

APT1004RGN 1000V 3.3A 4.00Ω

POWER MOS IV™

N - CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

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

| Symbol | Parameter | APT1004RGN | UNIT |
|----------------|---|------------|-------|
| V_{DSS} | Drain-Source Voltage | 1000 | Volts |
| I_D | Continuous Drain Current @ $T_C = 25^\circ\text{C}$ | 3.3 | Amps |
| I_{DM} | Pulsed Drain Current ① | 13.2 | |
| V_{GS} | Gate-Source Voltage | ± 30 | Volts |
| P_D | Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | 100 | Watts |
| | Linear Derating Factor | 0.8 | 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 | |

STATIC ELECTRICAL CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | MIN | TYP | MAX | UNIT |
|---------------------|---|------|-----|-----------|---------------|
| BV_{DSS} | Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu\text{A}$) | 1000 | | | Volts |
| $I_D(\text{ON})$ | On State Drain Current ② ($V_{DS} > I_D(\text{ON}) \times R_{DS}(\text{ON}) \text{ Max}, V_{GS} = 10V$) | 3.3 | | | Amps |
| $R_{DS}(\text{ON})$ | Drain-Source On-State Resistance ② ($V_{GS} = 10V, 0.5 I_D[\text{Cont.}]$) | | | 4.00 | 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 |
| $V_{GS}(\text{TH})$ | Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 1.0\text{mA}$) | 2 | | 4 | Volts |

SAFE OPERATING AREA CHARACTERISTICS

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|----------|---------------------------|--|-----|-----|-----|-------|
| SOA1 | Safe Operating Area | $V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$ | 100 | | | Watts |
| SOA2 | Safe Operating Area | $I_{DS} = I_D[\text{Cont.}], V_{DS} = P_D / I_D[\text{Cont.}], t = 1 \text{ Sec.}$ | 100 | | | |
| I_{LM} | Inductive Current Clamped | | 3.3 | | | Amps |

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

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

DYNAMIC CHARACTERISTICS

APT1004RGN

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|--------------|------------------------------|--|-----|-----|-----|------|
| C_{DC} | Drain-to-Case Capacitance | $f = 1 \text{ MHz}$ | | 8 | 12 | pF |
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$ | | 805 | 950 | |
| C_{oss} | Output Capacitance | | | 115 | 160 | |
| C_{rss} | Reverse Transfer Capacitance | | | 37 | 60 | |
| Q_g | Total Gate Charge | $V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ | | 35 | 55 | nC |
| Q_{gs} | Gate-Source Charge | | | 4.3 | 7 | |
| Q_{gd} | Gate-Drain ("Miller") Charge | | | 18 | 27 | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$ | | 10 | 20 | ns |
| t_r | Rise Time | | | 12 | 24 | |
| $t_{d(off)}$ | Turn-off Delay Time | | | 33 | 50 | |
| t_f | Fall Time | | | 16 | 32 | |

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | MIN | TYP | MAX | UNIT |
|----------|---|-----|------|------|---------|
| I_S | Continuous Source Current (Body Diode) | | | 3.3 | Amps |
| I_{SM} | Pulsed Source Current ^① (Body Diode) | | | 13.2 | |
| V_{SD} | Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$) | | | 1.3 | Volts |
| t_{rr} | Reverse Recovery Time ($I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$) | | 290 | 580 | ns |
| Q_{rr} | Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$) | | 1.65 | 3.3 | μC |

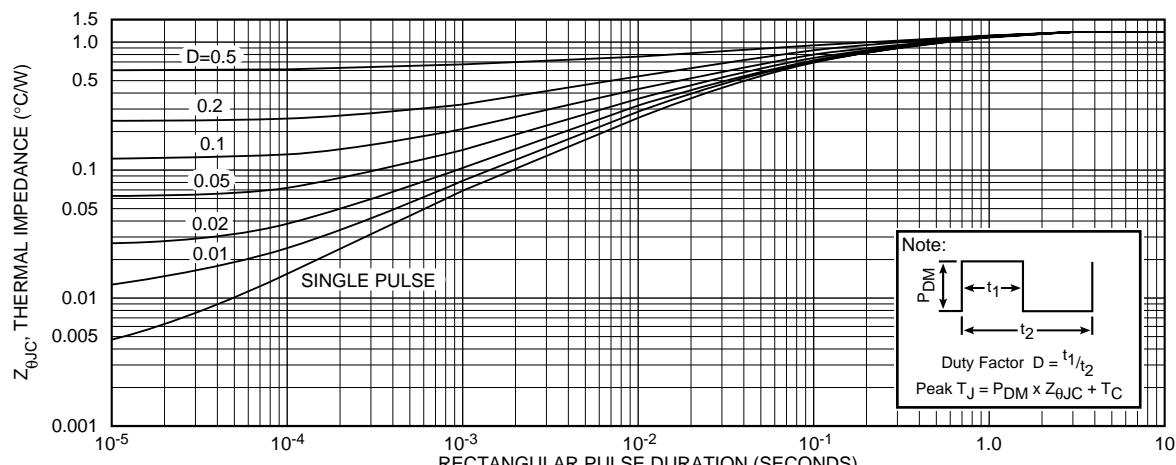
THERMAL CHARACTERISTICS

| Symbol | Characteristic | MIN | TYP | MAX | UNIT |
|-----------------|---------------------|-----|-----|------|------|
| $R_{\theta JC}$ | Junction to Case | | | 1.20 | W/°C |
| $R_{\theta JA}$ | Junction to Ambient | | | 80 | |

① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig.1)

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

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



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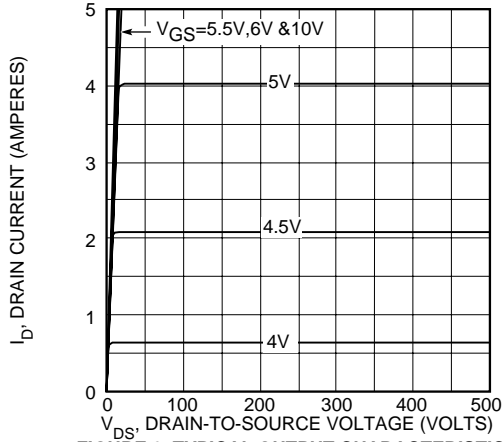


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

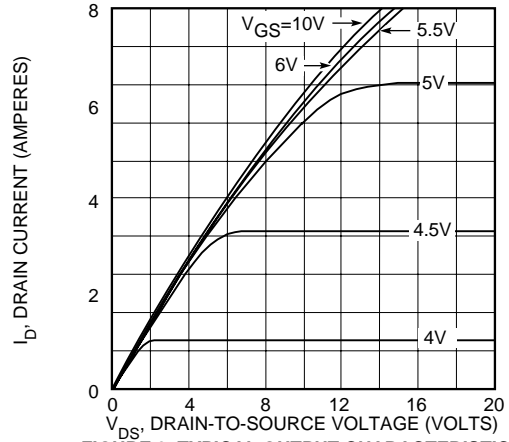


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

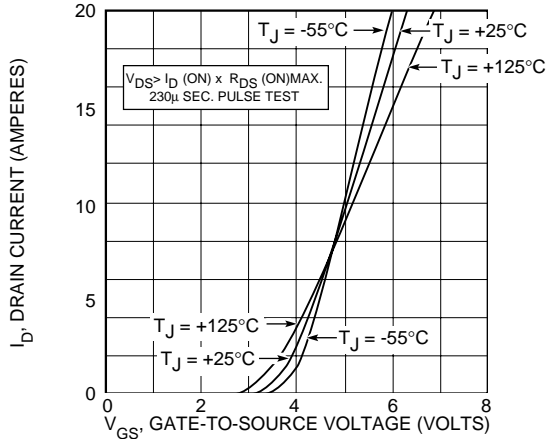


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

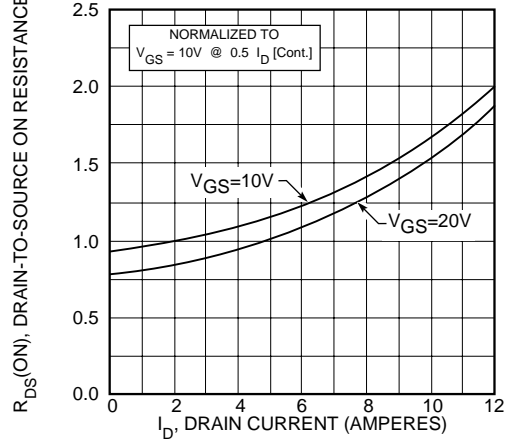


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

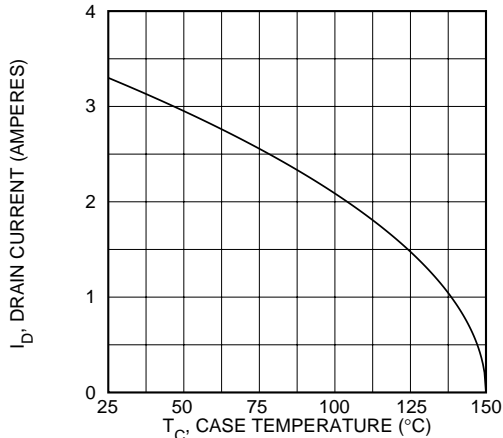


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

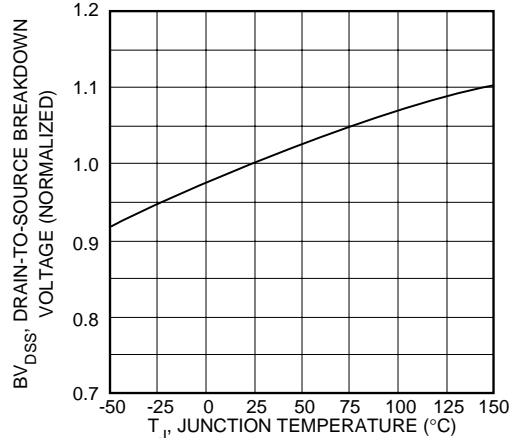


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

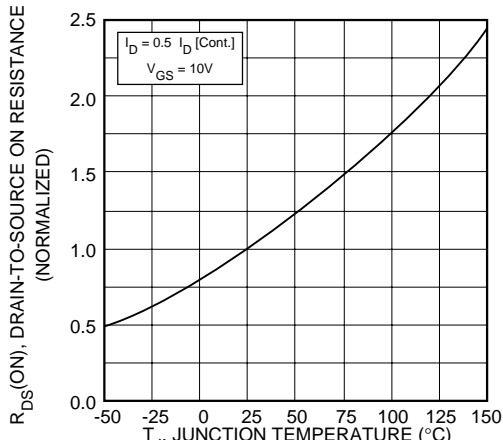


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

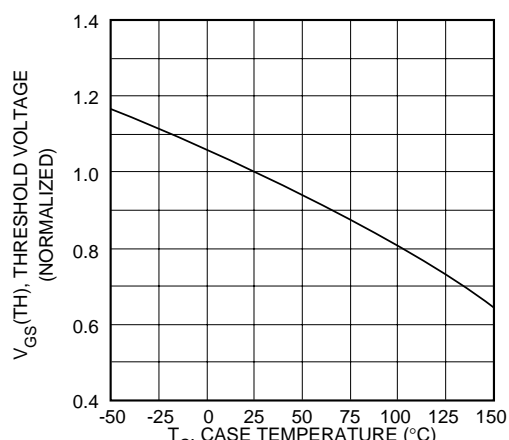


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

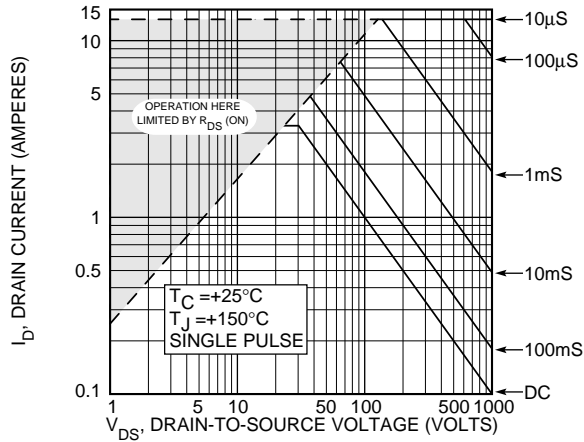


FIGURE 10, MAXIMUM SAFE OPERATING AREA

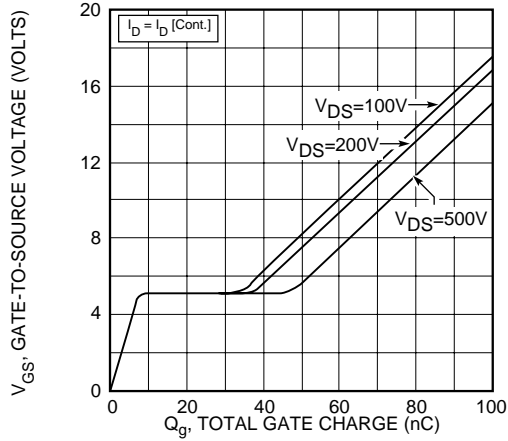


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

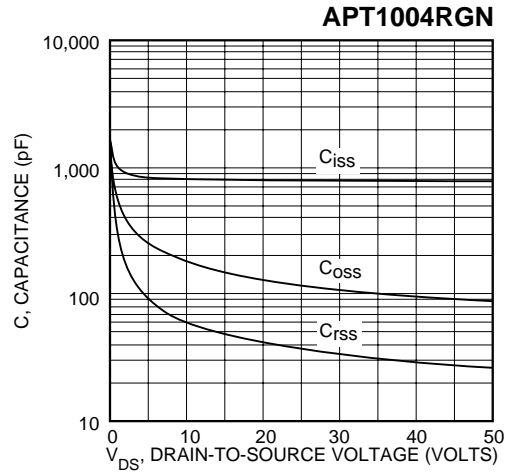


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

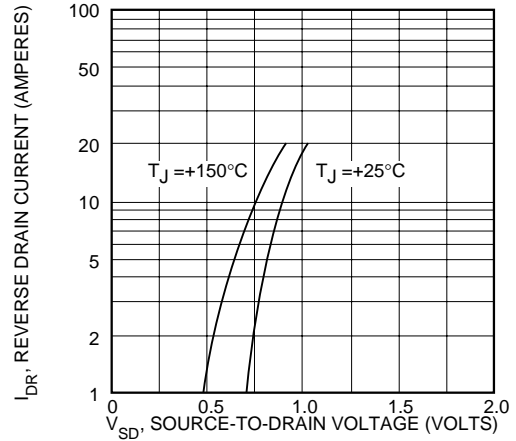
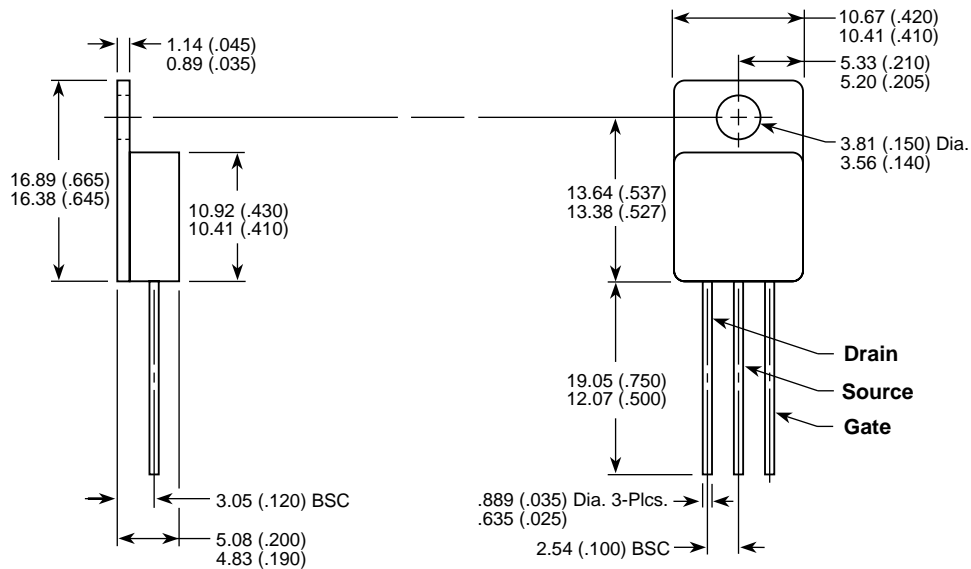


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-257AA Package Outline



Dimensions in Millimeters and (Inches)