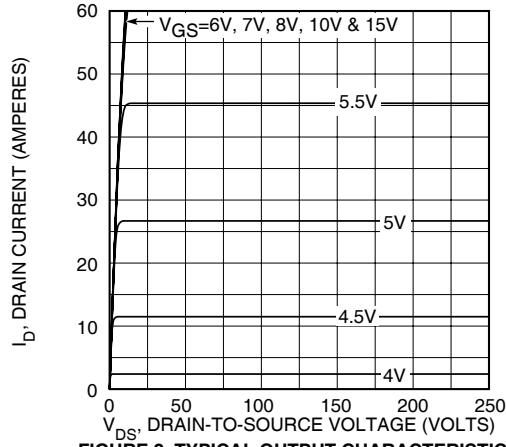


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

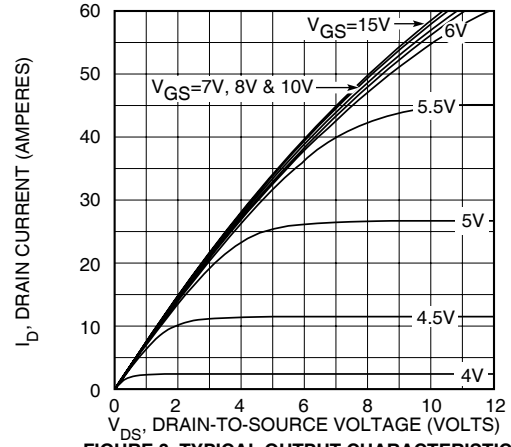


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

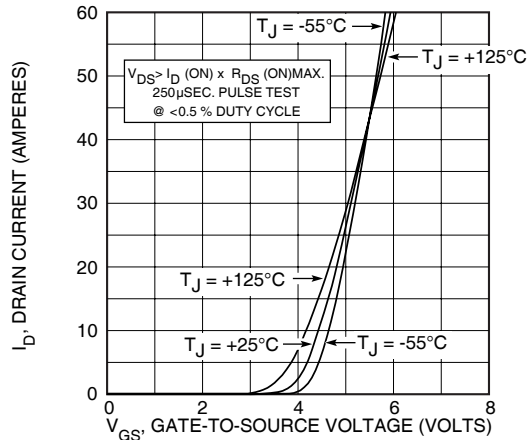


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

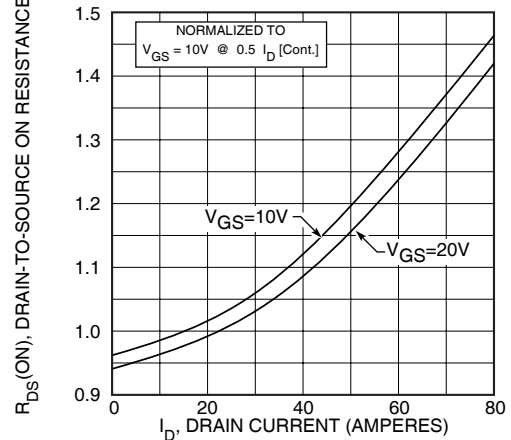


FIGURE 5,  $R_{DS}(ON)$  vs DRAIN CURRENT

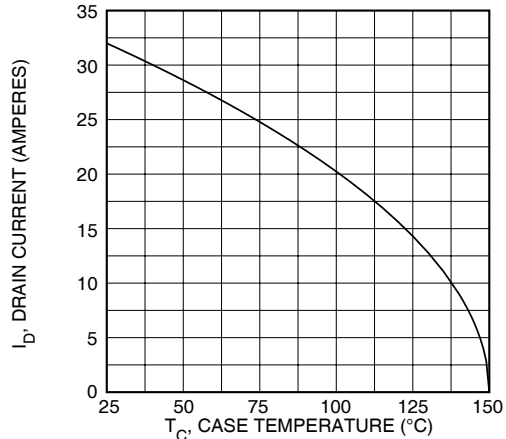


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

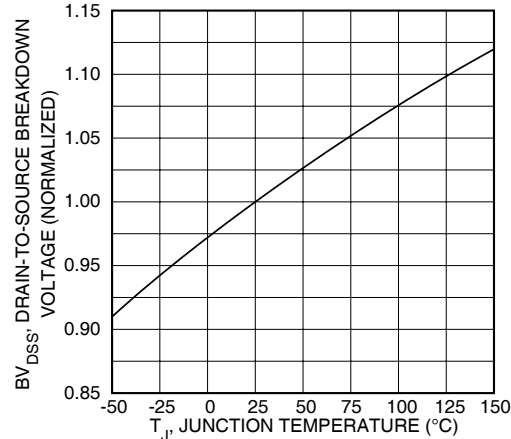


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

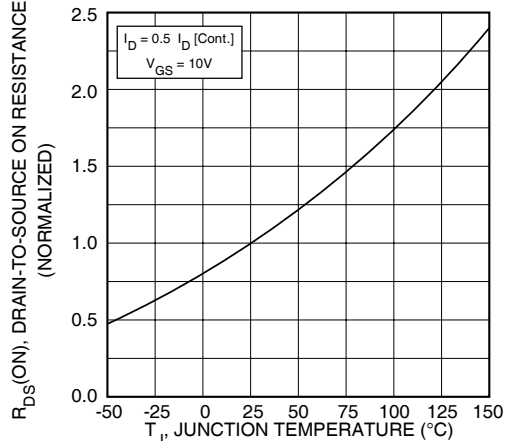


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

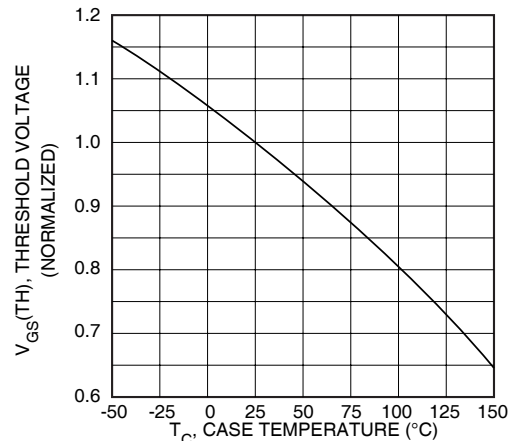


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

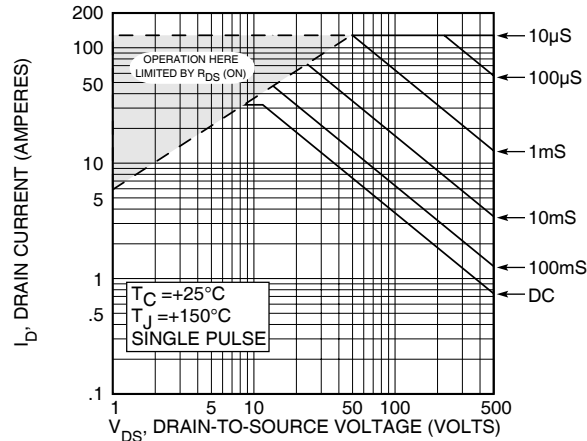


FIGURE 10, MAXIMUM SAFE OPERATING AREA

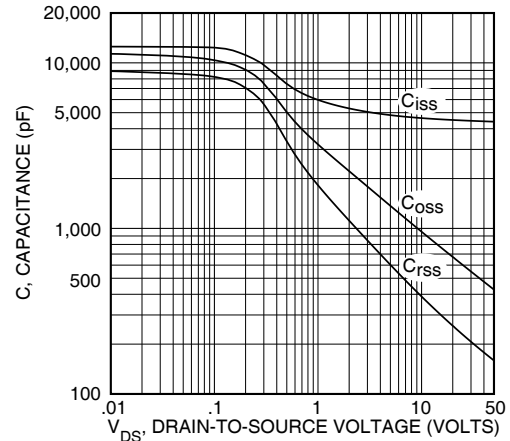


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

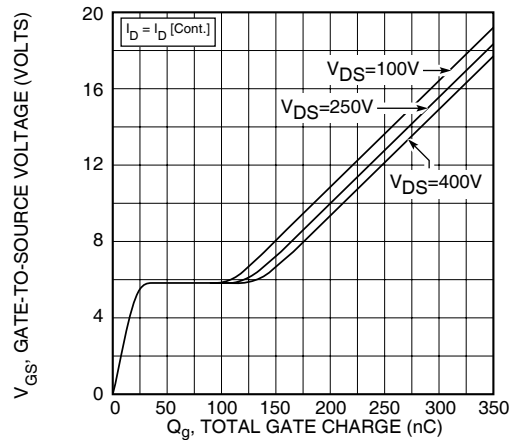


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

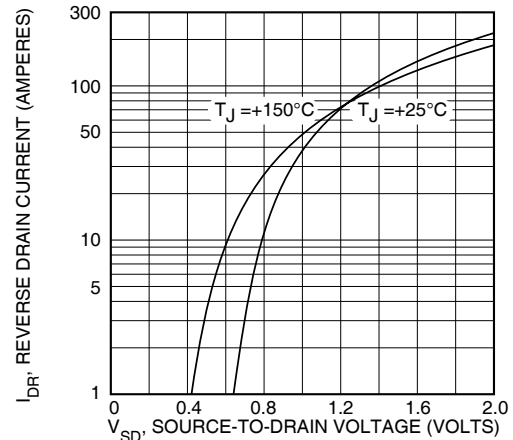
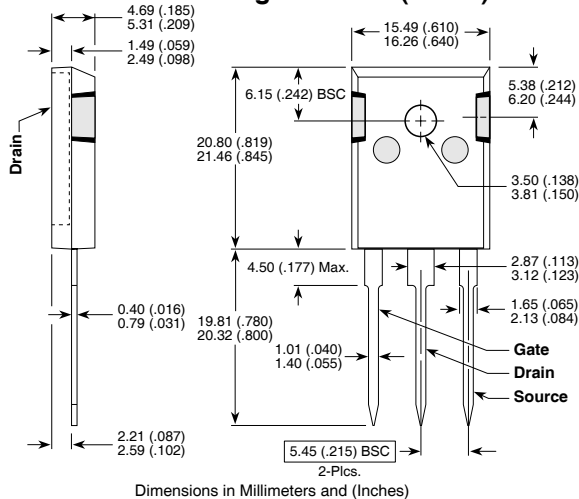


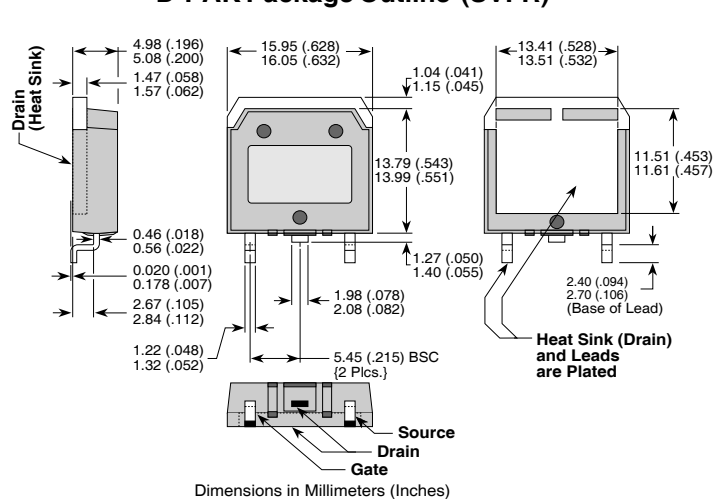
FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

### TO-247 Package Outline (BVFR)



Dimensions in Millimeters and (Inches)

### D<sup>3</sup>PAK Package Outline (SVFR)



Dimensions in Millimeters (Inches)