# STATIC ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic / Test Conditions</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_F$</td>
<td>Forward Voltage</td>
<td>$.80</td>
<td>$.85</td>
<td></td>
<td>Volts</td>
</tr>
<tr>
<td>$I_F$</td>
<td>Maximum Average Forward Current</td>
<td></td>
<td></td>
<td></td>
<td>Amps</td>
</tr>
<tr>
<td>$I_{RHM}$</td>
<td>RMS Forward Current (Square wave, 50% duty)</td>
<td></td>
<td></td>
<td></td>
<td>Amps</td>
</tr>
<tr>
<td>$I_{RSM}$</td>
<td>Non-Repetitive Forward Surge Current</td>
<td></td>
<td></td>
<td></td>
<td>Amps</td>
</tr>
<tr>
<td>$E_{AVL}$</td>
<td>Avalanche Energy (2A, 15mH)</td>
<td></td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
</tbody>
</table>

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APT Website - http://www.advancedpower.com
### Dynamic Characteristics

**THERMAL AND MECHANICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic / Test Conditions</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{\text{θ}_{JC}}$</td>
<td>Junction-to-Case Thermal Resistance</td>
<td>1.04</td>
<td></td>
<td>°C/W</td>
<td></td>
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<tr>
<td>$R_{\text{θ}_{JA}}$</td>
<td>Junction-to-Ambient Thermal Resistance</td>
<td>20</td>
<td></td>
<td>°C/W</td>
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<tr>
<td>$W_T$</td>
<td>Package Weight</td>
<td>1.03</td>
<td></td>
<td>oz</td>
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<tr>
<td></td>
<td></td>
<td>29.2</td>
<td></td>
<td>g</td>
<td></td>
</tr>
<tr>
<td>Torque</td>
<td>Maximum Terminal &amp; Mounting Torque</td>
<td>10</td>
<td></td>
<td>lb•in</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.1</td>
<td>N•m</td>
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</tr>
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</table>

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

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

**FIGURE 1b. TRANSIENT THERMAL IMPEDANCE MODEL**
TYPICAL PERFORMANCE CURVES

**Figure 2. Forward Current vs. Forward Voltage**

**Figure 3. Reverse Recovery Time vs. Current Rate of Change**

**Figure 4. Reverse Recovery Charge vs. Current Rate of Change**

**Figure 5. Reverse Recovery Current vs. Current Rate of Change**

**Figure 6. Dynamic Parameters vs. Junction Temperature**

**Figure 7. Maximum Average Forward Current vs. Case Temperature**

**Figure 8. Junction Capacitance vs. Reverse Voltage**

**APT2X31S20J**

- **TJ = 125°C**
  - VR = 133V
- **TJ = 150°C**
  - VR = 133V
- **TJ = -55°C**
  - VR = 133V

**CJ, JUNCTION CAPACITANCE**

- **Kf, DYNAMIC PARAMETERS**
  - Normalized to 700A/μs

- **IF(AV), FORWARD VOLTAGE**
- **VF, ANODE-TO-CATHODE VOLTAGE (V)**
- **-diF /dt, CURRENT RATE OF CHANGE (A/μs)**

- **Grr, REVERSE RECOVERY CHARGE**
- **Qrr, REVERSE RECOVERY CURRENT**
- **t rr, REVERSE RECOVERY TIME**
- **trr, REVERSE RECOVERY CHARGE**

- **TJ, JUNCTION TEMPERATURE (°C)**
- **Case Temperature (°C)**

- **VR, REVERSE VOLTAGE (V)**

- **Duty cycle = 0.5**

- **0 0.2 0.4 0.6 0.8 1 1.2**
  - 0 200 400 600 800

- **100 90 80 70 60 50 40 30 20 10**
  - 0 200 400 600 800 0 200 400 600 800

- **1200 1000 800 600 400 200 0**
  - 1800 1600 1400 1200 1000 800 600 400 200 0

- **1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.0**
  - 1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.0

- **0 25 50 75 100 125 150 25 50 75 100 125 150**
  - 1 10 100 200

- **0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600**
  - 0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600

- **0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100**
  - 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
1. $I_F$ - Forward Conduction Current
2. $\frac{di_F}{dt}$ - Rate of Diode Current Change Through Zero Crossing.
3. $I_{RRM}$ - Maximum Reverse Recovery Current.
4. $t_{rr}$ - Reverse Recovery Time, measured from zero crossing where diode current goes from positive to negative, to the point at which the straight line through $I_{RRM}$ and $0.25 \cdot I_{RRM}$ passes through zero.
5. $Q_{rr}$ - Area Under the Curve Defined by $I_{RRM}$ and $t_{rr}$.

Figure 9. Diode Test Circuit

Figure 10. Diode Reverse Recovery Waveform and Definitions

**SOT-227 Package Outline**

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