

APT60D120BG
Datasheet
Ultrafast Soft Recovery Rectifier Diode

Final
June 2018



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1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision G

Revision G was published in June 2018. The new Microsemi template and format was applied. The package outline drawing was updated.

For more information, see [Package Outline Drawing \(see page 9\)](#).

1.2 Revision F

Revision F was published in June 2015. All APT references were updated to say Microsemi.

1.3 Revision E

Revision E was published in May 2005. Lead-free format and 175 °C ratings implemented.

1.4 Revision D

Revision D was published in January 2004. Changes include creating a new formatted datasheet.

1.5 Revision C

Revision C was published in January 2003. S-package was added to the datasheet as offered originally.

1.6 Revision B

Revision B was published in June 2002. IF(AV) test condition was changed to TC= 85DC. IF(RMS) was changed to 115 Amps.

1.7 Revision A

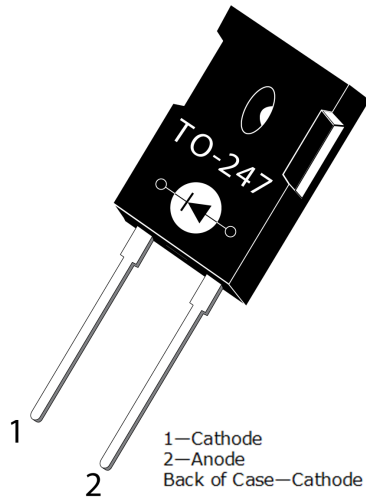
Revision A was published in December 1998. It was the first publication of this document. The following is a summary of the changes in revision A of this document.

- APT website address was added.
- Shorting bar was added to TO-247 symbol.
- Minimum mounting hole diameter on outline drawing was corrected from 0.140 in. to 0.138 in.

2 Product Overview

This section outlines the product overview for the APT60D120BG device.

The following figure shows TO-247 package.



2.1 Features

The following are key features of the APT60D120BG device.

- Ultrafast recovery times
- Soft recovery characteristics
- Low forward voltage
- Low leakage current
- RoHS compliant

2.2 Benefits

The following are benefits of the APT60D120BG device.

- Low switching losses
- Low noise (EMI) switching
- Cooler operation
- Higher reliability systems
- Increased system power density

2.3 Applications

The APT60D120BG device is designed for the following applications.

- Power factor correction (PFC)
- Anti-parallel diode
 - Switchmode power supply
 - Inverters
- Freewheeling diode
 - Motor controllers
 - Converters
 - Inverters
- Snubber diode

3 Electrical Specifications

This section shows the electrical specifications for the APT60D120BG device.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the APT60D120BG device.

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

Table 1 • Absolute Maximum Ratings

| Symbol | Parameter | Ratings | Unit |
|----------------|---|------------|------------------|
| V_R | Maximum DC reverse voltage | 1200 | V |
| V_{RRM} | Maximum peak repetitive reverse voltage | 1200 | |
| V_{RWM} | Maximum working peak reverse voltage | 1200 | |
| $I_{F(AV)}$ | Maximum average forward current ($T_c = 126\text{ }^\circ\text{C}$, duty cycle = 0.5) | 60 | A |
| $I_{F(RMS)}$ | RMS forward current | 115 | |
| I_{FSM} | Non-repetitive forward surge current ($T_J = 45\text{ }^\circ\text{C}$, 8.3 ms) | 540 | |
| T_J, T_{STG} | Operating and storage temperature range | -55 to 175 | $^\circ\text{C}$ |
| T_L | Lead temperature for 10 seconds | 300 | |

3.2 Typical Electrical Performance

The following table shows the static characteristics of the APT60D120BG device.

Table 2 • Static Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Minimum | Typical | Maximum | Unit |
|----------|---------------------------------|---|---------|---------|---------|---------------|
| V_F | Forward voltage | $I_F = 60\text{ A}$ | | 2.0 | 2.5 | V |
| | | $I_F = 120\text{ A}$ | | 2.3 | | |
| | | $I_F = 60\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | 1.8 | | |
| I_{RM} | Maximum reverse leakage current | $V_R = V_R\text{ rated}$ | | | 250 | μA |
| | | $V_R = V_R\text{ rated}, T_J = 125\text{ }^\circ\text{C}$ | | | 500 | |
| C_T | Junction capacitance | $V_R = 200\text{ V}$ | | 60 | | pF |

The following table shows the dynamic characteristics of the APT60D120BG device.

Table 3 • Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Minimum | Typical | Maximum | Unit |
|-----------|----------------------------------|--|---------|---------|---------|------|
| t_{rr} | Reverse recovery time | $I_F = 1\text{ A}$ $di_r/dt = -100\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$ $T_J = 25\text{ }^\circ\text{C}$ | | 38 | | ns |
| t_{rr} | Reverse recovery time | $I_F = 60\text{ A}$ | | 400 | | |
| Q_{rr} | Reverse recovery charge | $di_r/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ | | 1200 | | nC |
| I_{RRM} | Maximum reverse recovery current | $T_C = 25\text{ }^\circ\text{C}$ | | 6 | | A |
| t_{rr} | Reverse recovery time | $I_F = 60\text{ A}$ | | 470 | | ns |
| Q_{rr} | Reverse recovery charge | $di_r/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ | | 4000 | | nC |
| I_{RRM} | Maximum reverse recovery current | $T_C = 125\text{ }^\circ\text{C}$ | | 13 | | A |
| t_{rr} | Reverse recovery time | $I_F = 60\text{ A}$ | | 200 | | ns |
| Q_{rr} | Reverse recovery charge | $di_r/dt = -1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ | | 6200 | | nC |
| I_{RRM} | Maximum reverse recovery current | $T_C = 125\text{ }^\circ\text{C}$ | | 47 | | A |

The following table shows the thermal and mechanical characteristics of the APT60D120BG device.

Table 4 • Thermal and Mechanical Characteristics

| Symbol | Characteristic/Test Conditions | Minimum | Typical | Maximum | Unit |
|-----------------|--|---------|---------|---------|--------|
| $R_{\theta JC}$ | Junction-to-case thermal resistance | | | 0.31 | °C/W |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | | | 40 | |
| W_T | Package weight | | 0.22 | | oz |
| | | | 6.2 | | g |
| | Mounting torque | | | 10 | lbf-in |
| | | | | 1.1 | N-m |

3.3 Typical Performance Curves

This section shows the typical performance curves for the APT60D120BG device.

Figure 1 • Maximum Effective Transient Thermal Impedance, Junction-to-Case vs. Pulse Duration

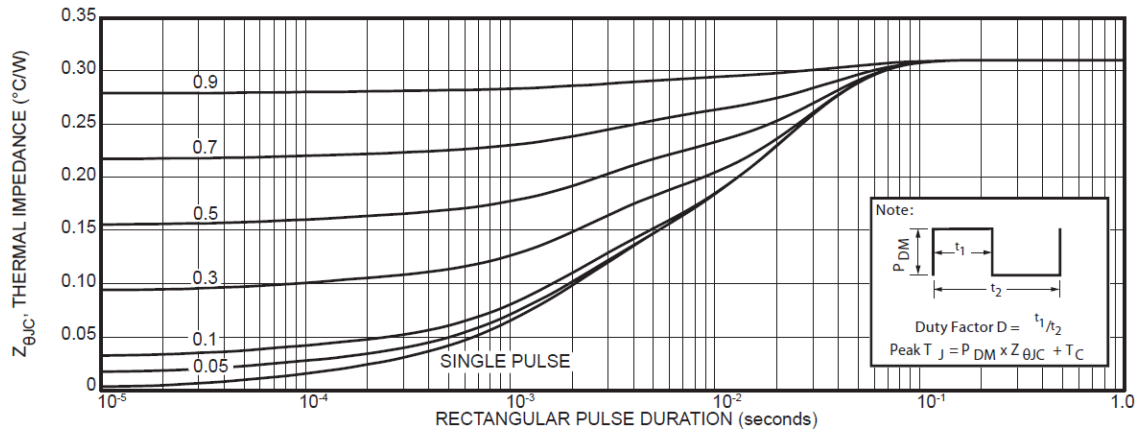


Figure 2 • Transient Thermal Impedance Model

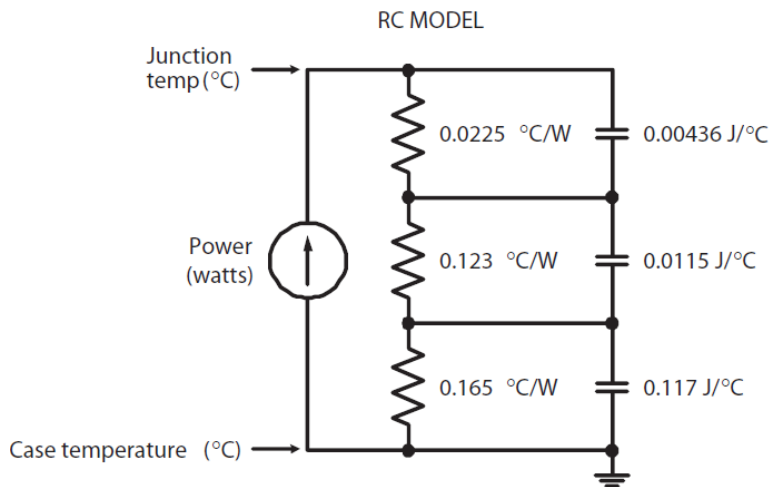


Figure 3 • Forward Current vs. Forward Voltage

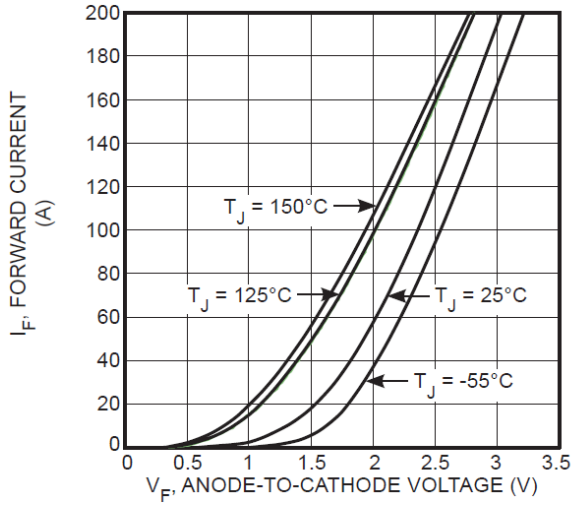


Figure 4 • RRT vs. Current Rate of Change

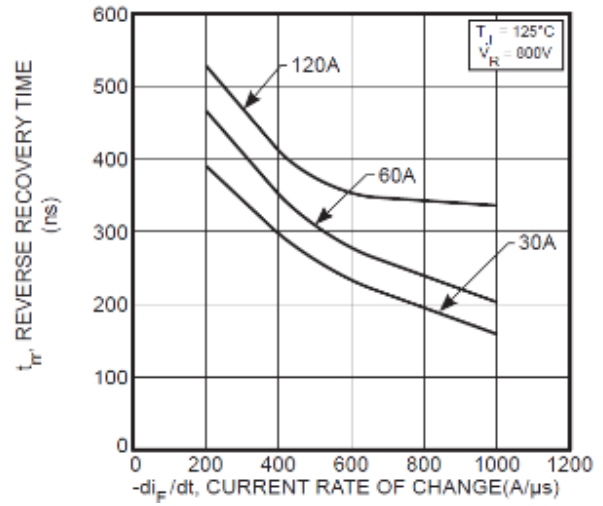


Figure 5 • Reverse Recovery Charge vs. Current Rate of Change

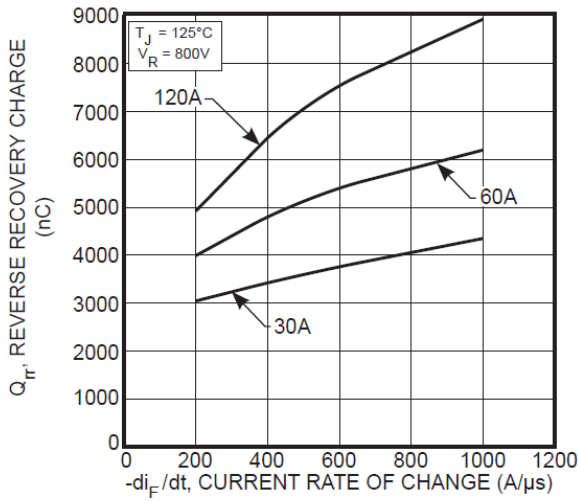


Figure 6 • Reverse Recovery Current vs. Current Rate of Change

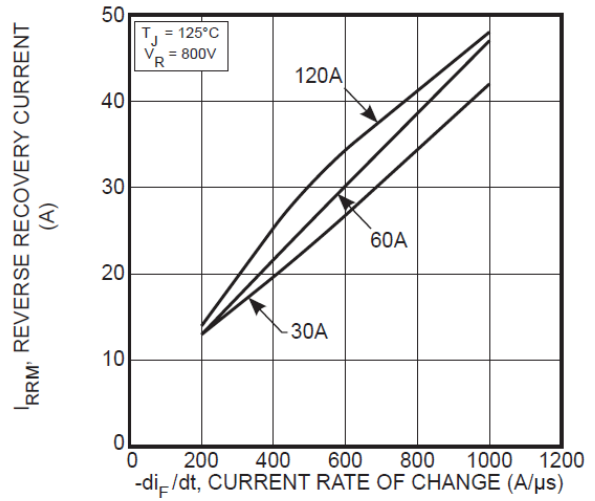


Figure 7 • Dynamic Parameters vs. Junction Temperature

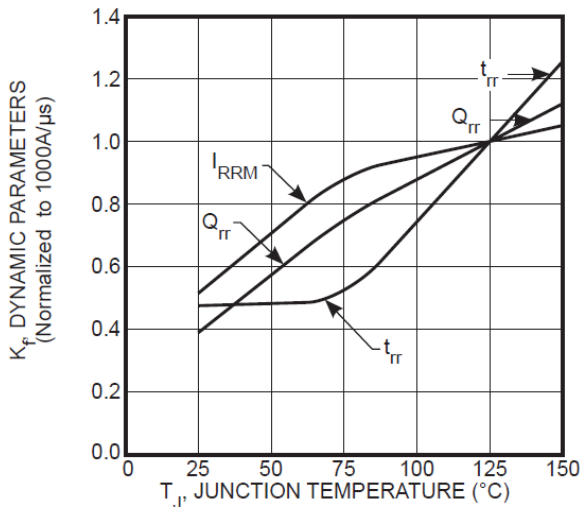


Figure 8 • Maximum Average Forward Current vs. Case Temperature

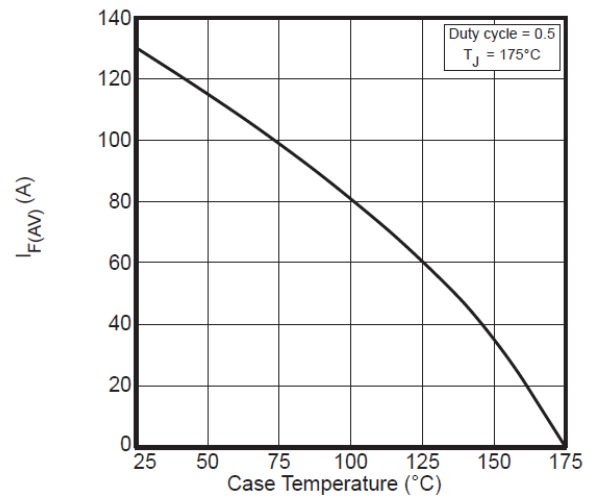
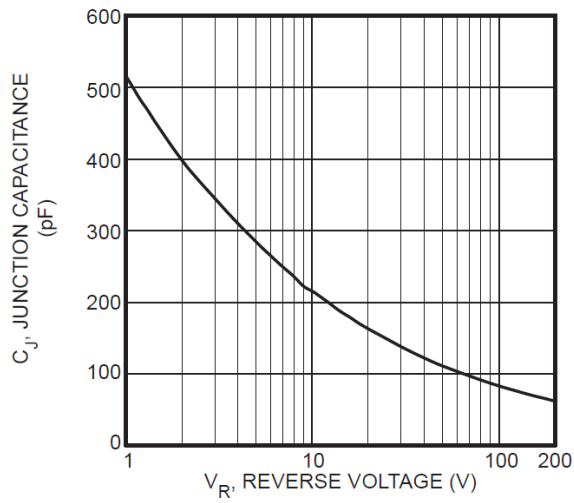


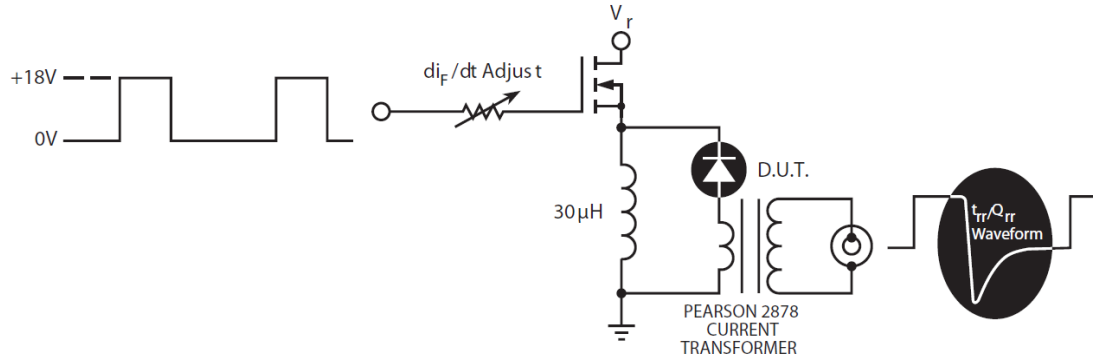
Figure 9 • Junction Capacitance vs. Reverse Voltage



3.4 Reverse Recovery Overview

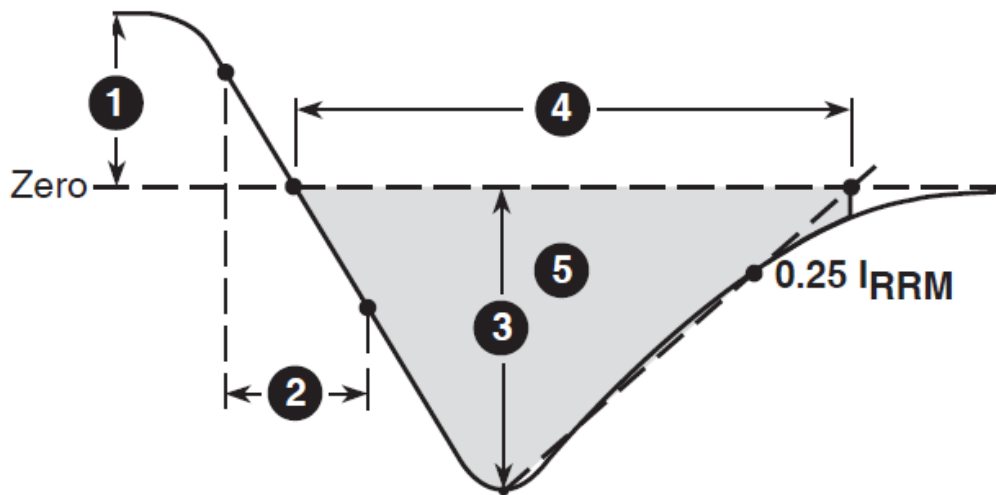
The following figure shows the diode test circuit.

Figure 10 • Diode Test Circuit



The following figure shows the diode reverse recovery waveform.

Figure 11 • Diode Reverse Recovery Waveform and Definitions



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 $0.25 \cdot I_{RRM}$ passes through zero
5. Q_{rr} —Area under the curve defined by I_{RRM} and t_{rr}

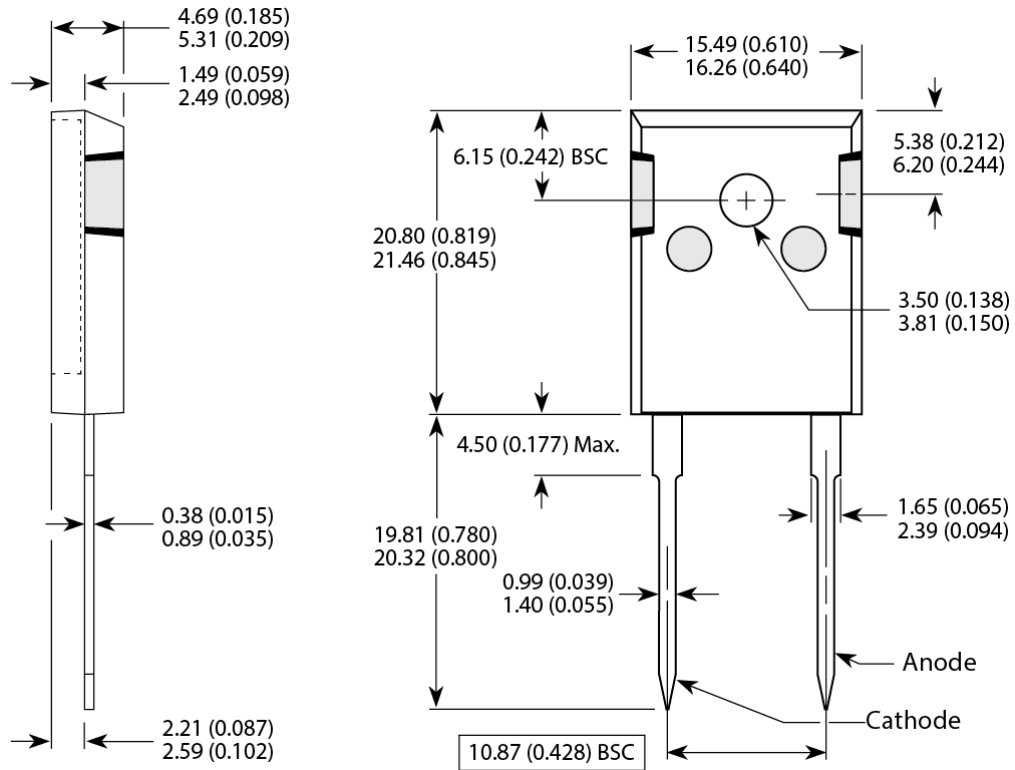
4 Package Specification

This section outlines the package specification for the APT60D120BG device.

4.1 Package Outline Drawing

The following figure shows the package outline drawing of the APT60D120BG device. Dimensions are in millimeters and (inches).

Figure 12 • Package Outline Drawing



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