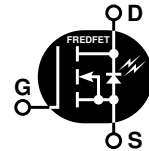


POWER MOS V®
FREDFET


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
- Lower Leakage
- Faster Switching
- 100% Avalanche Tested
- Surface Mount D³PAK Package


MAXIMUM RATINGS

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

| Symbol | Parameter | APT5020SVFR | UNIT |
|----------------|--|-------------|-------|
| V_{DSS} | Drain-Source Voltage | 500 | Volts |
| I_D | Continuous Drain Current @ $T_C = 25^\circ\text{C}$ | 26 | Amps |
| I_{DM} | Pulsed Drain Current ^① | 104 | |
| V_{GS} | Gate-Source Voltage Continuous | ± 30 | Volts |
| V_{GSM} | Gate-Source Voltage Transient | ± 40 | |
| P_D | Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | 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) | 26 | 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 ($V_{GS} = 0V, I_D = 250\mu\text{A}$) | 500 | | | Volts |
| $I_{D(on)}$ | On State Drain Current ^② ($V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$) | 26 | | | Amps |
| $R_{DS(on)}$ | Drain-Source On-State Resistance ^② ($V_{GS} = 10V, 0.5 I_{D[Cont.]}$) | | | 0.20 | Ohms |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$) | | | 250 | μA |
| | Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$) | | | 1000 | |
| I_{GSS} | Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$) | | | ± 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.

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DYNAMIC CHARACTERISTICS

APT5020SVFR

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|--------------|--------------------------------|---|-----|------|------|------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ | | 3700 | 4440 | pF |
| C_{oss} | Output Capacitance | $V_{DS} = 25V$ | | 510 | 715 | |
| C_{rss} | Reverse Transfer Capacitance | $f = 1\text{ MHz}$ | | 200 | 300 | |
| Q_g | Total Gate Charge ^③ | $V_{GS} = 10V$ | | 150 | 225 | nC |
| Q_{gs} | Gate-Source Charge | $V_{DD} = 0.5 V_{DSS}$ | | 25 | 37 | |
| Q_{gd} | Gate-Drain ("Miller") Charge | $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ | | 70 | 105 | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{GS} = 15V$ | | 12 | 25 | ns |
| t_r | Rise Time | $V_{DD} = 0.5 V_{DSS}$ | | 10 | 20 | |
| $t_{d(off)}$ | Turn-off Delay Time | $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ | | 50 | 75 | |
| t_f | Fall Time | $R_G = 1.8\Omega$ | | 8 | 15 | |

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | MIN | TYP | MAX | UNIT |
|-----------|---|---------------------------|-----|-----|---------------|
| I_S | Continuous Source Current (Body Diode) | | | 26 | Amps |
| I_{SM} | Pulsed Source Current ^① (Body Diode) | | | 104 | |
| V_{SD} | Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$) | | | 1.3 | Volts |
| dv/dt | Peak Diode Recovery dv/dt ^⑤ | | | 5 | V/ns |
| t_{rr} | Reverse Recovery Time ($I_S = -I_D [\text{Cont.}], di/dt = 100A/\mu s$) | $T_j = 25^\circ\text{C}$ | | 250 | ns |
| | | $T_j = 125^\circ\text{C}$ | | 500 | |
| Q_{rr} | Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}], di/dt = 100A/\mu s$) | $T_j = 25^\circ\text{C}$ | | 1.3 | μC |
| | | $T_j = 125^\circ\text{C}$ | | 4.5 | |
| I_{RRM} | Peak Recovery Current ($I_S = -I_D [\text{Cont.}], di/dt = 100A/\mu s$) | $T_j = 25^\circ\text{C}$ | | 12 | Amps |
| | | $T_j = 125^\circ\text{C}$ | | 18 | |

THERMAL CHARACTERISTICS

| Symbol | Characteristic | MIN | TYP | MAX | UNIT |
|-----------------|---------------------|-----|-----|------|--------------------|
| $R_{\theta JC}$ | Junction to Case | | | 0.42 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction to Ambient | | | 40 | |

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

② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting $T_j = +25^\circ\text{C}$, $L = 3.85\text{mH}$, $R_G = 25\Omega$, Peak $I_L = 26\text{A}$

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

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

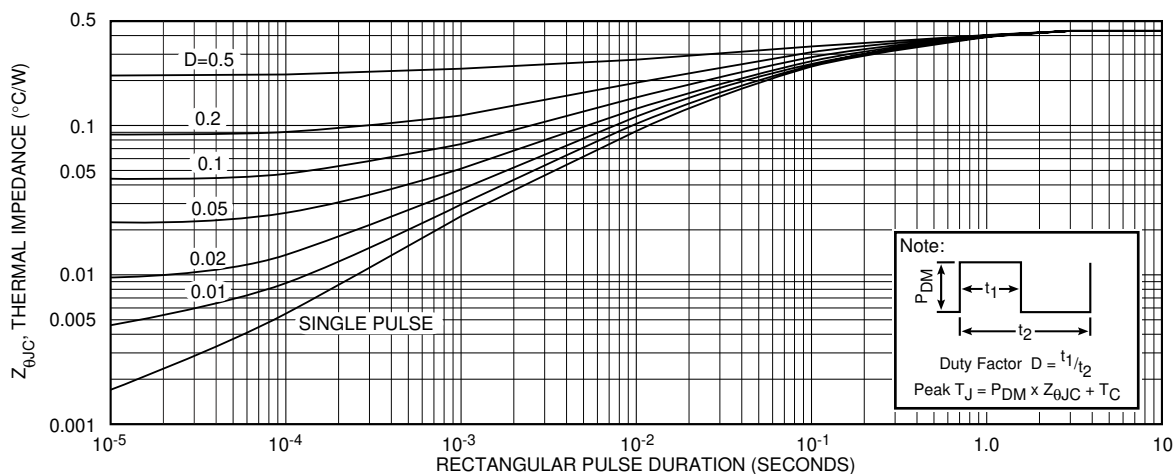


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT5020SVFR

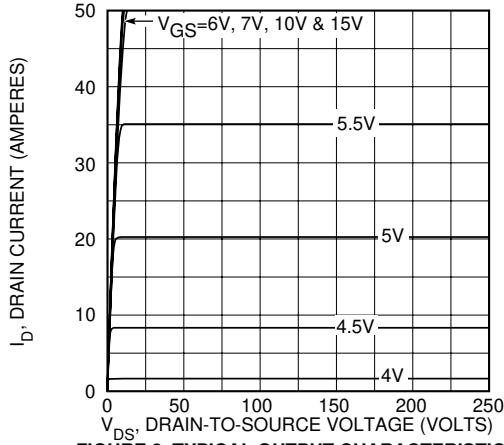


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

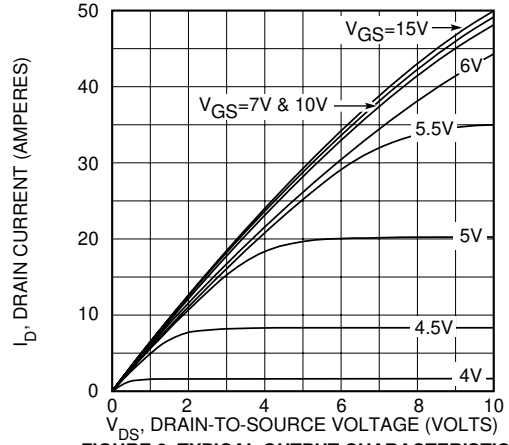


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

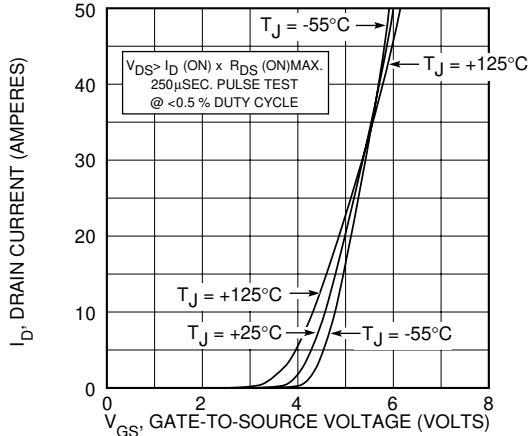


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

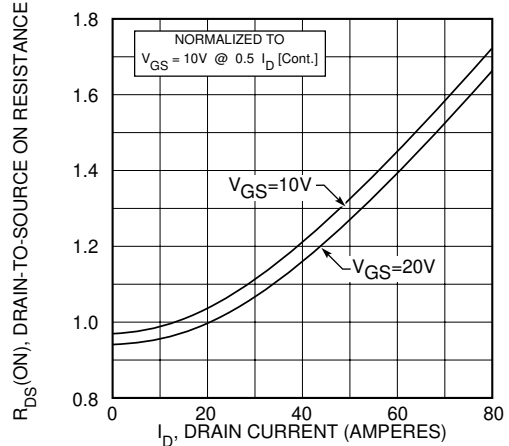


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

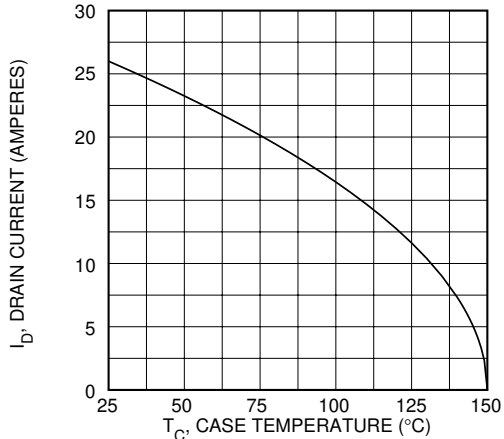


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

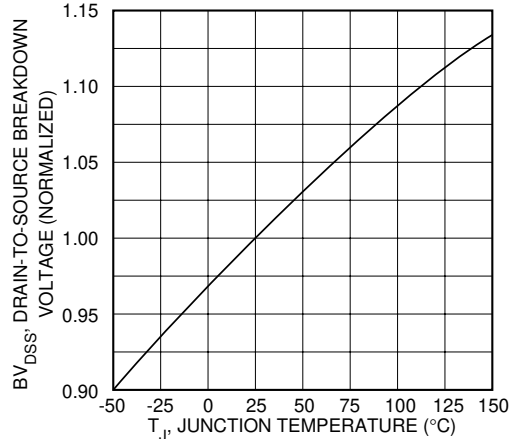


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

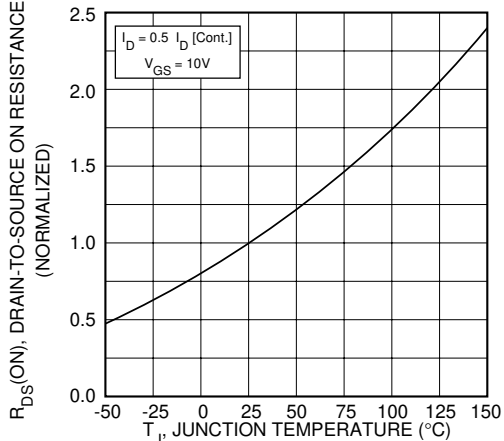


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

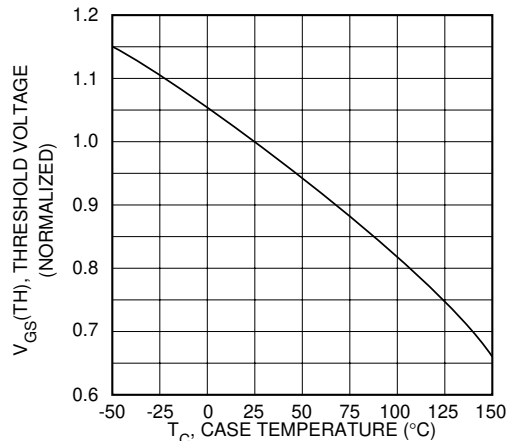


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

APT5020SVFR

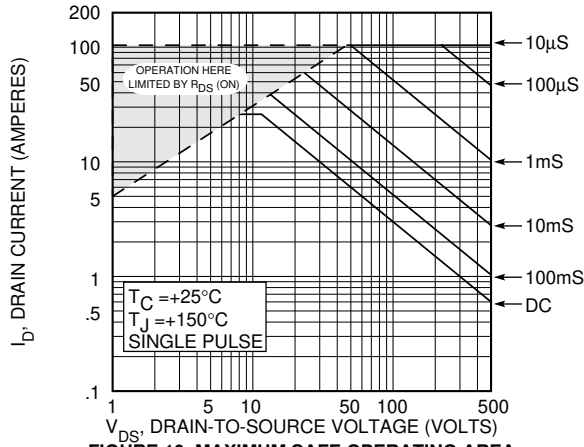


FIGURE 10, MAXIMUM SAFE OPERATING AREA

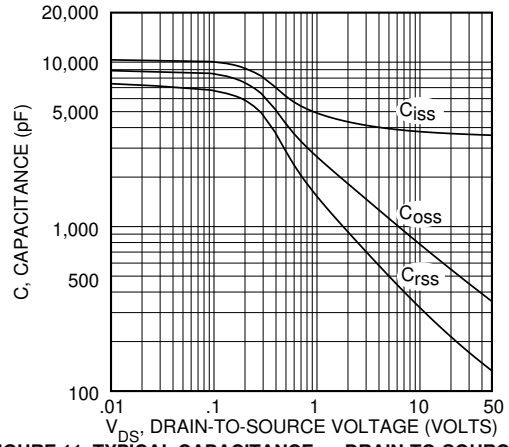


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

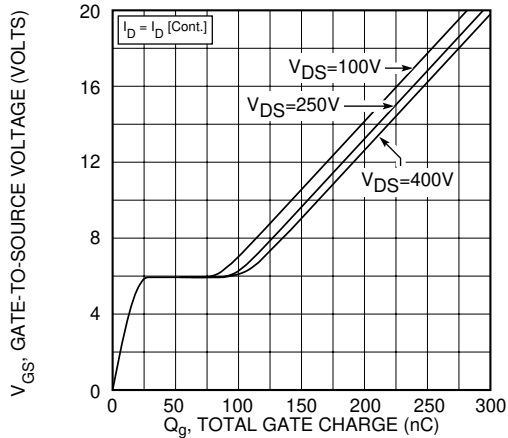


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

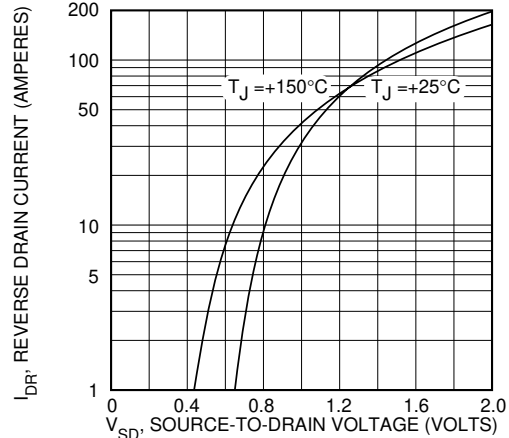


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

D³PAK Package Outline

