

**APT60DQ120SG**  
**Datasheet**  
**Ultrafast Soft Recovery Rectifier Diode**

Final  
April 2018



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# 1 Revision History

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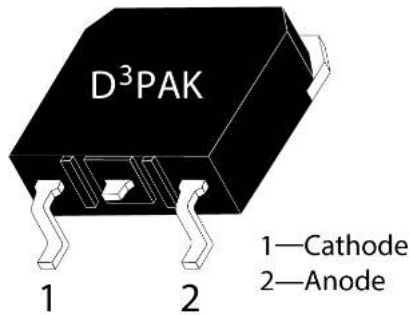
The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

## 1.1 Revision A

Revision A was published in April 2018. It is the first publication of this document.

## 2 Product Overview

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### Features

The following are key features of the APT60DQ120SG device:

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

### 2.1 Benefits

The following are benefits of the APT60DQ120SG device:

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

### 2.2 Applications

The APT60DQ120SG 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 APT60DQ120SG device.

#### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the APT60DQ120SG 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 ( $T_c = 103\text{ }^\circ\text{C}$ , duty cycle = 0.5)	60	A
$I_{F(RMS)}$	RMS forward current	87	
$I_{FSM}$	Non-repetitive forward surge current ( $T_j = 45\text{ }^\circ\text{C}$ , 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	$^\circ\text{C}$
$T_L$	Lead temperature for 10 seconds	300	

The following table shows the thermal and mechanical characteristics of the APT60DQ120SG device.

**Table 2 • Thermal and Mechanical Characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			0.40	$^\circ\text{C}/\text{W}$
$W_T$	Package weight		0.14		oz
			4.0		g

#### 3.2 Electrical Performance

The following table shows the static characteristics of the APT60DQ120SG 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		
		$I_F = 60\text{ A}, T_j = 125\text{ }^\circ\text{C}$		2.11		
$I_{RM}$	Maximum reverse leakage current	$V_R = 1200\text{ V}$			100	$\mu\text{A}$
		$V_R = 1200\text{ V}, T_j = 125\text{ }^\circ\text{C}$			500	
$C_j$	Junction capacitance	$V_R = 200\text{ V}$		37		pF

### 3.3 Dynamic Characteristics

The following table shows the dynamic characteristics of the APT60DQ120SG device.

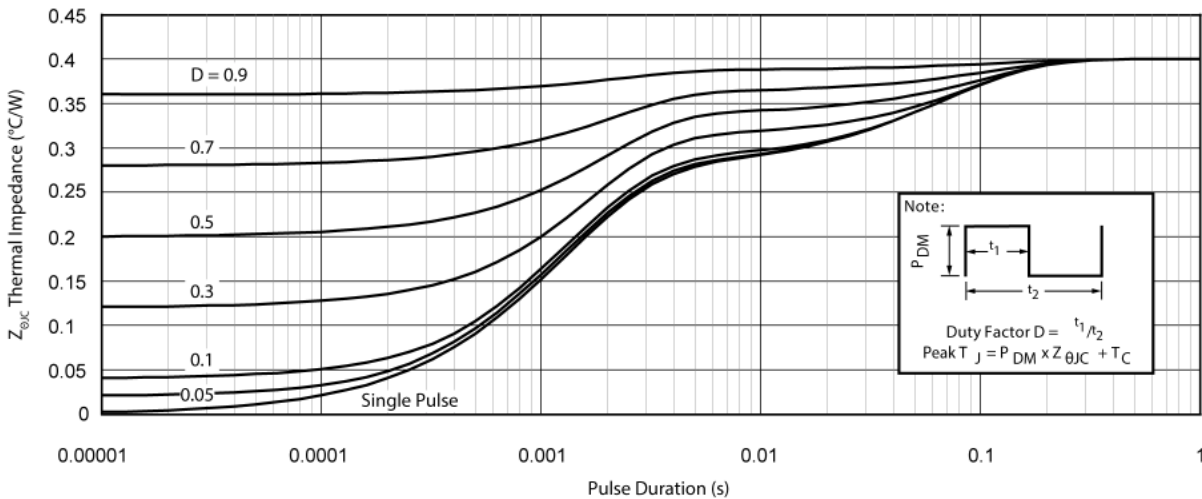
**Table 4 • Dynamic Characteristics**

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

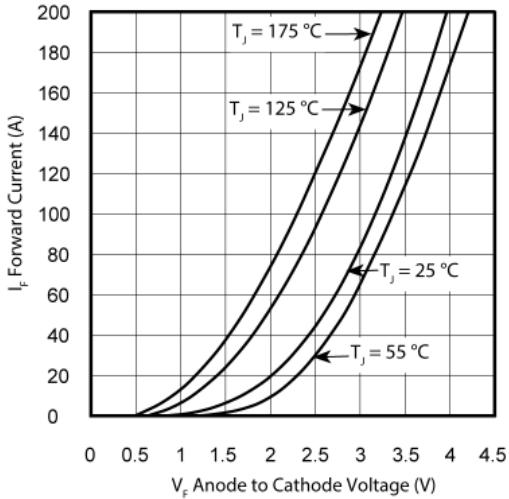
### 3.4 Typical Performance Curves

This section shows the typical performance curves for the APT60DQ120SG device.

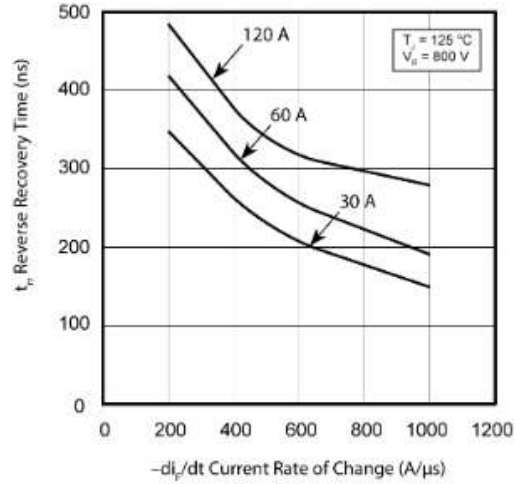
**Figure 1 • Maximum Transient Thermal Impedance**



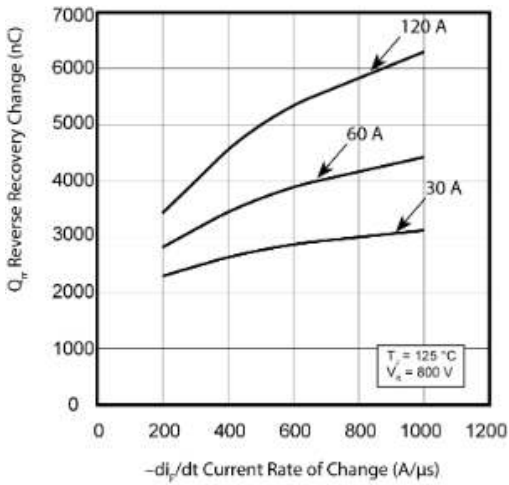
**Figure 2 • Forward Current vs. Forward Voltage**



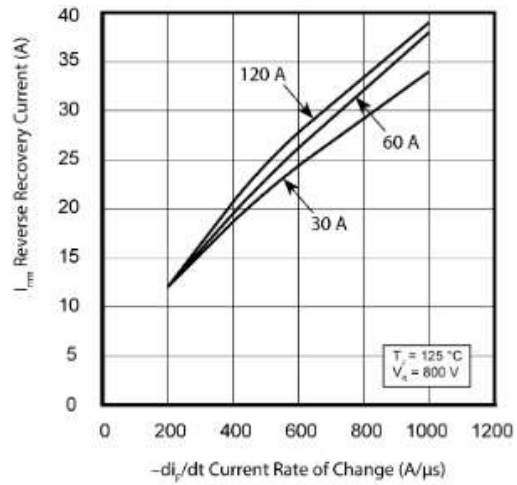
**Figure 3 •  $t_{rr}$  vs. Current Rate of Change**



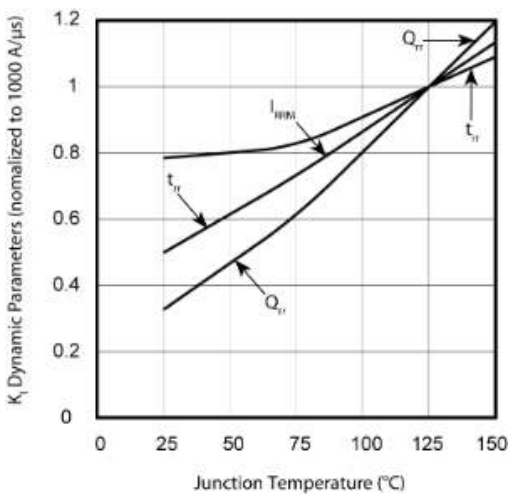
**Figure 4 •  $Q_{rr}$  vs. Current Rate of Change**



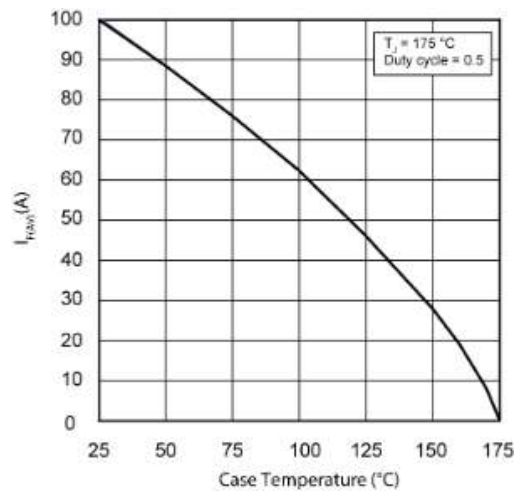
**Figure 5 • IRRM vs. Current Rate of Change**

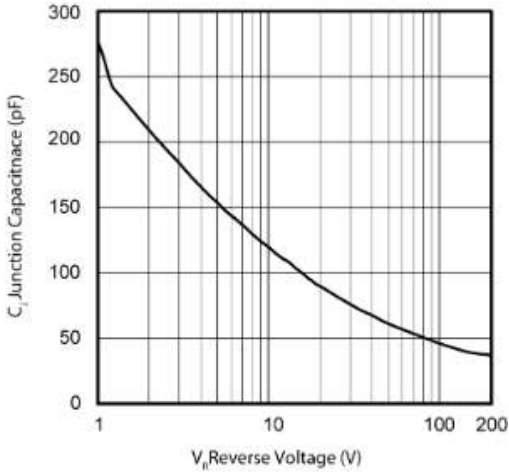


**Figure 6 • Dynamic Parameters vs. Junction Temperature**



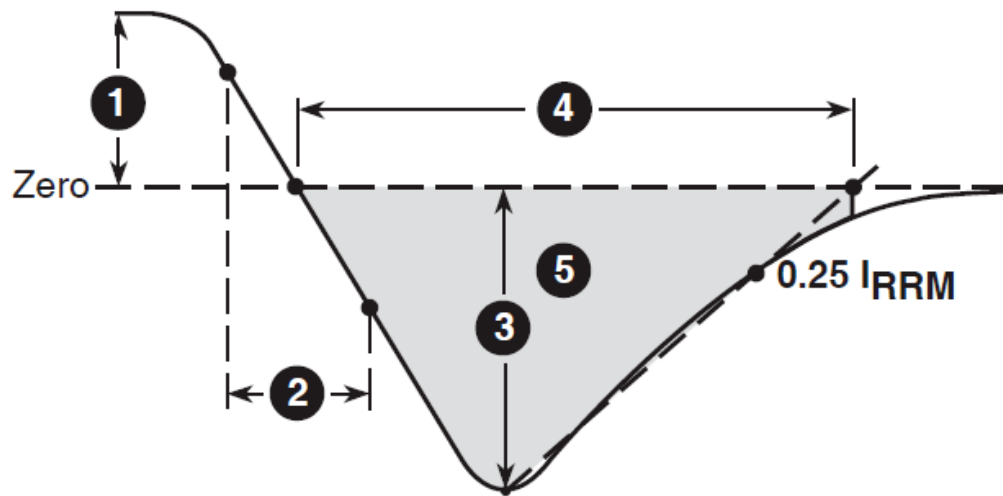
**Figure 7 • Maximum Average Forward Current vs. Case Temperature**



**Figure 8 • Junction Capacitance vs. Reverse Voltage**

### 3.5 Reverse Recovery Overview

The following illustration shows the reverse recovery testing and measurement information for the APT60DQ120SG 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  $t_{rr}$ .



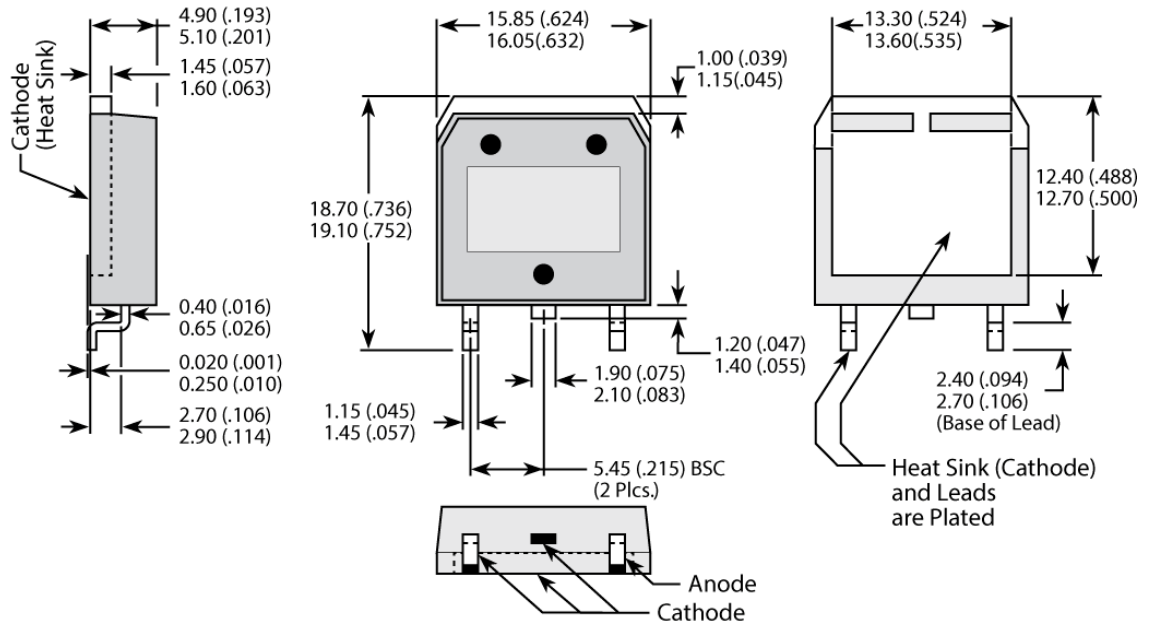
## 4 Package Specification

This section outlines the package specification for the APT60DQ120SG device.

### 4.1 Package Outline Drawing

This section details the D<sup>3</sup>PAK package drawing of the APT60DQ120SG device. Dimensions are in millimeters and (inches).

Figure 10 • Package Outline Drawing



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