

**APT60D120BG**  
**Datasheet**  
**Ultrafast Soft Recovery Rectifier Diode**

Final  
June 2018



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# 1 Revision History

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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.

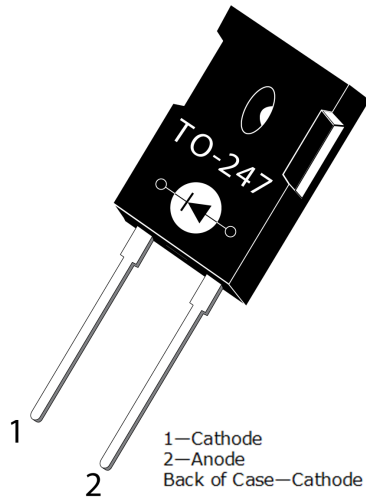
- APT website address was added.
- Shorting bar was added to TO-247 symbol.
- Minimum mounting hole diameter on outline drawing was corrected from 0.140 in. to 0.138 in.

## 2 Product Overview

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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	$\mu\text{A}$
		$V_R = V_R\text{ rated}, T_J = 125\text{ }^\circ\text{C}$			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.

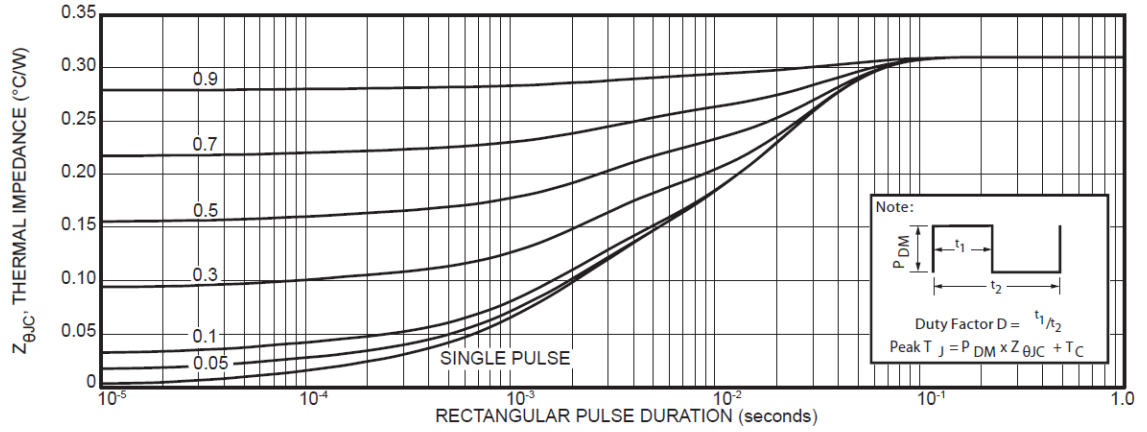
**Table 4 • Thermal and Mechanical Characteristics**

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**

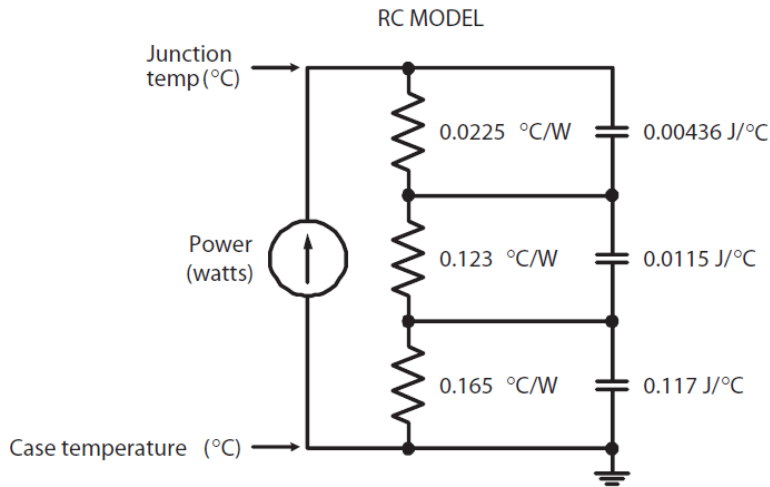


Figure 3 • Forward Current vs. Forward Voltage

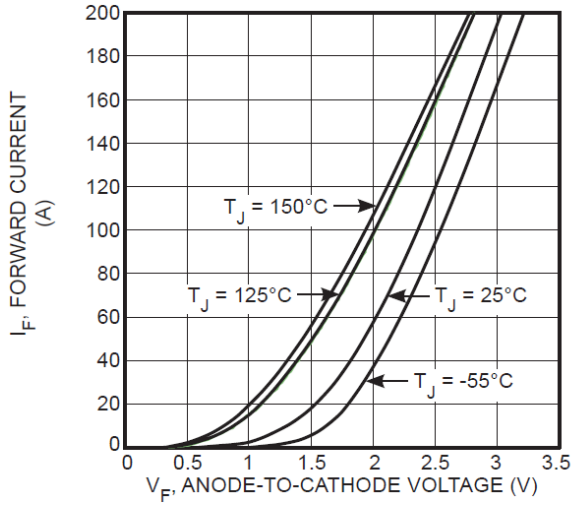


Figure 4 • RRT vs. Current Rate of Change

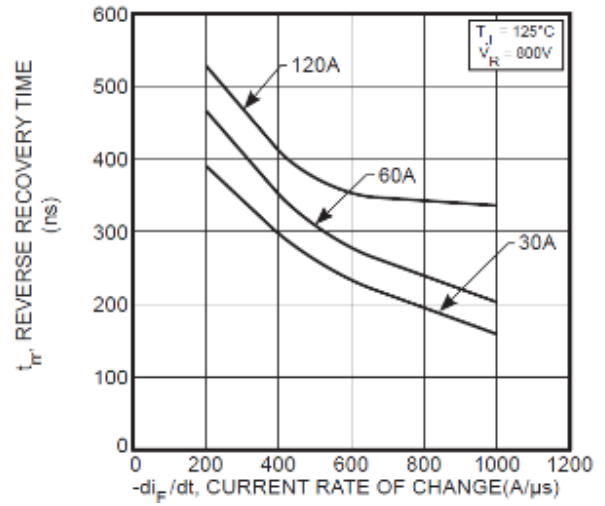


Figure 5 • Reverse Recovery Charge vs. Current Rate of Change

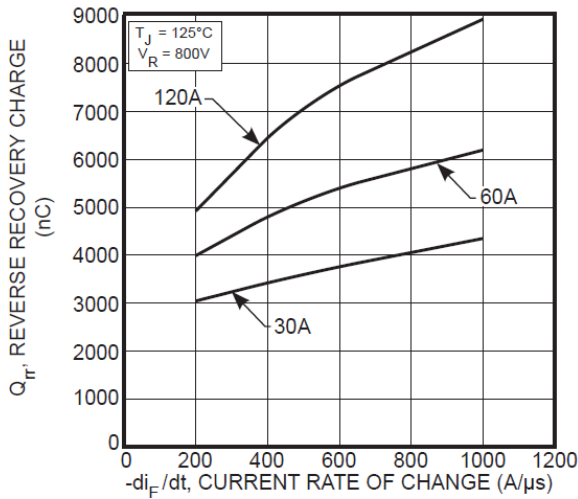
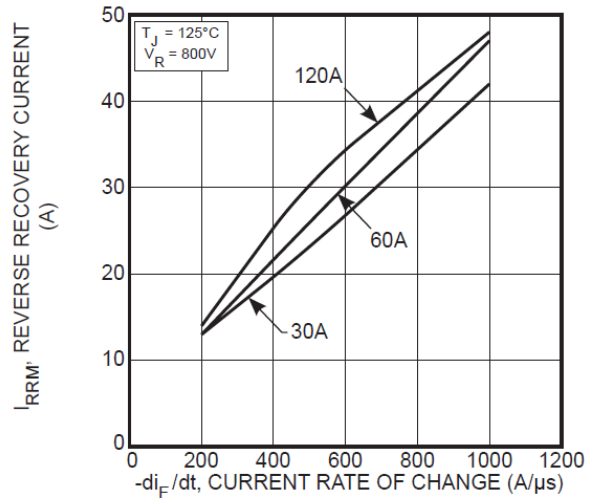
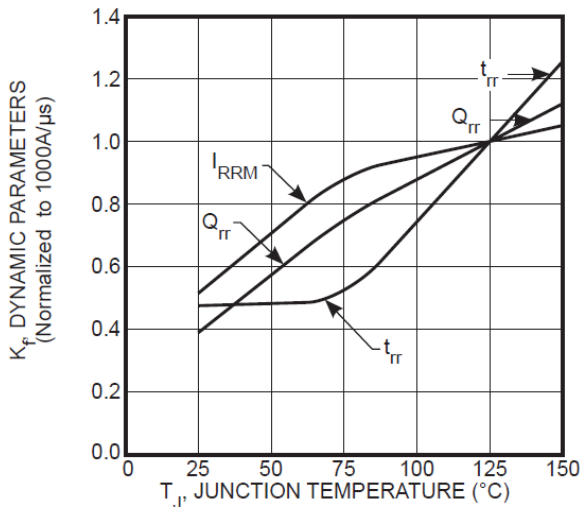


Figure 6 • Reverse Recovery Current vs. Current Rate of Change

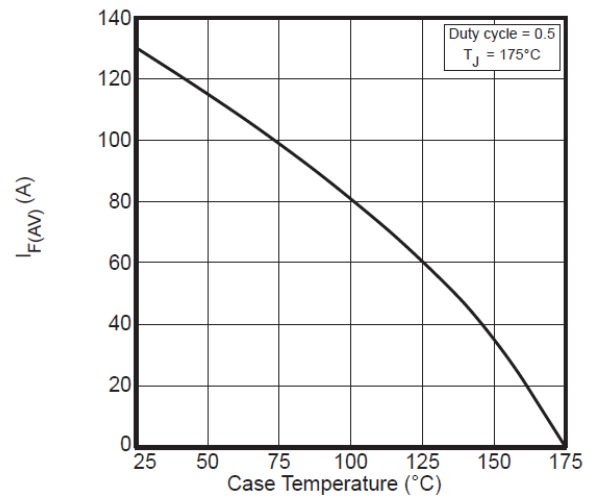




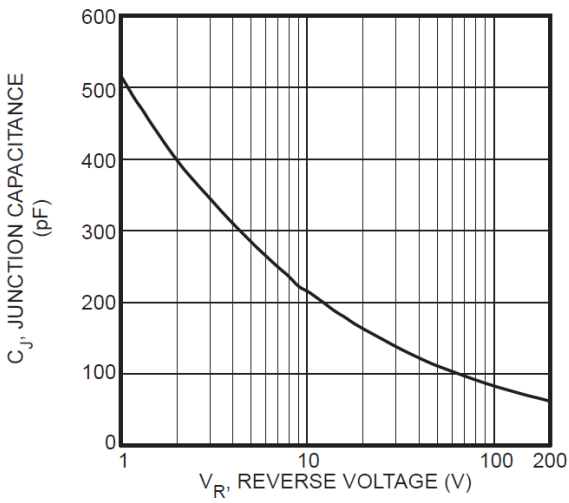
**Figure 7 • Dynamic Parameters vs. Junction Temperature**



**Figure 8 • Maximum Average Forward Current vs. Case Temperature**



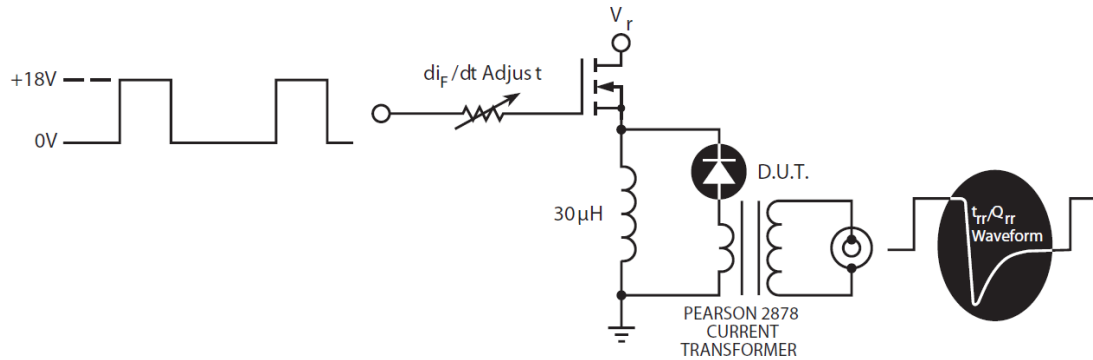
**Figure 9 • Junction Capacitance vs. Reverse Voltage**



### 3.4 Reverse Recovery Overview

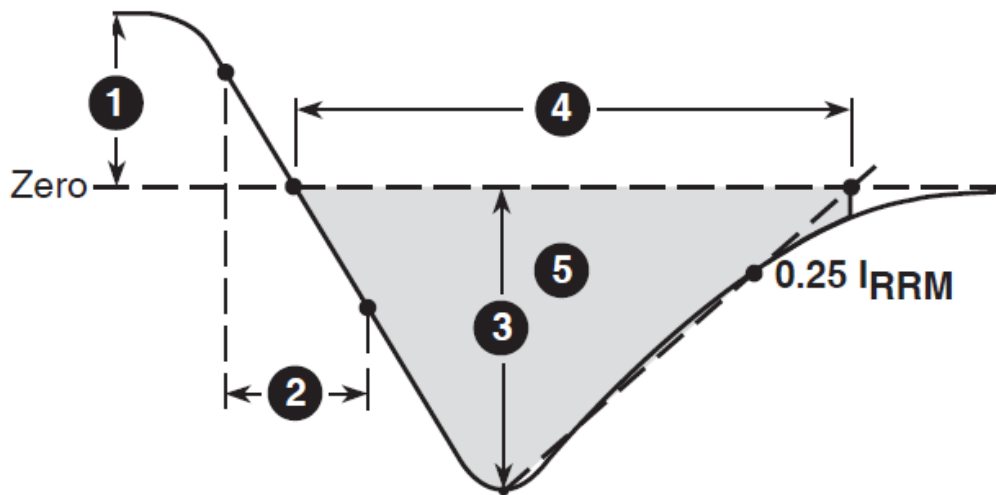
The following figure shows the diode test circuit.

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  $t_{rr}$

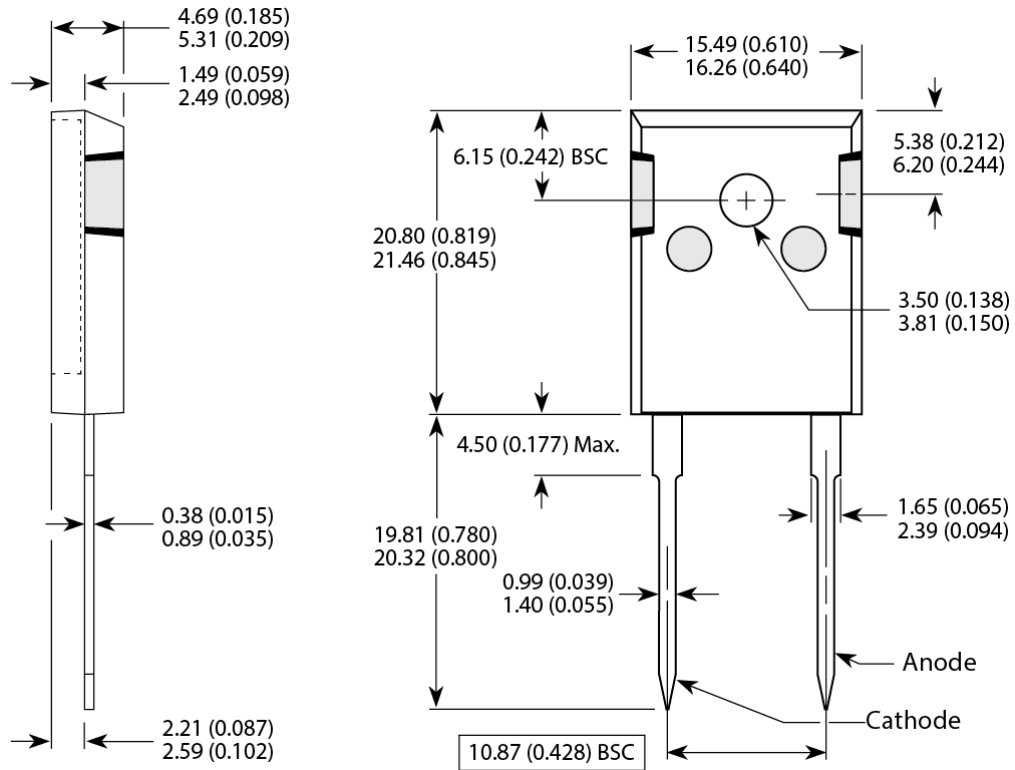
## 4 Package Specification

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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