

**APT30D120SG**  
**Datasheet**  
**Ultrafast Soft Recovery Rectifier Diode**

Final  
March 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.

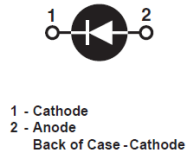
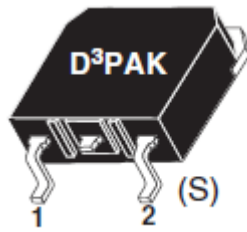
## 1.1 Revision A

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

## 2 Product Overview

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This section outlines the product overview for the APT30D120SG device.



### 2.1 Features

The following are key features of the APT30D120SG device:

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

### 2.2 Benefits

The following are benefits of the APT30D120SG device:

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

### 2.3 Applications

The APT30D120SG 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 details the electrical specifications for the APT30D120SG device.

#### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the APT30D120SG 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 ( $T_C = 128\text{ }^\circ\text{C}$ , duty cycle = 0.5)	30	A
$I_{F(RMS)}$	RMS forward current	59	
$I_{FSM}$	Non-repetitive forward surge current ( $T_J = 45\text{ }^\circ\text{C}$ , 8.3 ms)	210	
$T_J, T_{STG}$	Operating and storage temperature range	-55 to 175	$^\circ\text{C}$
$T_L$	Lead temperature for 10 s	300	

#### 3.2 Typical Electrical Performance

The following table shows the static electrical characteristics of the APT30D120SG device.

**Table 2 • Static Electrical Characteristics**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	Unit
$V_F$	Forward voltage	$I_F = 30\text{ A}$		2.0	2.5	V
		$I_F = 60\text{ A}$		2.3		
		$I_F = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$		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	$V_R = 200\text{ V}$		32		pF

The following table shows the dynamic characteristics of the APT30D120SG device.

**Table 3 • Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ $di_F/dt = -100\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$ $T_J = 25\text{ }^\circ\text{C}$		31		ns
$t_{rr}$	Reverse recovery time	$I_F = 30\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 25\text{ }^\circ\text{C}$		370		
$Q_{rr}$	Reverse recovery charge	$I_F = 30\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 25\text{ }^\circ\text{C}$		660		nC
$I_{RRM}$	Maximum reverse recovery current	$I_F = 30\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 25\text{ }^\circ\text{C}$		5		A
$t_{rr}$	Reverse recovery time	$I_F = 30\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$		500		ns
$Q_{rr}$	Reverse recovery charge	$I_F = 30\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$		3450		nC
$I_{RRM}$	Maximum reverse recovery current	$I_F = 30\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$		12		A
$t_{rr}$	Reverse recovery time	$I_F = 30\text{ A}$ $di_F/dt = -1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$		220		ns
$Q_{rr}$	Reverse recovery charge	$I_F = 30\text{ A}$ $di_F/dt = -1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$		4650		nC
$I_{RRM}$	Maximum reverse recovery current	$I_F = 30\text{ A}$ $di_F/dt = -1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$		37		A

The following table shows the thermal and mechanical characteristics of the APT30D120SG device.

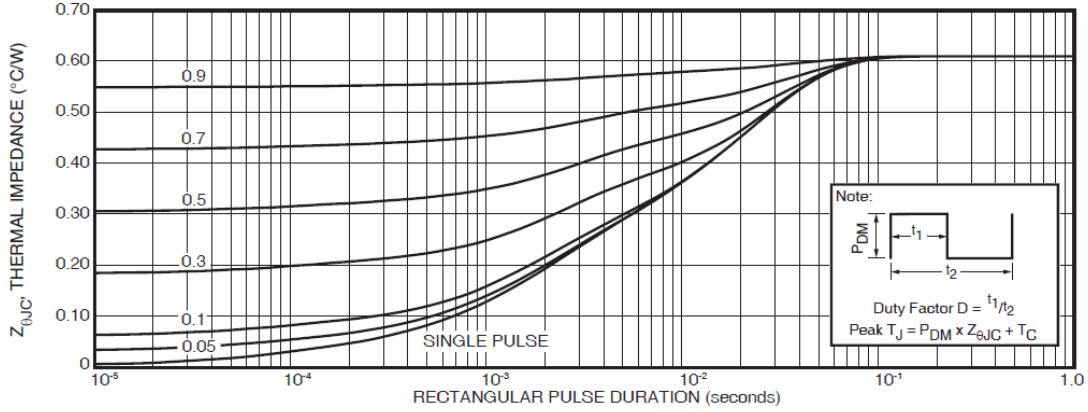
**Table 4 • Thermal and Mechanical Characteristics**

Symbol	Characteristic/Test Conditions	MIN	TYP	MAX	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			0.61	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-ambient thermal resistance			40	
$W_T$	Package weight		0.14		oz
			4.0		g

### 3.3 Typical Performance Curves

This section shows the typical performance curves for the APT30D120SG device.

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



**Figure 2 • Transient Thermal Impedance Model**

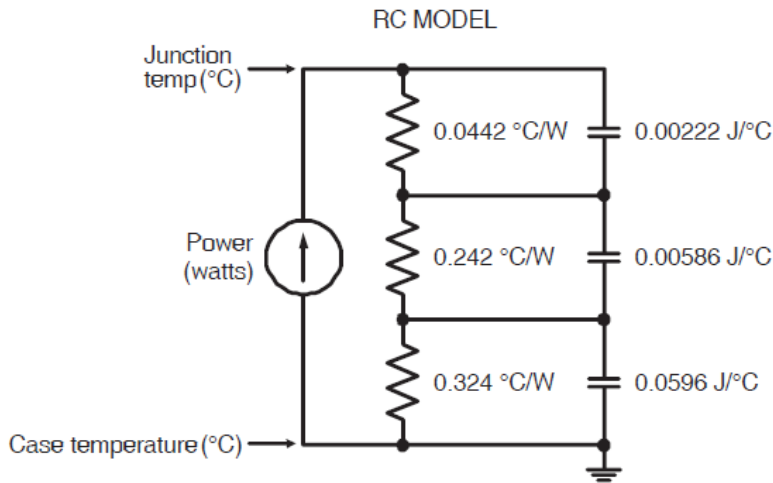


Figure 3 • Forward Current vs. Forward Voltage

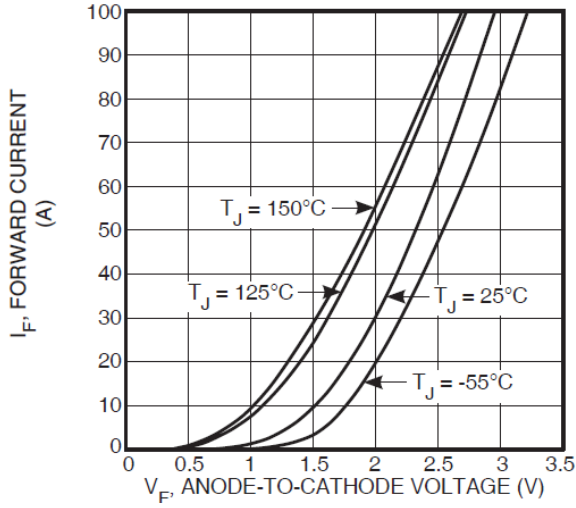


Figure 4 •  $t_{rr}$  vs. Current Rate of Change

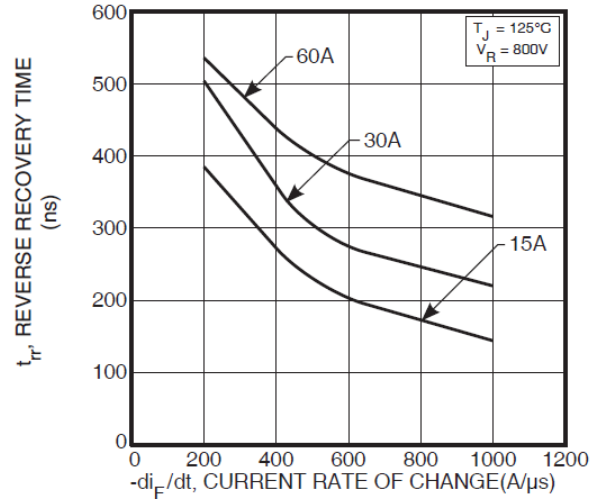


Figure 5 •  $Q_{rr}$  vs. Current Rate of Change

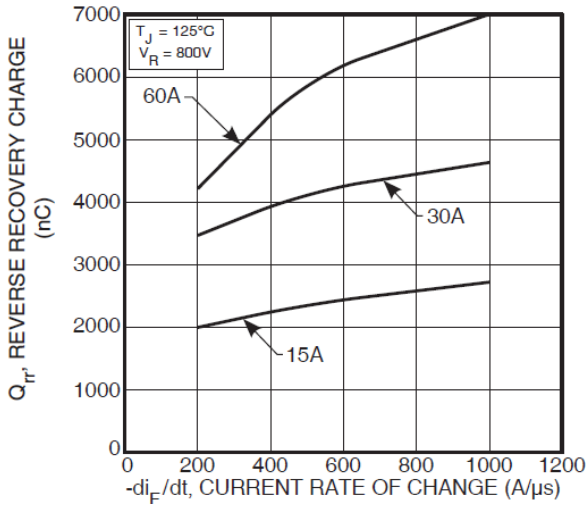


Figure 6 •  $I_{RRM}$  vs. Current Rate of Change

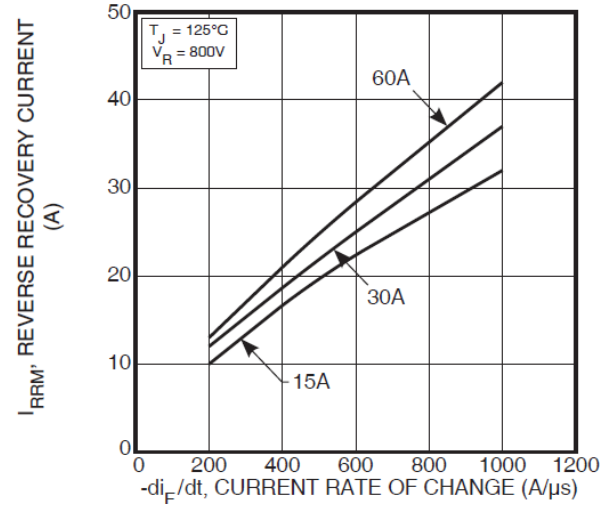


Figure 7 • Dynamic Parameters vs. Junc Temp

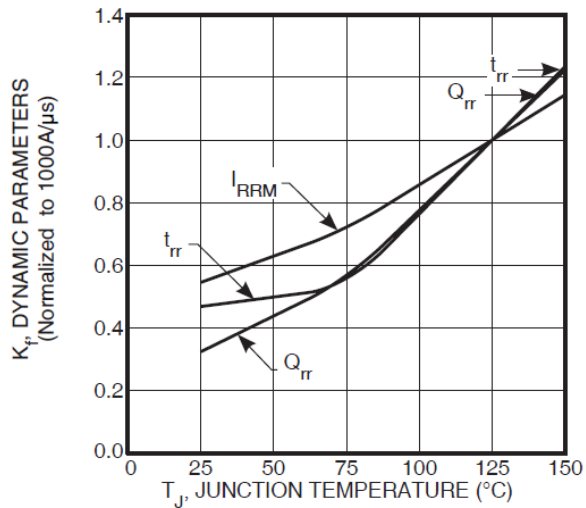
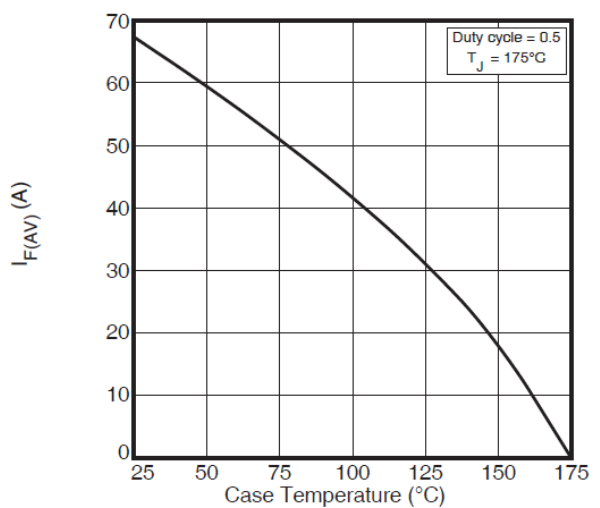
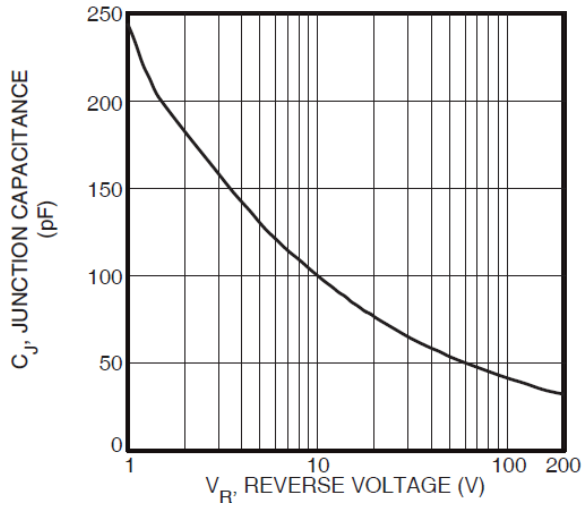


Figure 8 • Max Avg Forward Current vs. Case Temp





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



### 3.4 Reverse Recovery Overview

The following illustration shows the reverse recovery testing and measurement information for the APT30D120SG device.

Figure 10 • Diode Test Circuit

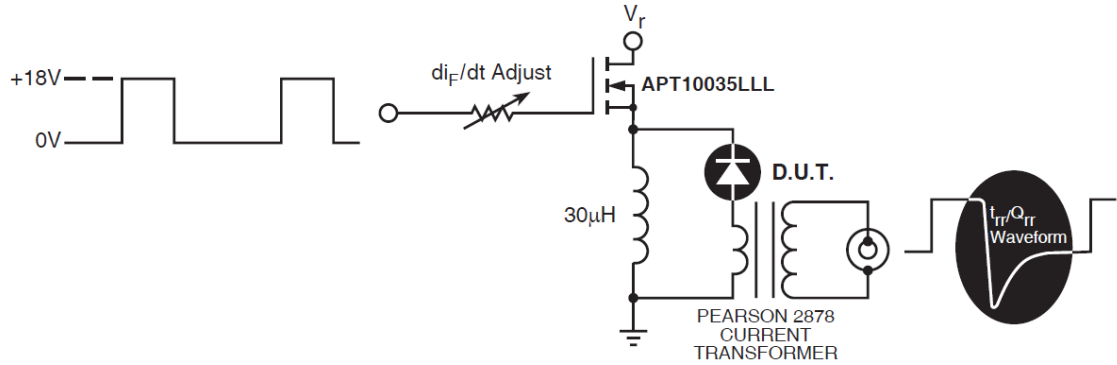
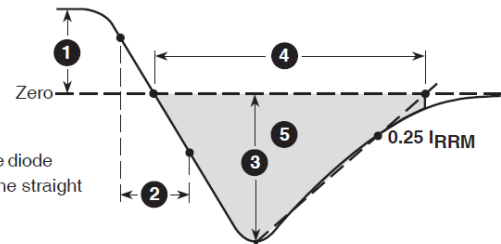


Figure 11 • Diode Reverse Recovery Waveform and Definitions

- 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  $t_{rr}$ .



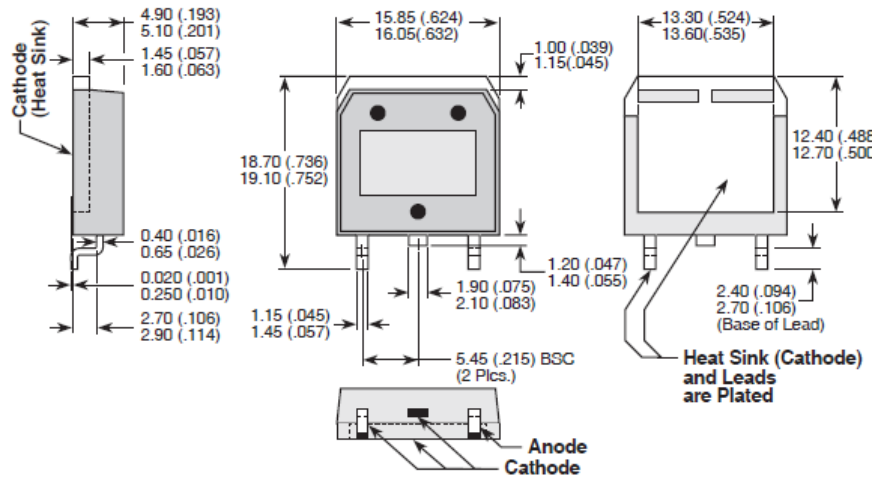
## 4 Package Specification

This section outlines the package specification for the APT30D120SG device.

### 4.1 Package Outline Drawing

This section details the D3PAK package drawing of the APT30D120SG device. Dimensions are in millimeters and (inches).

Figure 12 • Package Outline Drawing



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