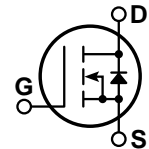


### Super Junction MOSFET



- Ultra low  $R_{DS(ON)}$
- Low Miller Capacitance
- Ultra Low Gate Charge,  $Q_g$
- Avalanche Energy Rated
- N-Channel Enhancement Mode
- Popular SOT-227 Package



#### MAXIMUM RATINGS

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

| Symbol         | Parameter  | APT31N80JC3 | UNIT                |
|----------------|--|-------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage   | 800         | Volts               |
| $I_D$          | Continuous Drain Current @ $T_C = 25^\circ\text{C}$                                    | 31          | Amps                |
| $I_{DM}$       | Pulsed Drain Current <sup>①</sup>  | 102         |                     |
| $V_{GS}$       | Gate-Source Voltage Continuous   | $\pm 20$    | Volts               |
| $V_{GSM}$      | Gate-Source Voltage Transient  | $\pm 30$    |                     |
| $P_D$          | Total Power Dissipation @ $T_C = 25^\circ\text{C}$                                     | 338         | Watts               |
|                | Linear Derating Factor   | 2.70        | 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.   | 260         |                     |
| $I_{AR}$       | Avalanche Current <sup>①</sup> (Repetitive and Non-Repetitive)                         | 31          | Amps                |
| $E_{AR}$       | Repetitive Avalanche Energy <sup>①</sup> ( $I_D = 31\text{A}, V_{DD} = -50\text{V}$ )  | 1           | mJ                  |
| $E_{AS}$       | Single Pulse Avalanche Energy <sup>④</sup> ( $I_D = 8\text{A}, V_{DD} = -50\text{V}$ ) | 1340        |                     |

#### STATIC ELECTRICAL CHARACTERISTICS

| Symbol       | Characteristic / Test Conditions  | MIN | TYP  | MAX       | UNIT          |
|--------------|---|-----|------|-----------|---------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{V}, I_D = 500\mu\text{A}$ )                             | 800 |      |           | Volts         |
| $I_{D(on)}$  | On State Drain Current <sup>②</sup> ( $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10\text{V}$ ) | 31  |      |           | Amps          |
| $R_{DS(on)}$ | Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10\text{V}, I_D = 22\text{A}$ )                 |     | .125 | 0.145     | Ohms          |
| $I_{DSS}$    | Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0\text{V}$ )                                |     | 1.0  | 50        | $\mu\text{A}$ |
|              | Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0\text{V}, T_J = 150^\circ\text{C}$ )       |     |      | 500       |               |
| $I_{GSS}$    | Gate-Source Leakage Current ( $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ )                             |     |      | $\pm 200$ | nA            |
| $V_{GS(th)}$ | Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 2\text{mA}$ )  | 2.1 | 3    | 3.9       | Volts         |

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

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

"COOLMOS™" comprise a new family of transistors developed by Infineon Technologies AG. "COOLMOS" is a trademark of Infineon Technologies AG"

**DYNAMIC CHARACTERISTICS**

**APT31N80JC3**

| Symbol       | Characteristic                 | Test Conditions   | MIN | TYP  | MAX | UNIT |
|--------------|--------------------------------|---|-----|------|-----|------|
| $C_{iss}$    | Input Capacitance              | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1\text{ MHz}$   |     | 4640 |     | pF   |
| $C_{oss}$    | Output Capacitance             |   |     | 2500 |     |      |
| $C_{rss}$    | Reverse Transfer Capacitance   |   |     | 120  |     |      |
| $Q_g$        | Total Gate Charge <sup>③</sup> | $V_{GS} = 0\text{ to }10V$<br>$V_{DD} = 640V$<br>$I_D = I_{D31A} @ 25^\circ C$                      |     | 182  | 354 | nC   |
| $Q_{gs}$     | Gate-Source Charge             |   |     | 24   |     |      |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge   |   |     | 92   |     |      |
| $t_{d(on)}$  | Turn-on Delay Time             | $V_{GS} = 0\text{ to }10V$<br>$V_{DD} = 400V$<br>$I_D = I_{D31A} @ 25^\circ C$<br>$R_G = 4.7\Omega$ |     | TBD  |     | ns   |
| $t_r$        | Current Rise Time              |   |     | TBD  |     |      |
| $t_{d(off)}$ | Turn-off Delay Time            |   |     | TBD  |     |      |
| $t_f$        | Current Fall Time              |   |     | TBD  |     |      |

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

| Symbol   | Characteristic / Test Conditions  | MIN | TYP | MAX | UNIT    |
|----------|---|-----|-----|-----|---------|
| $I_S$    | Continuous Source Current (Body Diode)                                    |     |     | 31  | Amps    |
| $I_{SM}$ | Pulsed Source Current <sup>①</sup> (Body Diode)                           |     |     | 102 |         |
| $V_{SD}$ | Diode Forward Voltage <sup>②</sup> ( $V_{GS} = 0V, I_S = -I_{D[Cont.]}$ ) |     | 1   | 1.2 | Volts   |
| $t_{rr}$ | Reverse Recovery Time ( $I_S = -I_{D[Cont.]}, di_S/dt = 100A/\mu s$ )     |     | 550 |     | ns      |
| $Q_{rr}$ | Reverse Recovery Charge ( $I_S = -I_{D[Cont.]}, di_S/dt = 100A/\mu s$ )   |     | 30  |     | $\mu C$ |
| $dv/dt$  | Peak Diode Recovery $dv/dt$ <sup>④</sup>                                  |     |     | 6   | V/ns    |

**THERMAL CHARACTERISTICS**

| Symbol          | Characteristic      | MIN | TYP | MAX  | UNIT         |
|-----------------|---------------------|-----|-----|------|--------------|
| $R_{\theta JC}$ | Junction to Case    |     |     | 0.37 | $^\circ C/W$ |
| $R_{\theta JA}$ | Junction to Ambient |     |     | TBD  |              |

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

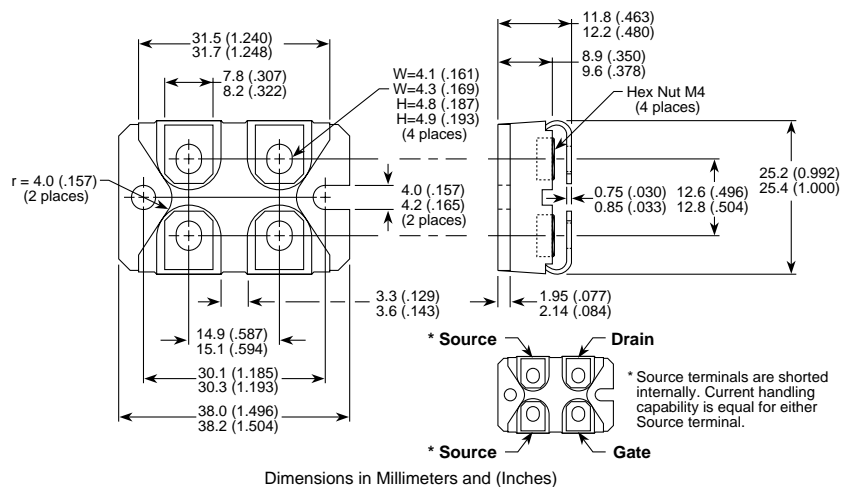
② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_{D[Cont.]}$ ,  $di/dt \leq 100A/\mu s$ ,  $V_R \leq 400V$ ,  $T_J \leq 150^\circ C$

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

**SOT-227 (ISOTOP<sup>®</sup>) 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