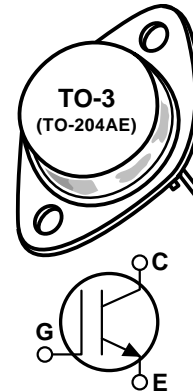


Thunderbolt IGBT™

The Thunderbolt IGBT™ is a new generation of high voltage power IGBTs. Using Non-Punch Through Technology the Thunderbolt IGBT™ offers superior ruggedness and ultrafast switching speed.

- **Low Forward Voltage Drop**
- **Low Tail Current**
- **Avalanche Rated**
- **Hermetic Package**
- **High Freq. Switching to 150KHz**
- **Ultra Low Leakage Current**
- **RBSOA and SCSOA Rated**




MAXIMUM RATINGS

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

| Symbol | Parameter | APT20GT60AR | UNIT |
|----------------|---|-------------|------------------|
| V_{CES} | Collector-Emitter Voltage | 600 | Volts |
| V_{CGR} | Collector-Gate Voltage ($R_{GE} = 20K\Omega$) | 600 | |
| V_{EC} | Emitter-Collector Voltage | 15 | |
| V_{GE} | Gate-Emitter Voltage | ± 20 | |
| I_{C1} | Continuous Collector Current @ $T_C = 25^\circ\text{C}$ | 30 | Amps |
| I_{C2} | Continuous Collector Current @ $T_C = 100^\circ\text{C}$ | 20 | |
| I_{CM} | Pulsed Collector Current ^① @ $T_C = 25^\circ\text{C}$ | 60 | |
| I_{LM} | RBSOA Clamped Inductive Load Current @ $R_g = 11\Omega$ $T_C = 125^\circ\text{C}$ | 40 | |
| E_{AS} | Single Pulse Avalanche Energy ^② | 40 | mJ |
| P_D | Total Power Dissipation | 140 | Watts |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_L | Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec. | 300 | |

STATIC ELECTRICAL CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | MIN | TYP | MAX | UNIT |
|--------------|---|-----|-----|-----------|---------|
| BV_{CES} | Collector-Emitter Breakdown Voltage ($V_{GE} = 0V, I_C = 0.5mA, T_j = -55^\circ\text{C}$) | 600 | | | Volts |
| RBV_{CES} | Collector-Emitter Reverse Breakdown Voltage ($V_{GE} = 0V, I_C = 50mA$) | -15 | | | |
| $V_{GE(TH)}$ | Gate Threshold Voltage ($V_{CE} = V_{GE}, I_C = 500\mu A, T_j = 25^\circ\text{C}$) | 3 | 4 | 5 | |
| $V_{CE(ON)}$ | Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = I_{C2}, T_j = 25^\circ\text{C}$) | 1.6 | 2.0 | 2.5 | |
| | Collector-Emitter On Voltage ($V_{GE} = 15V, I_C = I_{C2}, T_j = 150^\circ\text{C}$) | | | 2.8 | |
| I_{CES} | Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25^\circ\text{C}$) | | | 40 | μA |
| | Collector Cut-off Current ($V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 150^\circ\text{C}$) | | | 1000 | |
| I_{GES} | Gate-Emitter Leakage Current ($V_{GE} = \pm 20V, V_{CE} = 0V$) | | | ± 100 | nA |

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

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

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 EUROPE Chemin de Magret F-33700 Merignac - France Phone: (33) 5 57 92 15 15 FAX: (33) 5 56 47 97 61

DYNAMIC CHARACTERISTICS

APT20GT60AR

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|--------------|----------------------------------|---|-----|------|-----|------|
| C_{ies} | Input Capacitance | Capacitance $V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1\text{ MHz}$ | | 1100 | | pF |
| C_{oes} | Output Capacitance | | | 110 | | |
| C_{res} | Reverse Transfer Capacitance | | | 65 | | |
| Q_g | Total Gate Charge ^③ | Gate Charge $V_{GE} = 15V$ $V_{CC} = 0.5V_{CES}$ $I_C = I_{C2}$ | | 95 | | nC |
| Q_{ge} | Gate-Emitter Charge | | | 40 | | |
| Q_{gc} | Gate-Collector ("Miller") Charge | | | 8 | | |
| $t_{d(on)}$ | Turn-on Delay Time | Resistive Switching (25°C) $V_{GE} = 15V$ $V_{CC} = 0.8V_{CES}$ $I_C = I_{C2}$ $R_G = 10\Omega$ | | 10 | | ns |
| t_r | Rise Time | | | 34 | | |
| $t_{d(off)}$ | Turn-off Delay Time | | | 115 | | |
| t_f | Fall Time | | | 125 | | |
| $t_{d(on)}$ | Turn-on Delay Time | Inductive Switching (150°C) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +150^\circ\text{C}$ | | 15 | | ns |
| t_r | Rise Time | | | 15 | | |
| $t_{d(off)}$ | Turn-off Delay Time | | | 190 | | |
| t_f | Fall Time | | | 30 | | |
| E_{on} | Turn-on Switching Energy | $R_G = 10\Omega$ $T_J = +150^\circ\text{C}$ | | 0.55 | | mJ |
| E_{off} | Turn-off Switching Energy | | | 0.45 | | |
| E_{ts} | Total Switching Losses | | | 1.0 | | |
| $t_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C) $V_{CLAMP(Peak)} = 0.66V_{CES}$ $V_{GE} = 15V$ $I_C = I_{C2}$ $R_G = 10\Omega$ $T_J = +25^\circ\text{C}$ | | 15 | | ns |
| t_r | Rise Time | | | 18 | | |
| $t_{d(off)}$ | Turn-off Delay Time | | | 160 | | |
| t_f | Fall Time | | | 25 | | |
| E_{ts} | Total Switching Losses | | | 0.60 | | |
| g_{fe} | Forward Transconductance | $V_{CE} = 20V, I_C = I_{C2}$ | 4 | | | S |

THERMAL CHARACTERISTICS

| Symbol | Characteristic | MIN | TYP | MAX | UNIT |
|-----------------|---------------------|-----|-----|------|------|
| $R_{\theta JC}$ | Junction to Case | | | 0.90 | °C/W |
| $R_{\theta JA}$ | Junction to Ambient | | | 80 | |

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

② $I_C = I_{C2}$, $R_{GE} = 25\Omega$, $L = 200\mu\text{H}$, $T_J = 25^\circ\text{C}$

③ See MIL-STD-750 Method 3471

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