Microsemi
POWER PRODUCTS GROUP

**1200V**

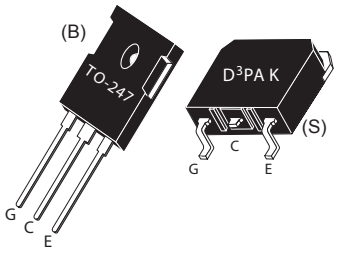
**APT15GT120BRDQ1 APT15GT120SRDQ1**
**APT15GT120BRDQ1G* APT15GT120SRDQ1G***

***G Denotes RoHS Compliant, Pb Free Terminal Finish.**

# Thunderbolt IGBT®

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

- **Low Forward Voltage Drop**
- **High Freq. Switching to 50KHz**
- **Low Tail Current**
- **Ultra Low Leakage Current**
- **RBSOA and SCSOA Rated**






Combi (IGBT and Diode)

## MAXIMUM RATINGS

All Ratings: $T_C$ = 25°C unless otherwise specified.

| Symbol | Parameter | APT15GT120B_SRDQ1(G) | UNIT |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 1200 | Volts |
| $V_{GE}$ | Gate-Emitter Voltage | ±30 | |
| $I_{C1}$ | Continuous Collector Current @ $T_C$ = 25°C | 36 | Amps |
| $I_{C2}$ | Continuous Collector Current @ $T_C$ = 110°C | 18 | |
| $I_{CM}$ | Pulsed Collector Current ① @ $T_C$ = 150°C | 45 | |
| SSOA | Switching Safe Operating Area @ $T_J$ = 150°C | 45A @ 960V | |
| $P_D$ | Total Power Dissipation | 250 | Watts |
| $T_J$,$T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to 150 | °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 | Units |
|---|---|---|---|---|---|
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage ($V_{GE}$ = 0V, $I_C$ = 1mA) | 1200 | | | Volts |
| $V_{GE(TH)}$ | Gate Threshold Voltage ($V_{CE}$ = $V_{GE}$, $I_C$ = 0.6mA, $T_j$ = 25°C) | 4.5 | 5.5 | 6.5 | |
| $V_{CE(ON)}$ | Collector-Emitter On Voltage ($V_{GE}$ = 15V, $I_C$ = 15A, $T_j$ = 25°C) | 2.5 | 3.0 | 3.6 | |
| | Collector-Emitter On Voltage ($V_{GE}$ = 15V, $I_C$ = 15A, $T_j$ = 125°C) | | 3.8 | | |
| $I_{CES}$ | Collector Cut-off Current ($V_{CE}$ = 1200V, $V_{GE}$ = 0V, $T_j$ = 25°C) ② | | | 200 | µA |
| | Collector Cut-off Current ($V_{CE}$ = 1200V, $V_{GE}$ = 0V, $T_j$ = 125°C) ② | | | TBD | |
| $I_{GES}$ | Gate-Emitter Leakage Current ($V_{GE}$ = ±20V) | | | 480 | nA |

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

## DYNAMIC CHARACTERISTICS



| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $C_{ies}$ | Input Capacitance | **Capacitance** | | 1250 | | pF |
| $C_{oes}$ | Output Capacitance | $V_{GE}$ = 0V, $V_{CE}$ = 25V | | 100 | | |
| $C_{res}$ | Reverse Transfer Capacitance | f = 1 MHz | | 65 | | |
| $V_{GEP}$ | Gate-to-Emitter Plateau Voltage | Gate Charge | | 10 | | V |
| $Q_g$ | Total Gate Charge ③ | $V_{GE}$ = 15V | | 105 | | nC |
| $Q_{ge}$ | Gate-Emitter Charge | $V_{CE}$ = 600V | | 10 | | |
| $Q_{gc}$ | Gate-Collector ("Miller") Charge | $I_C$ = 15A | | 60 | | |
| SSOA | Switching Safe Operating Area | $T_J$ = 150°C, $R_G$ = 5Ω, $V_{GE}$ = 15V, L = 100µH, $V_{CE}$ = 960V | 45 | | | A |
| $t_{d(on)}$ | Turn-on Delay Time | **Inductive Switching (25°C)** | | 10 | | ns |
| $t_r$ | Current Rise Time | $V_{CC}$ = 800V | | 11 | | |
| $t_{d(off)}$ | Turn-off Delay Time | $V_{GE}$ = 15V | | 85 | | |
| $t_f$ | Current Fall Time | $I_C$ = 15A | | 35 | | |
| $E_{on1}$ | Turn-on Switching Energy ④ | $R_G$ = 5Ω | | 585 | | µJ |
| $E_{on2}$ | Turn-on Switching Energy (Diode) ⑤ | $T_J$ = +25°C | | 800 | | |
| $E_{off}$ | Turn-off Switching Energy ⑥ | | | 260 | | |
| $t_{d(on)}$ | Turn-on Delay Time | **Inductive Switching (125°C)** | | 10 | | ns |
| $t_r$ | Current Rise Time | $V_{CC}$ = 800V | | 11 | | |
| $t_{d(off)}$ | Turn-off Delay Time | $V_{GE}$ = 15V | | 95 | | |
| $t_f$ | Current Fall Time | $I_C$ = 15A | | 42 | | |
| $E_{on1}$ | Turn-on Switching Energy ④ | $R_G$ = 5Ω | | 590 | | µJ |
| $E_{on2}$ | Turn-on Switching Energy (Diode) ⑤ | $T_J$ = +125°C | | 1440 | | |
| $E_{off}$ | Turn-off Switching Energy ⑥ | | | 340 | | |

## THERMAL AND MECHANICAL CHARACTERISTICS

| Symbol | Characteristic | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction to Case **(IGBT)** | | | .50 | °C/W |
| $R_{\theta JC}$ | Junction to Case **(DIODE)** | | | 1.18 | |
| $W_T$ | Package Weight | | 5.9 | | gm |

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

② For Combi devices, $I_{ces}$ includes both IGBT and FRED leakages

③ See MIL-STD-750 Method 3471.

④ $E_{on1}$ is the clamped inductive turn-on energy of the IGBT only, without the effect of a commutating diode reverse recovery current adding to the IGBT turn-on loss. Tested in inductive switching test circuit shown in figure 21, but with a Silicon Carbide diode.

⑤ $E_{on2}$ is the clamped inductive turn-on energy that includes a commutating diode reverse recovery current in the IGBT turn-on switching loss. (See Figures 21, 22.)

⑥ $E_{off}$ is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1. (See Figures 21, 23.)

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

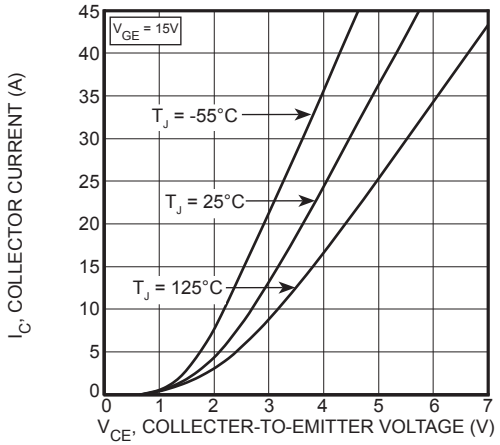



**FIGURE 1, Output Characteristics($T_J$ = 25°C)**

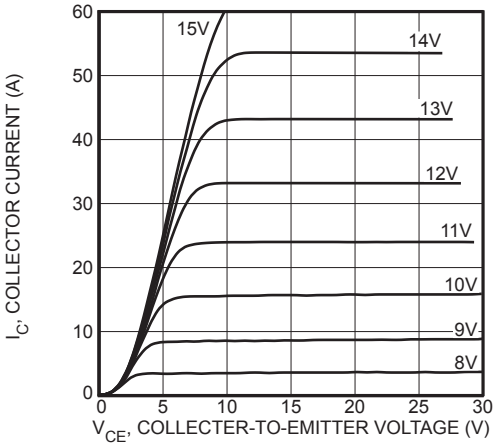



**FIGURE 2, Output Characteristics ($T_J$ = 125°C)**

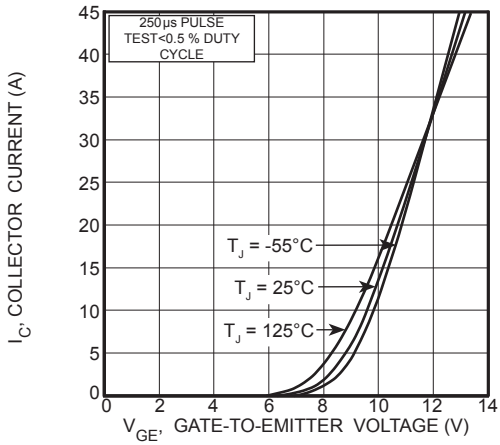



**FIGURE 3, Transfer Characteristics**

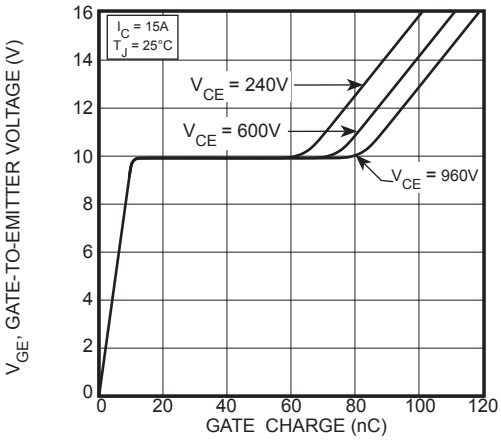



**FIGURE 4, Gate Charge**

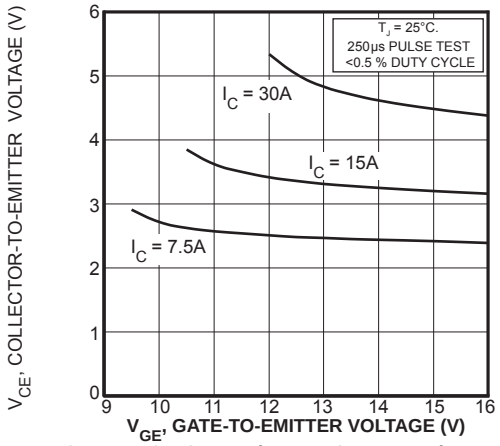



**FIGURE 5, On State Voltage vs Gate-to- Emitter Voltage**

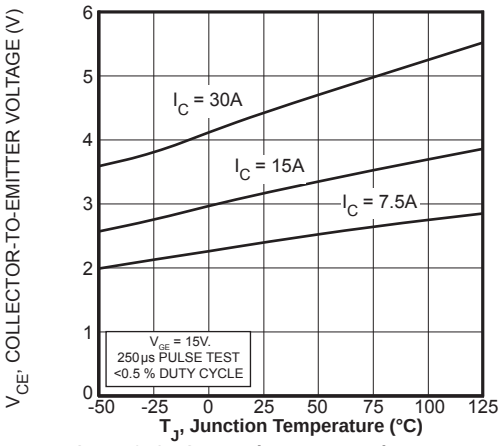



**FIGURE 6, On State Voltage vs Junction Temperature**

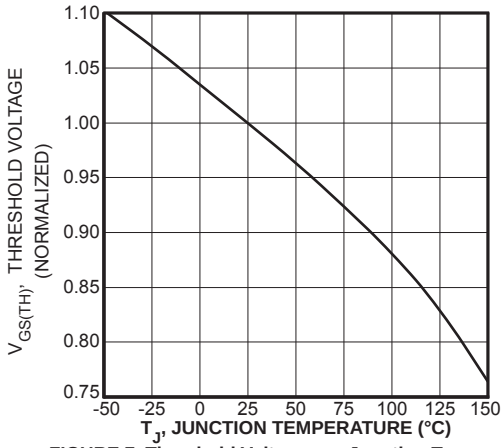



**FIGURE 7, Threshold Voltage vs. Junction Temperature**

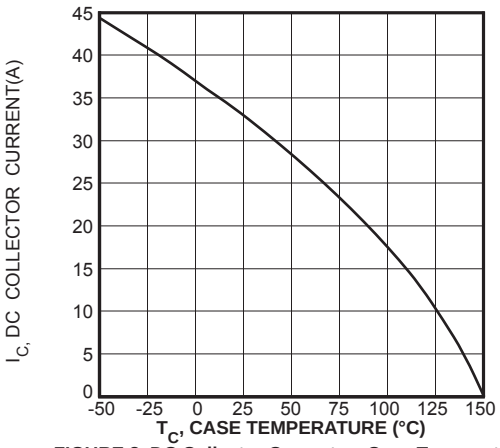



**FIGURE 8, DC Collector Current vs Case Temperature**

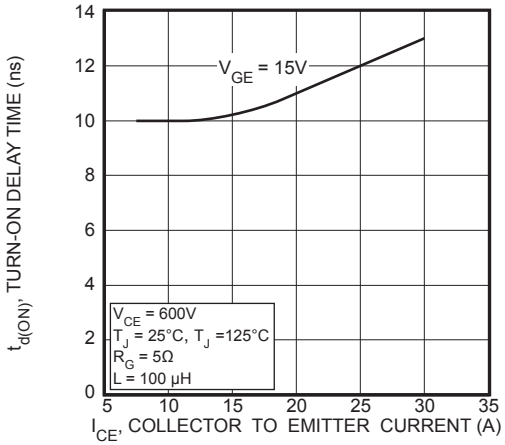



**FIGURE 9, Turn-On Delay Time vs Collector Current**

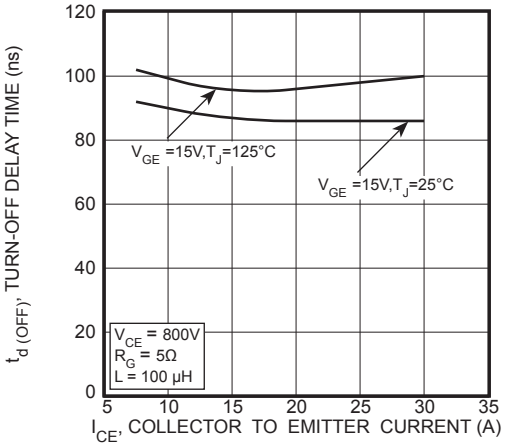



**FIGURE 10, Turn-Off Delay Time vs Collector Current**

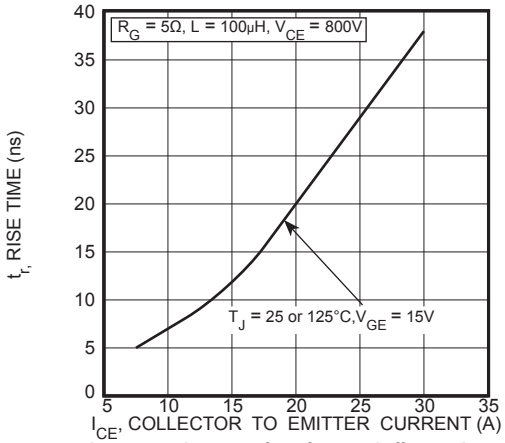



**FIGURE 11, Current Rise Time vs Collector Current**

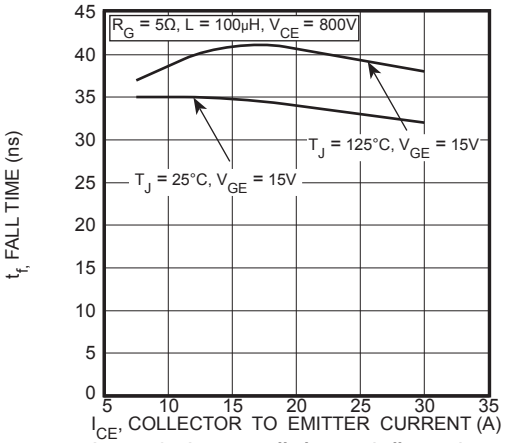



**FIGURE 12, Current Fall Time vs Collector Current**

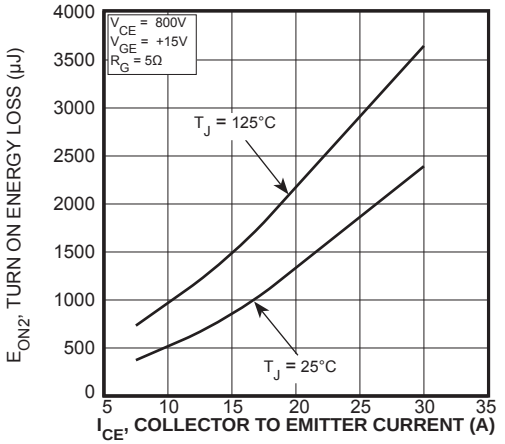



**FIGURE 13, Turn-On Energy Loss vs Collector Current**

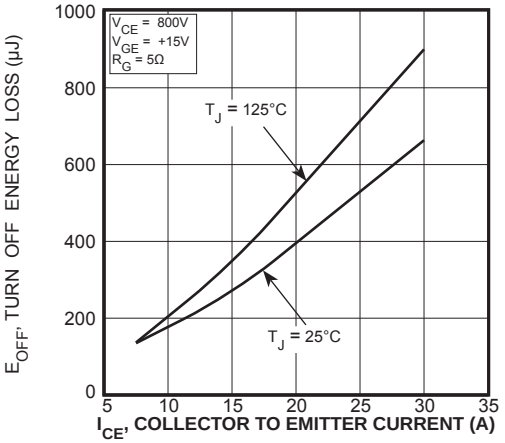



**FIGURE 14, Turn Off Energy Loss vs Collector Current**

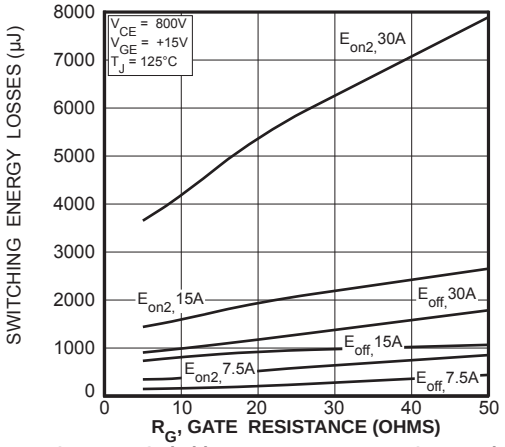



**FIGURE 15, Switching Energy Losses vs. Gate Resistance**

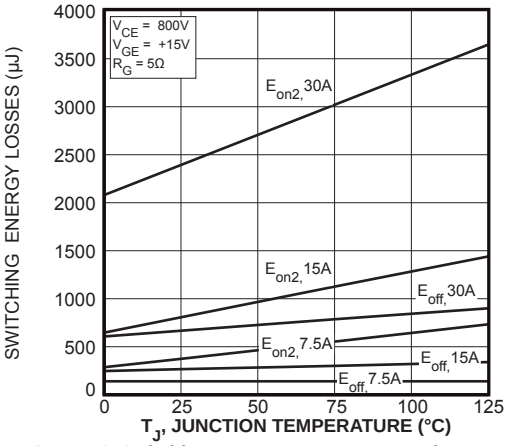



**FIGURE 16, Switching Energy Losses vs Junction Temperature**

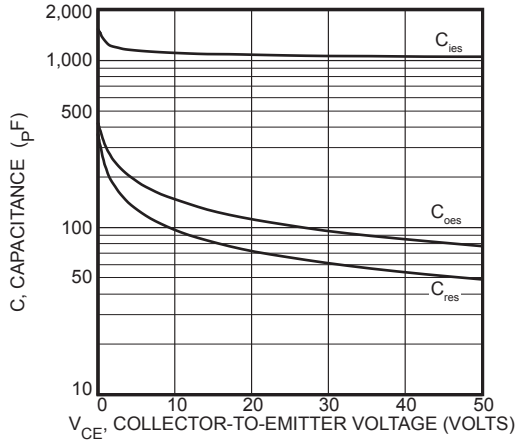



**Figure 17, Capacitance vs Collector-To-Emitter Voltage**

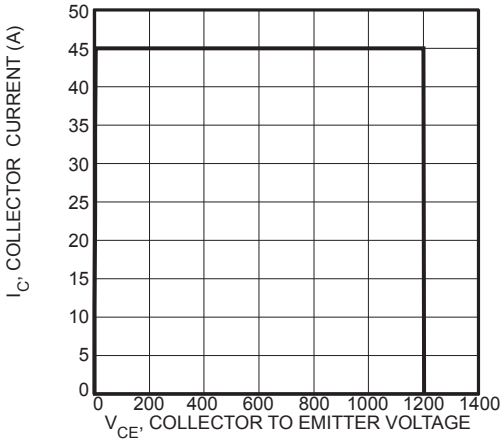



**Figure 18,Minimim Switching Safe Operating Area**

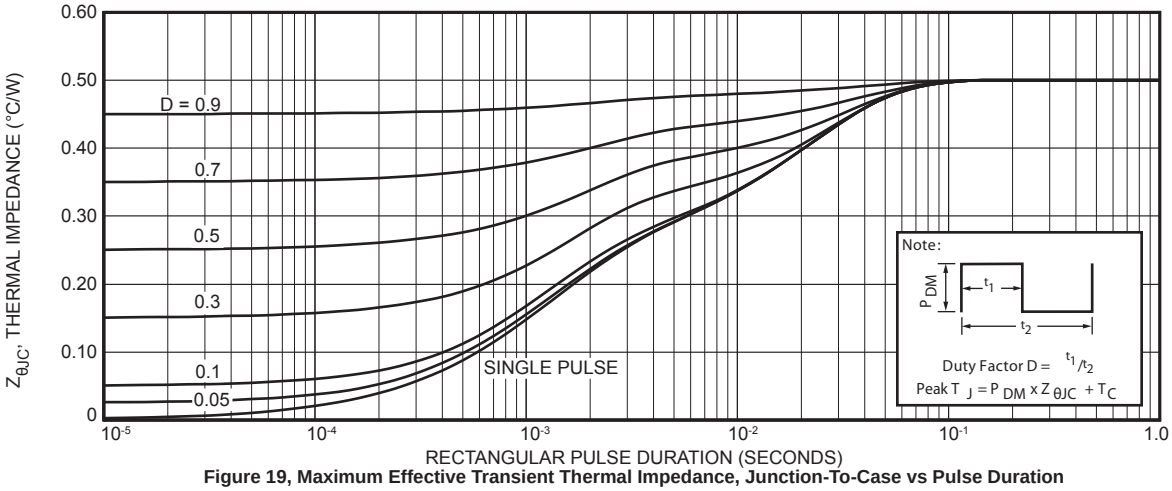



**Figure 19, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration**

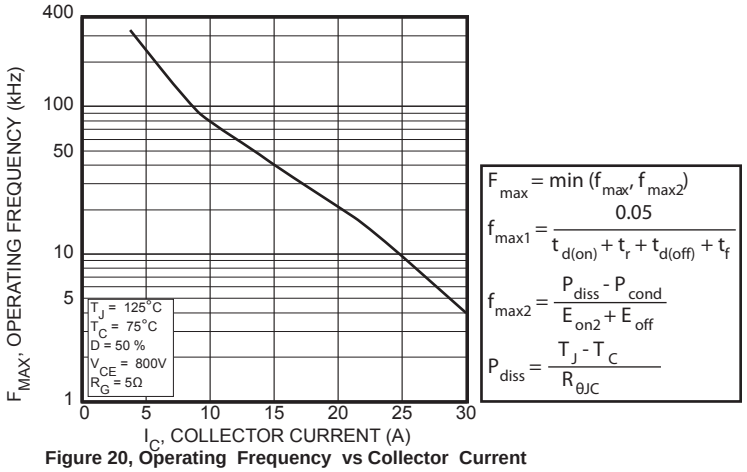



**Figure 20, Operating Frequency vs Collector Current**

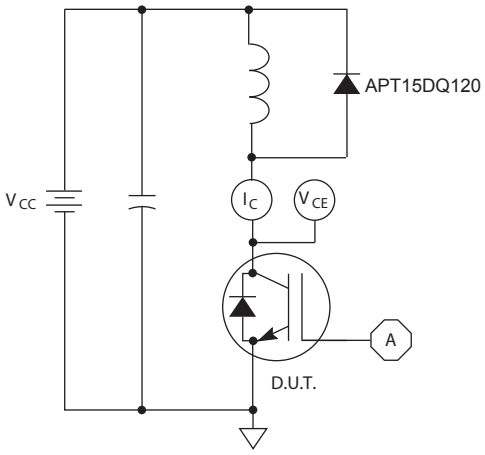



**Figure 21, Inductive Switching Test Circuit**

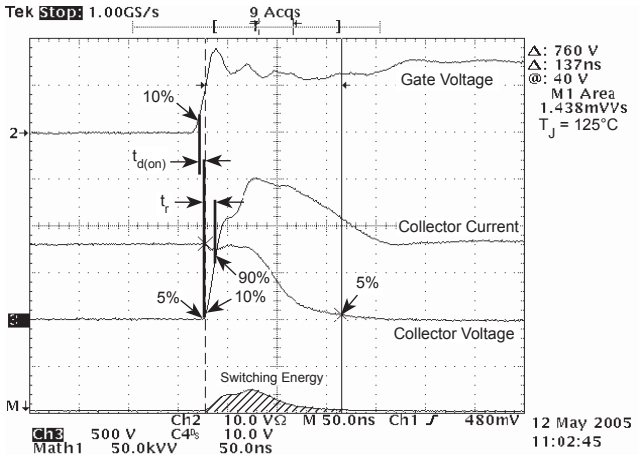



**Figure 22, Turn-on Switching Waveforms and Definitions**

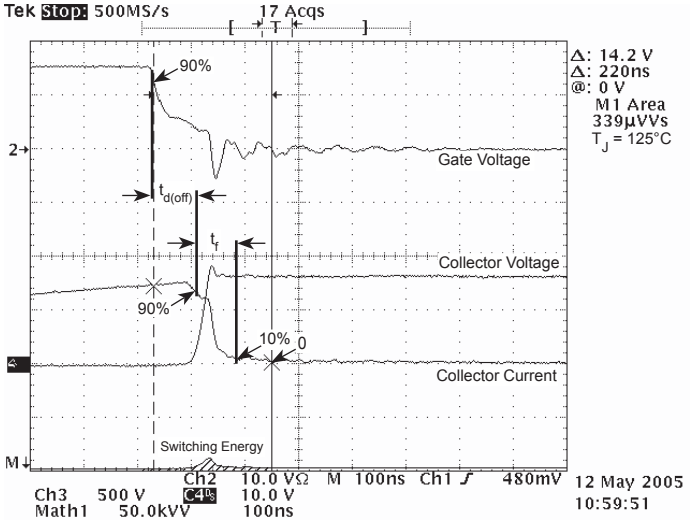



**Figure 23, Turn-off Switching Waveforms and Definitions**

# ULTRAFAST SOFT RECOVERY ANTI-PARALLEL DIODE

## MAXIMUM RATINGS

All Ratings: $T_C$ = 25°C unless otherwise specified.

| Symbol | Characteristic / Test Conditions | APT15GT120B_SRDQ1(G) | | | UNIT |
|---|---|---|---|---|---|
| $I_F(AV)$ | Maximum Average Forward Current ($T_C$ = 127°C, Duty Cycle = 0.5) | | 15 | | Amps |
| $I_F(RMS)$ | RMS Forward Current (Square wave, 50% duty) | | 29 | | |
| $I_{FSM}$ | Non-Repetitive Forward Surge Current ($T_J$ = 45°C, 8.3ms) | | 110 | | |

## STATIC ELECTRICAL CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | $I_F$ = 15A | | 2.8 | | Volts |
| | | $I_F$ = 30A | | 3.4 | | |
| | | $I_F$ = 15A, $T_J$ = 125°C | | 2.45 | | |

## DYNAMIC CHARACTERISTICS

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 1A, $di_F/dt$ = -100A/µs, $V_R$ = 30V, $T_J$ = 25°C | - | 21 | | ns |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15A, $di_F/dt$ = -200A/µs $V_R$ = 800V, $T_C$ = 25°C | - | 240 | | |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 260 | | nC |
| $I_{RRM}$ | Maximum Reverse Recovery Current | | - | 3 | - | Amps |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15A, $di_F/dt$ = -200A/µs $V_R$ = 800V, $T_C$ = 125°C | - | 290 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 960 | | nC |
| $I_{RRM}$ | Maximum Reverse Recovery Current | | - | 6 | - | Amps |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15A, $di_F/dt$ = -1000A/µs $V_R$ = 800V, $T_C$ = 125°C | - | 130 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 1340 | | nC |
| $I_{RRM}$ | Maximum Reverse Recovery Current | | - | 19 | | Amps |

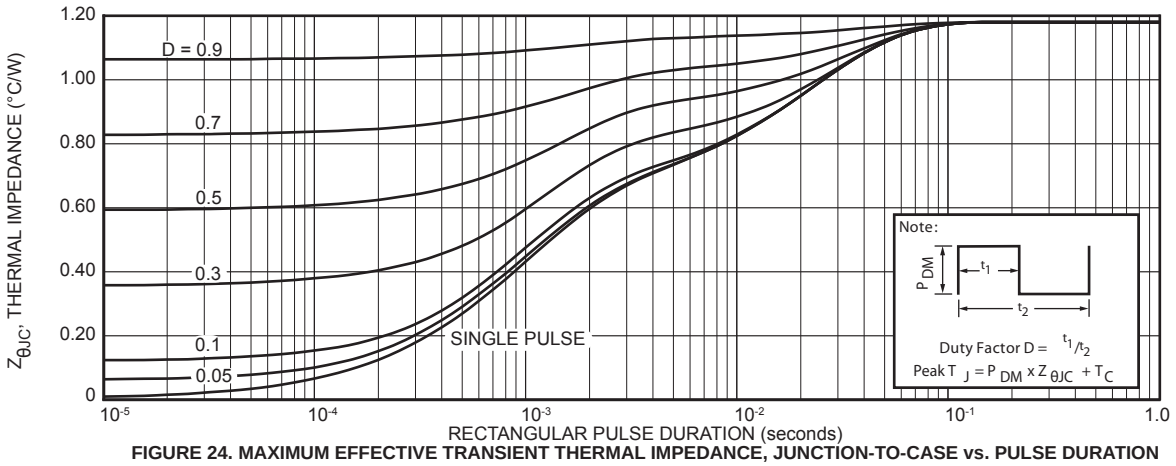



**FIGURE 24. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION**

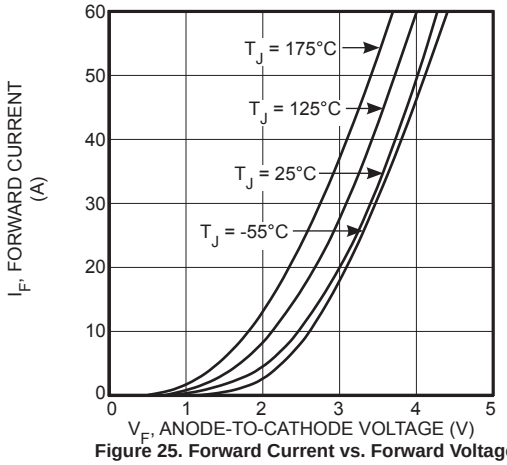



**Figure 25. Forward Current vs. Forward Voltage**

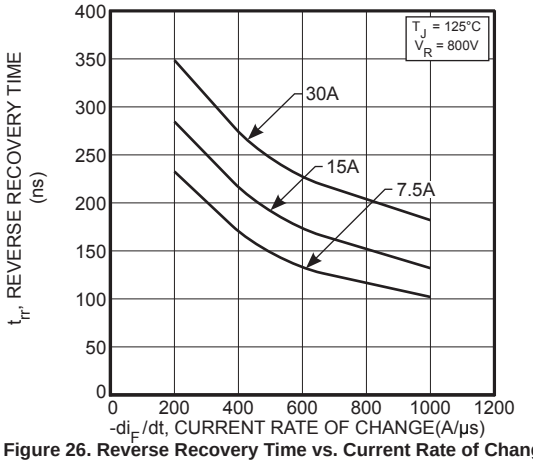



**Figure 26. Reverse Recovery Time vs. Current Rate of Change**

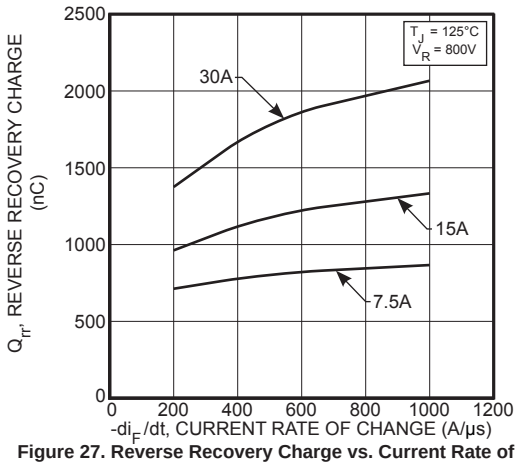



**Figure 27. Reverse Recovery Charge vs. Current Rate of Change**

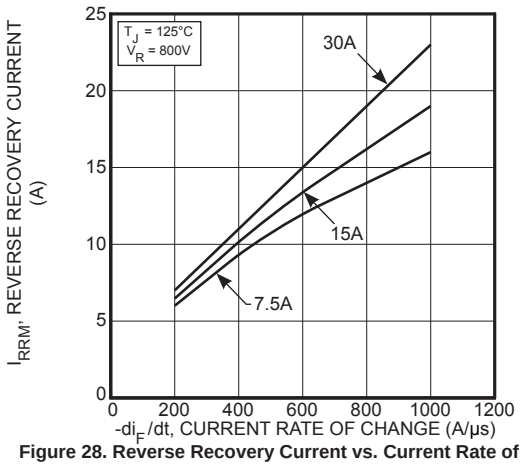



**Figure 28. Reverse Recovery Current vs. Current Rate of Change**

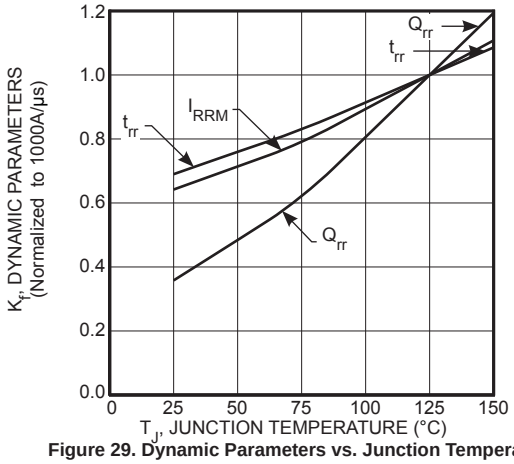



**Figure 29. Dynamic Parameters vs. Junction Temperature**

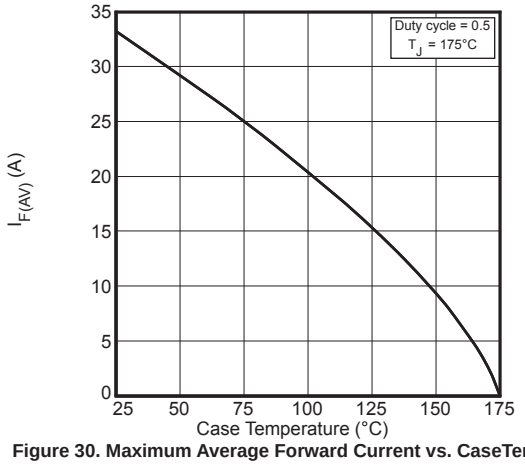



**Figure 30. Maximum Average Forward Current vs. CaseTemperature**

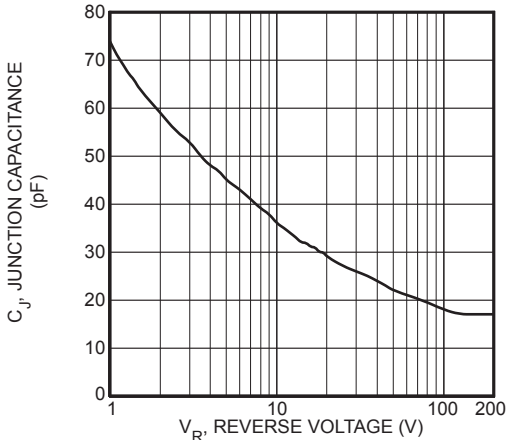



**Figure 31. Junction Capacitance vs. Reverse Voltage**

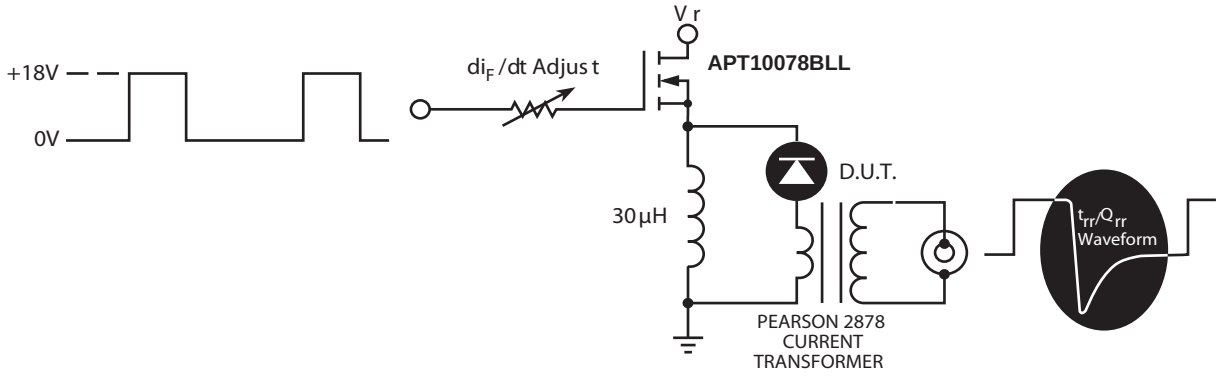



**Figure 32. Diode Test Circuit**

1. $I_F$ - Forward Conduction Current
2. $di_F/dt$ - 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, $I_{RRM}$ passes through zero.
5. $Q_{rr}$ - Area Under the Curve Defined by $I_{RRM}$ and $t_{RR.}$

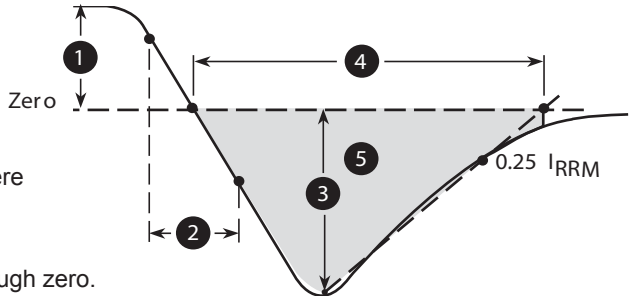
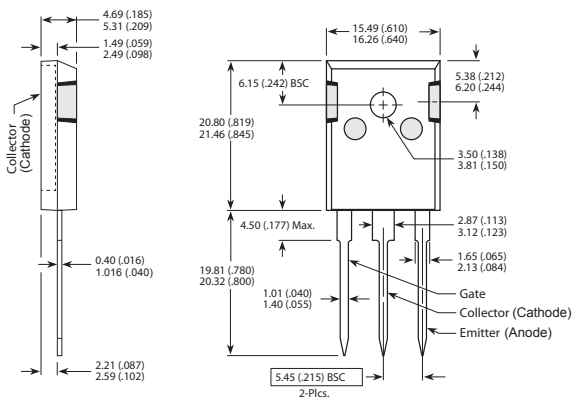



**Figure 33. Diode Reverse Recovery Waveform Definition**

## TO-247 Package Outline

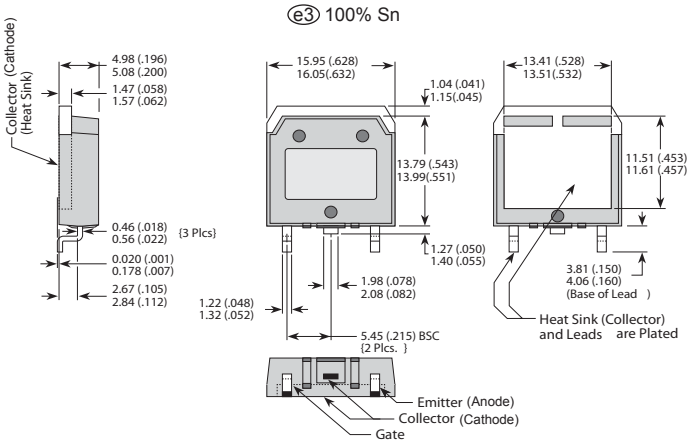
e1 SAC: Tin, Silver, Copper




Dimensions in Millimeters (Inches)

## D$^3$PAK Package Outline

e3 100% Sn




Dimensions in Millimeters (Inches)

ENTEGRECİ

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# Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

### Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

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**Kategorilere göz atın**

### Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

**Üreticileri görün**

### Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

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