APT60D120BG

Datasheet

Ultrafast Soft Recovery Rectifier Diode

Final

June 2018

Microsemi

a Microchip company

Contents

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

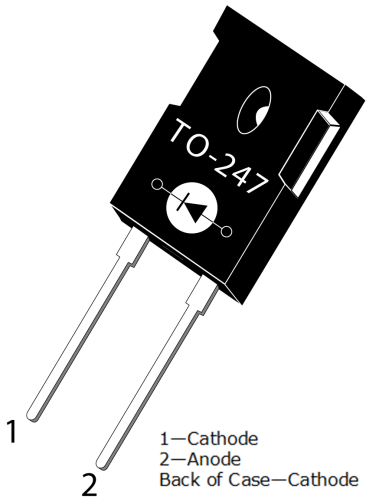
Revision A was published in December 1998. It was the first publication of this document. The following is a summary of the changes in revision A of this document.

- 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 °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 °C, duty cycle = 0.5)	60	A
$I_{F(RMS)}$	RMS forward current	115	
I_{FSM}	Non-repetitive forward surge current (T_J = 45 °C, 8.3 ms)	540	
T_J , T_{STG}	Operating and storage temperature range	–55 to 175	°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 A		2.0	2.5	V
		I_F = 120 A		2.3		
		I_F = 60 A, T_J = 125 °C		1.8		
I_{RM}	Maximum reverse leakage current	V_R = V_R rated			250	µA
		V_R = V_R rated, T_J = 125 °C			500	
C_T	Junction capacitance	V_R = 200 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 A di_F/dt = –100 A/µs V_R = 30 V T_J = 25 °C		38		ns
t_{rr}	Reverse recovery time	I_F = 60 A di_F/dt = –200 A/µs V_R = 800 V T_C = 25 °C		400		
Q_{rr}	Reverse recovery charge			1200		nC
I_{RRM}	Maximum reverse recovery current			6		A
t_{rr}	Reverse recovery time	I_F = 60 A di_F/dt = –200 A/µs V_R = 800 V T_C = 125 °C		470		ns
Q_{rr}	Reverse recovery charge			4000		nC
I_{RRM}	Maximum reverse recovery current			13		A
t_{rr}	Reverse recovery time	I_F = 60 A di_F/dt = –1000 A/µs V_R = 800 V T_C = 125 °C		200		ns
Q_{rr}	Reverse recovery charge			6200		nC
I_{RRM}	Maximum reverse recovery current			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

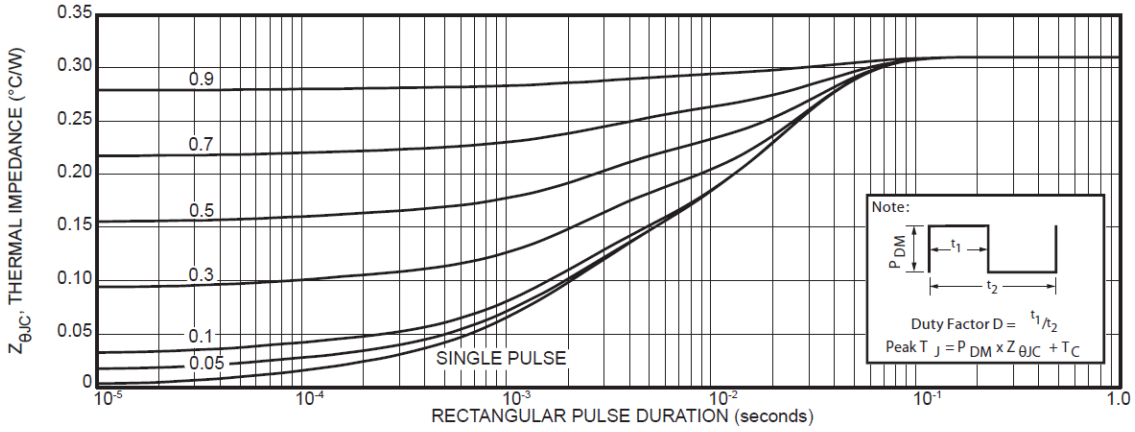


Figure 2 • Transient Thermal Impedance Model

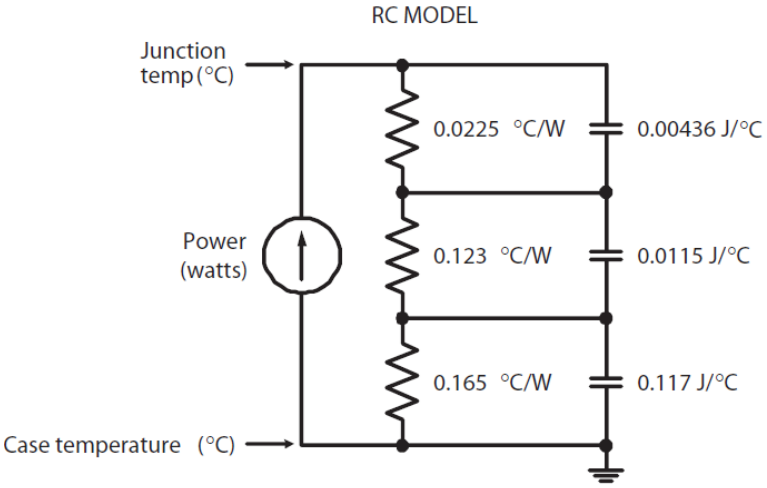


Figure 3 • Forward Current vs. Forward Voltage

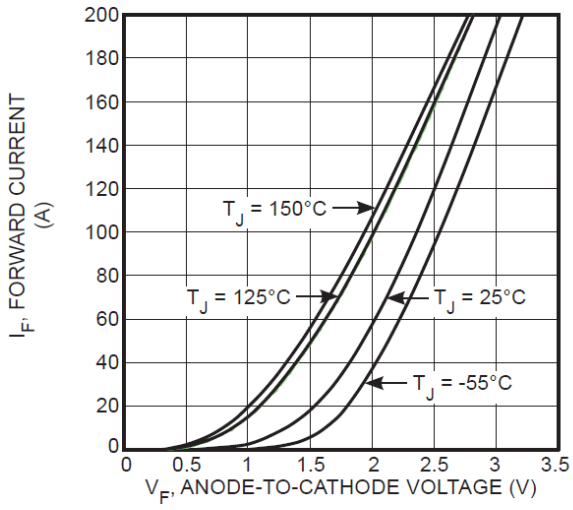


Figure 4 • RRT vs. Current Rate of Change

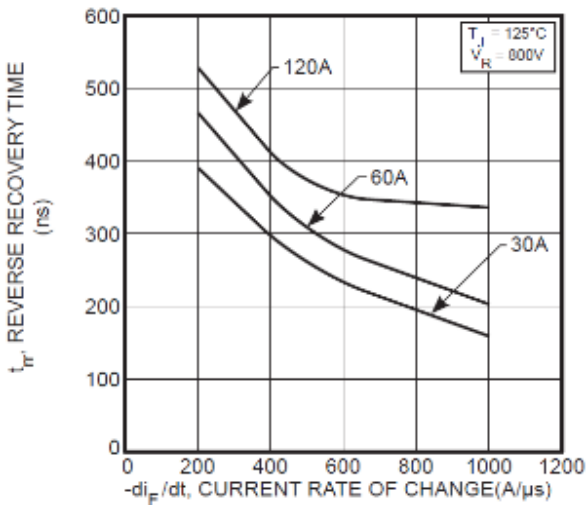


Figure 5 • Reverse Recovery Charge vs. Current Rate of Change

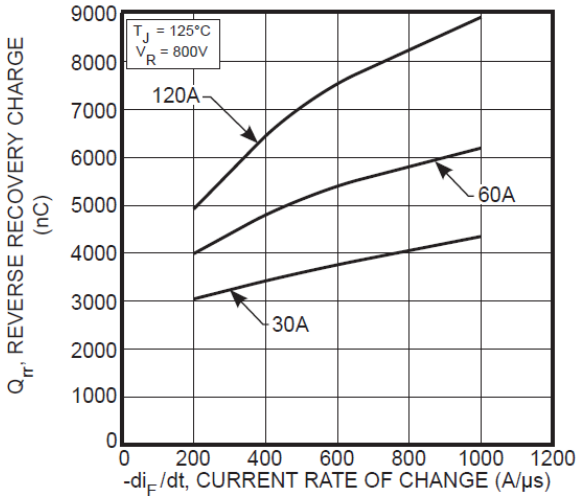


Figure 6 • Reverse Recovery Current vs. Current Rate of Change

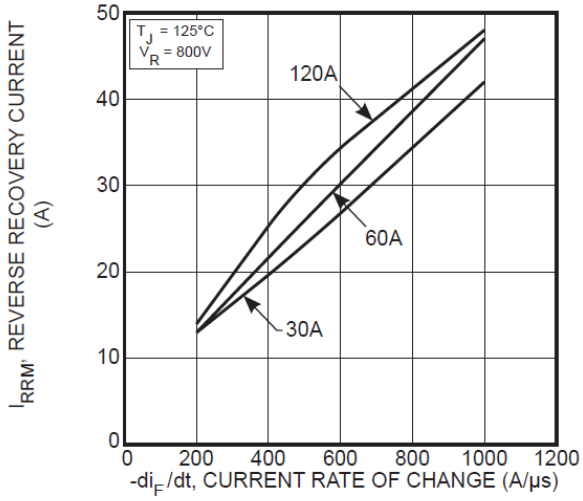


Figure 7 • Dynamic Parameters vs. Junction Temperature

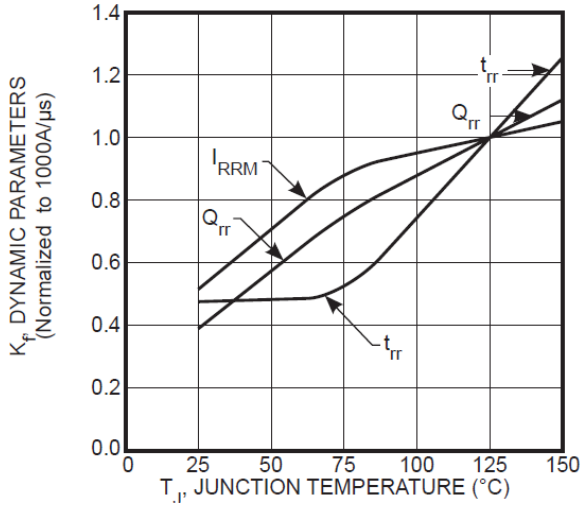


Figure 8 • Maximum Average Forward Current vs. Case Temperature

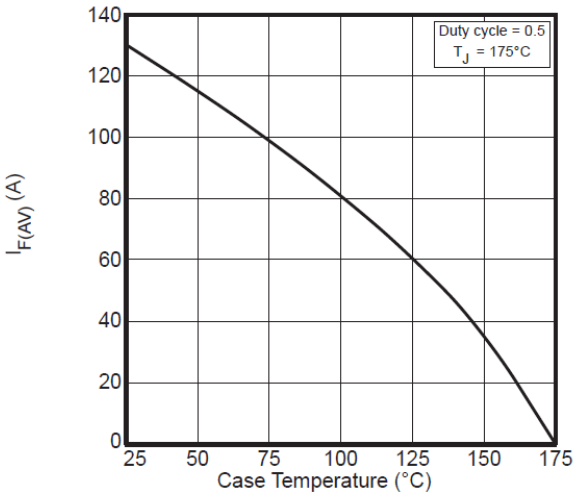
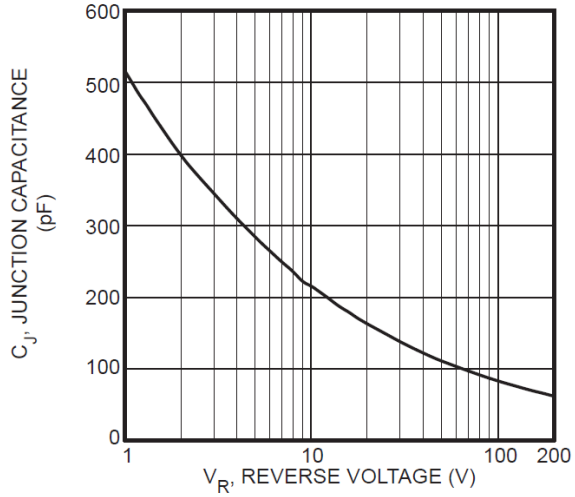


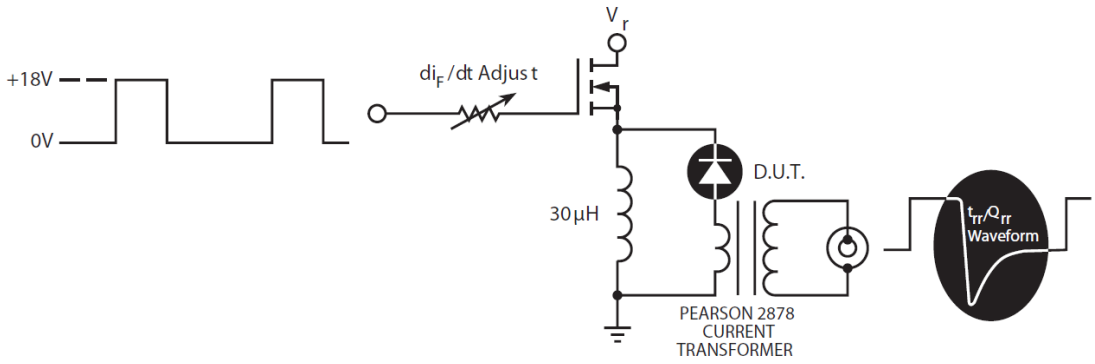
Figure 9 • Junction Capacitance vs. Reverse Voltage



3.4 Reverse Recovery Overview

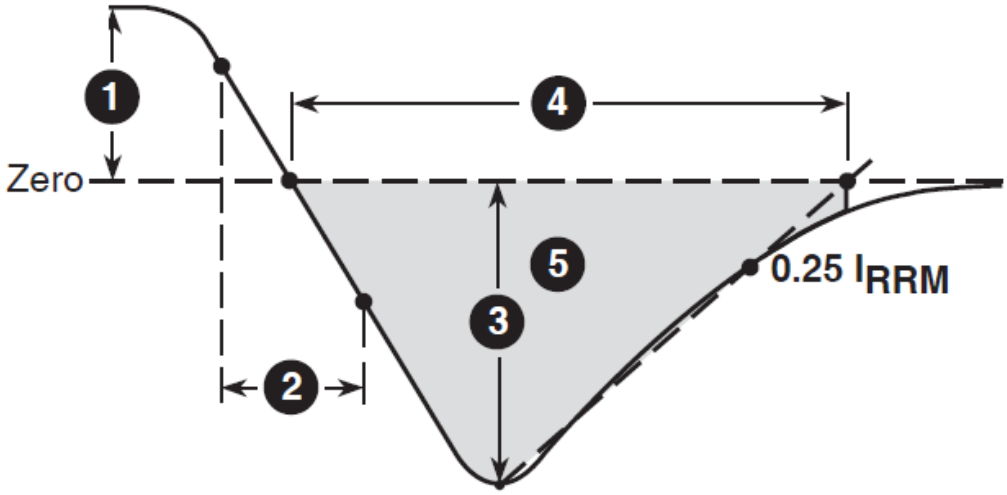
The following figure shows the diode test circuit.

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

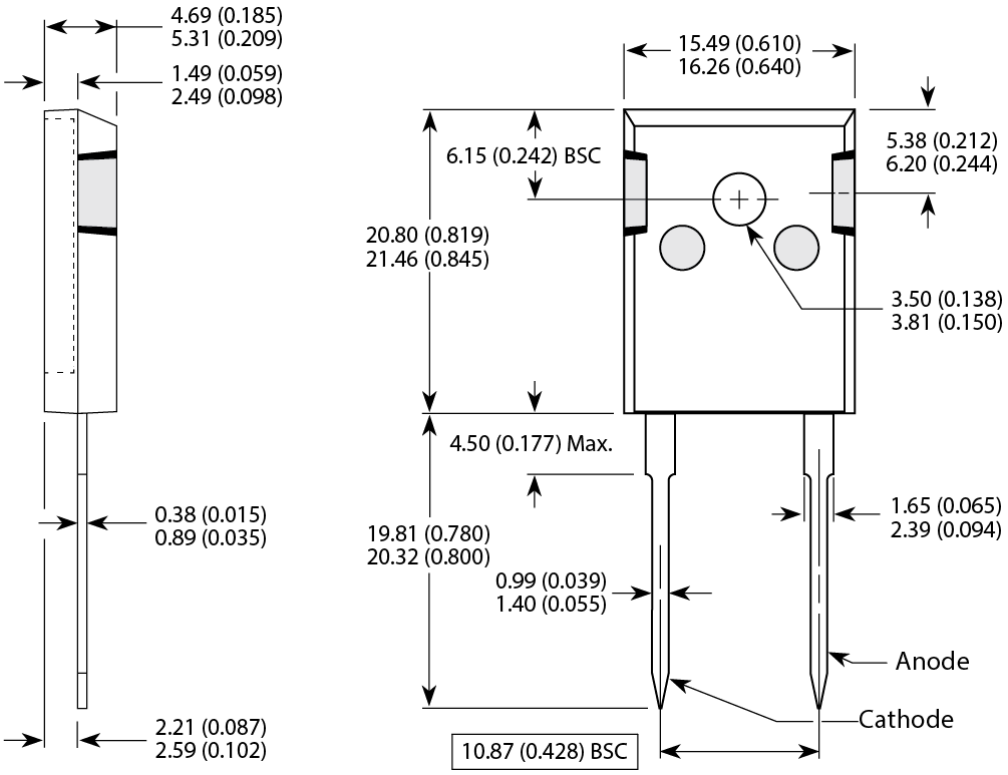
4 Package Specification

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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