

**APT60DQ120BG**  
**Datasheet**

**Ultrafast Soft Recovery Rectifier Diode**

Final

March 2018



## Contents

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1	Revision History .....	1
1.1	Revision C .....	1
1.2	Revision B .....	1
1.3	Revision A .....	1
2	Product Overview .....	2
2.1	Features .....	2
2.2	Benefits .....	2
2.3	Applications .....	2
3	Electrical Specifications .....	3
3.1	Absolute Maximum Ratings .....	3
3.2	Electrical Performance .....	3
3.3	Dynamic Characteristics .....	4
3.4	Typical Performance Curves .....	5
4	Reverse Recovery Overview .....	7
5	Package Specification .....	8
5.1	Package Outline Drawing .....	8

## 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 C

Revision C was published in March 2018. The following is a summary of the changes in revision C of this document.

- The new Microsemi template and format was applied.
- The package outline drawing was updated. For more information, see [Package Outline Drawing](#).

### 1.2 Revision B

Revision B was published in May 2011. The following is a summary of the changes in revision B of this document.

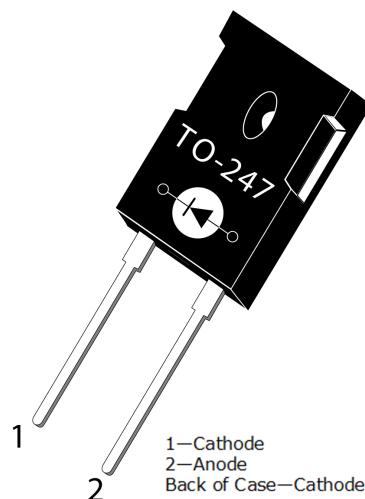
- The patent information was removed from the document.
- For TO-247 packages: the maximum lead thickness was changed from 0.70 in (0.031 mm) to 1.016 in (0.040 mm).

### 1.3 Revision A

Revision A was published in January 2006. It is the first publication of this document.

## 2 Product Overview

This section outlines the product overview for the APT60DQ120BG device.



### 2.1 Features

The following are key features of the APT60DQ120BG device:

- Ultrafast recovery times
- Soft recovery characteristics
- Low forward voltage
- Low leakage current
- Avalanche energy rated
- RoHS compliant
- AEC-Q101 qualified

### 2.2 Benefits

The following are benefits of the APT60DQ120BG device:

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

### 2.3 Applications

The APT60DQ120BG device is designed for the following applications:

- Power factor correction (PFC)
- Anti-parallel diode
  - Switch-mode power supply
  - Inverters/converters
  - Motor controllers
- Freewheeling diode
  - Switch-mode power supply
  - Inverters/converters
- Snubber/clamp diode

## 3 Electrical Specifications

This section shows the electrical specifications for the APT60DQ120BG device.

### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the APT60DQ120BG device.

All ratings:  $T_c = 25^\circ\text{C}$  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 ( $T_c = 103^\circ\text{C}$ , duty cycle = 0.5)	60	A
$I_{F(RMS)}$	RMS forward current	87	
$I_{FSM}$	Non-repetitive forward surge current ( $T_J = 45^\circ\text{C}$ , 8.3 ms)	540	
$E_{AVL}$	Avalanche energy (1 A, 40 mH)	20	mJ
$T_J, T_{STG}$	Operating and storage temperature range	-55 to 175	°C
$T_L$	Lead temperature for 10 seconds	300	

The following table shows the thermal and mechanical characteristics of the APT60DQ120BG device.

**Table 2 • Thermal and Mechanical Characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{eic}$	Junction-to-case thermal resistance		0.40		°C/W
$W_T$	Package weight	0.22		oz	
			5.9		g
Torque	Maximum mounting torque	10		lb-in	
			1.1		N-m

### 3.2 Electrical Performance

The following table shows the static characteristics of the APT60DQ120BG device.

**Table 3 • Static Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_F$	Forward voltage	$I_F = 60 \text{ A}$		2.8	3.3	V
		$I_F = 120 \text{ A}$			3.35	
		$I_F = 60 \text{ A}, T_J = 125^\circ\text{C}$			2.11	
$I_{RM}$	Maximum reverse leakage current	$V_R = 1200 \text{ V}$		100	500	$\mu\text{A}$
		$V_R = 1200 \text{ V}, T_J = 125^\circ\text{C}$				
$C_J$	Junction capacitance	$V_R = 200 \text{ V}$		37		pF

### 3.3 Dynamic Characteristics

The following table shows the dynamic characteristics of the APT60DQ120BG device.

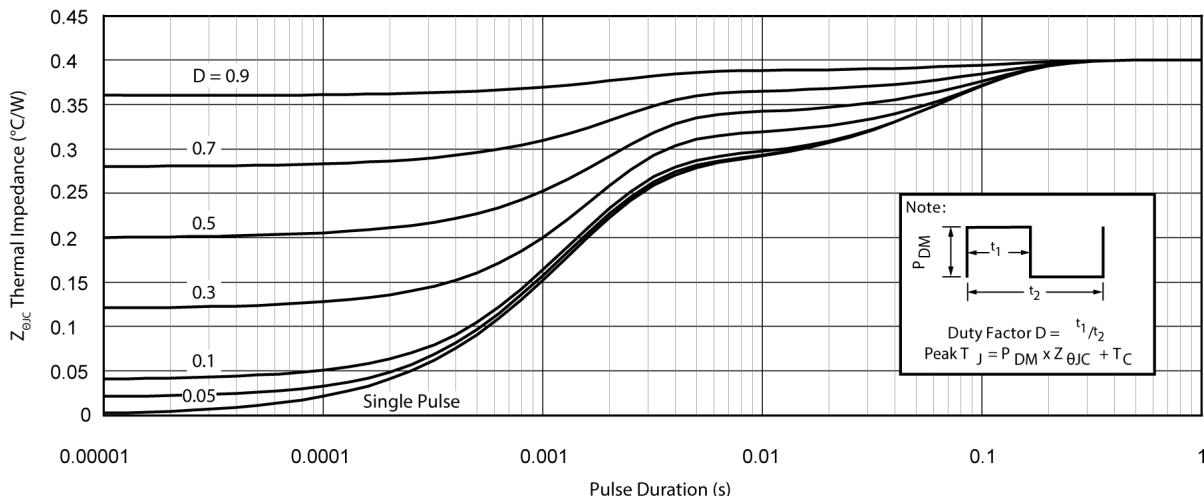
**Table 4 • Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1 \text{ A}$ $dI_F/dt = -100 \text{ A}/\mu\text{s}$ $V_R = 30 \text{ V}$ $T_J = 25^\circ\text{C}$		30		ns
$t_{rr}$	Reverse recovery time	$I_F = 60 \text{ A}$		320		
$Q_{rr}$	Reverse recovery change	$dI_F/dt = -200 \text{ A}/\mu\text{s}$ $V_R = 800 \text{ V}$ $T_c = 25^\circ\text{C}$		630		nC
$I_{RRM}$	Maximum reverse recovery current			5		A
$t_{rr}$	Reverse recovery time	$I_F = 60 \text{ A}$		420		ns
$Q_{rr}$	Reverse recovery charge	$dI_F/dt = -200 \text{ A}/\mu\text{s}$ $V_R = 800 \text{ V}$		2810		nC
$I_{RRM}$	Maximum reverse recovery current	$T_c = 125^\circ\text{C}$		12		A
$t_{rr}$	Reverse recovery time	$I_F = 60 \text{ A}$		190		ns
$Q_{rr}$	Reverse recovery change	$dI_F/dt = -1000 \text{ A}/\mu\text{s}$ $V_R = 800 \text{ V}$ $T_c = 125^\circ\text{C}$		4415		nC
$I_{RRM}$	Maximum reverse recovery current			38		A

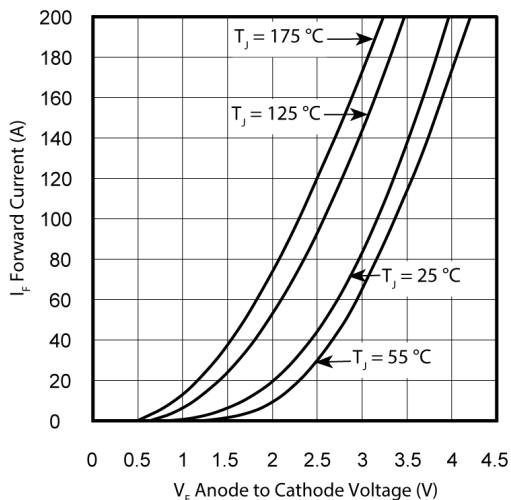
### 3.4 Typical Performance Curves

This section shows the typical performance curves for the APT60DQ120BG device.

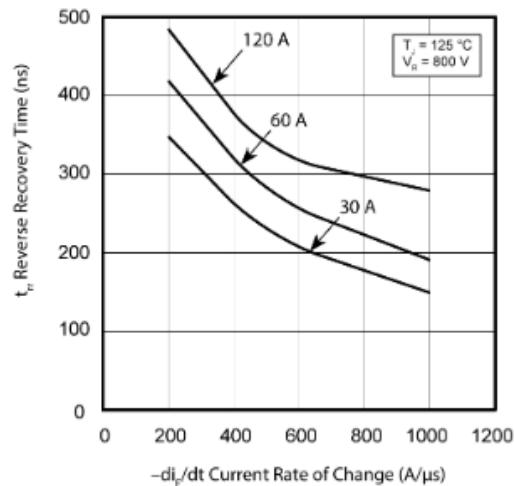
**Figure 1 • Maximum Transient Thermal Impedance**

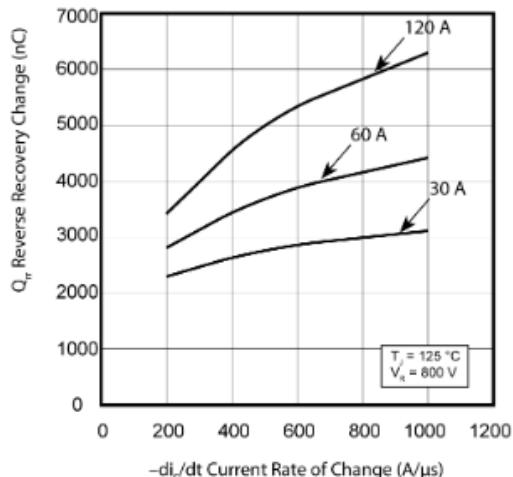
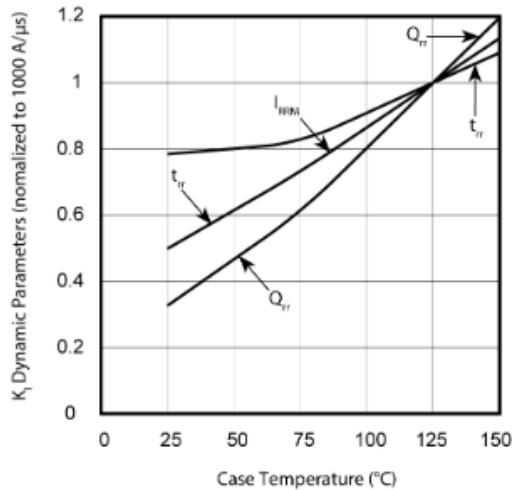
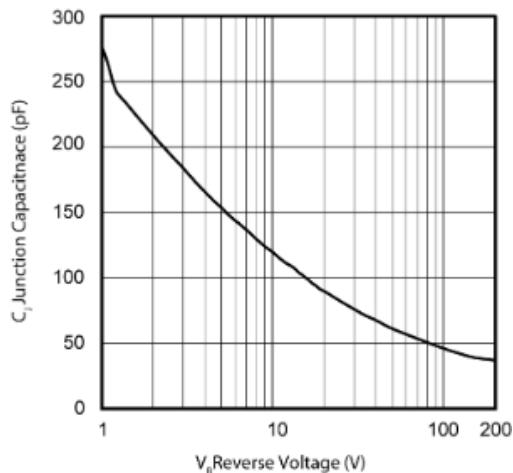
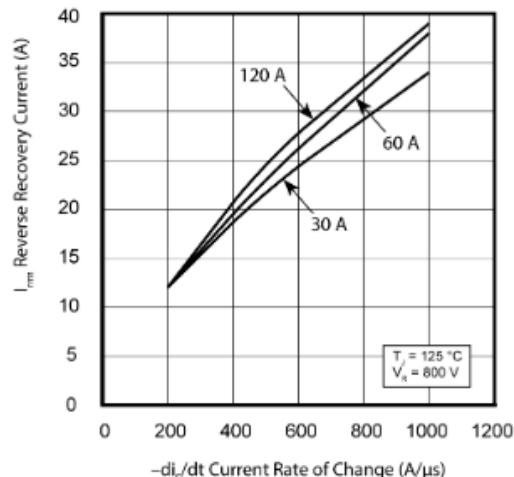
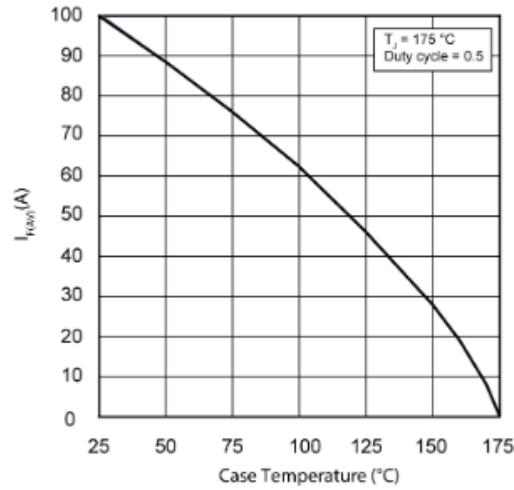


**Figure 2 • Forward Current vs. Forward Voltage**



**Figure 3 • trr vs. Current Rate of Change**



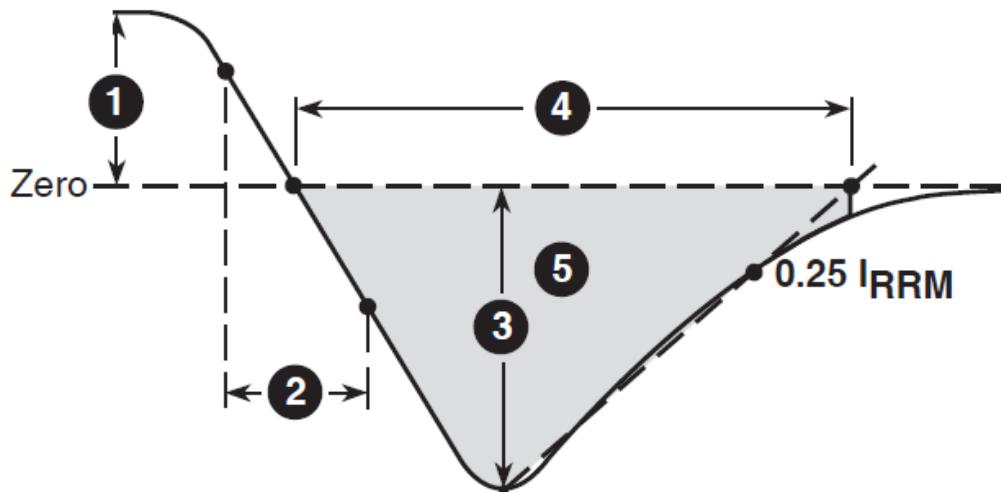
**Figure 4 • Qrr vs. Current Rate of Change****Figure 6 • Dynamic Parameters vs. Junction Temperature****Figure 8 • Junction Capacitance vs. Reverse Voltage****Figure 5 • IRRM vs. Current Rate of Change****Figure 7 • Maximum Average Forward Current vs. Case Temperature**

**4**

## Reverse Recovery Overview

The following illustration shows the reverse recovery testing and measurement information for the APT60DQ120BG device.

**Figure 9 • 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  $0.25 \times I_{RRM}$  passes through zero.
5.  $Q_{rr}$ —Area under the curve defined by  $I_{RRM}$  and  $t_{rr}$ .

## 5 Package Specification

This section shows the package specification for the APT60DQ120BG device.

### 5.1 Package Outline Drawing

This section shows the TO-247 package drawing of the APT60DQ120BG device. Dimensions are in millimeters and (inches).

**Figure 10 • Package Outline Drawing**

