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 J

Revision J was published in March 2017. The following is a summary of the changes in revision J of this document.

- Updated bullets in Product Overview section.
- Removed square wave 50% duty cycle in the Absolute Maximum Ratings table.

1.2 Revision I

Revision I was published in January 2017. The following is a summary of the changes in revision I of this document.

- Updated features section.

1.3 Revision H

Revision H was published in July 2016. The following is a summary of the changes in revision H of this document.

- Updated K pack dimensions.

1.4 Revision G

Revision G was published in January 2016. The following is a summary of the changes in revision G of this document.

- Revised the K pack outline.

1.5 Revision F

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

- Updated B pack information changing the maximum lead thickness.

1.6 Revision E

Revision E was published in March 2009. The following is a summary of the changes in revision E of this document.

- Updated K pack and removed thermal ladder.

1.7 Revision D

Revision D was published in November 2008. The following is a summary of the changes in revision D of this document.

- Updated K pack drawing outline in the Product Overview section.
- Changed APT references to Microsemi.

1.8 Revision C

Revision C was published in October 2006. There were no changes to the technical content in revision C of this document.

1.9 Revision B

Revision B was published in August 2005. The following is a summary of the changes in revision B of this document.

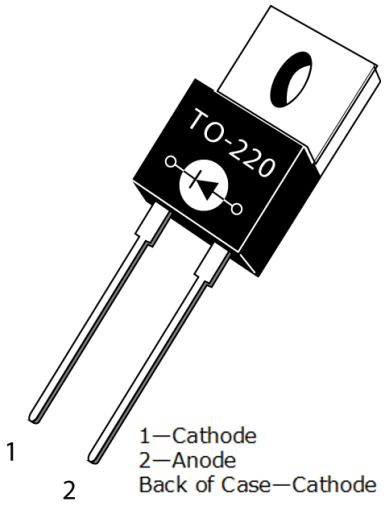
- The I_{RM} value in Table 2 Static Characteristics was updated.

1.10 Revision A

Revision A was published in May 2005. It is the first publication of this document.

2 Product Overview

This section outlines the product overview for the APT15DQ120KG device.



2.1 Features

The following are key features of the APT15DQ120KG 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 APT15DQ120KG device:

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

2.3 Applications

The APT15DQ120KG 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 details the electrical specifications for the APT15DQ120KG device.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the APT15DQ120KG device.

All ratings taken at 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 = 127 °C, duty cycle = 0.5)	15	A
$I_{F(RMS)}$	RMS forward current	29	
I_{FSM}	Non-repetitive forward surge current (T_J = 45 °C, 8.3 ms)	110	
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	

3.2 Electrical Performance

The following table shows the static characteristics of the APT15DQ120KG device.

Table 2 • Static Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_F	Forward Voltage	I_F = 15 A		2.8	3.3	V
		I_F = 30 A		3.4		
		I_F = 15 A, T_J = 125 °C		2.45		
I_{RM}	Maximum reverse leakage current	V_R = 1200 V			100	µA
		V_R = 1200 V, T_J = 125 °C			500	
C_J	Junction capacitance	V_R = 200 V		17		pF

The following table shows the dynamic characteristics of the APT15DQ120KG device.

Table 3 • Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	I_F = 1 A di_F/dt = –100 A/µs V_R = 30 V T_J = 25 °C		21		ns
t_{rr}	Reverse recovery time	I_F = 15 A di_F/dt = –200 A/µs, V_R = 800 V T_J = 25 °C		240		
Q_{rr}	Reverse recovery change			260		nC
I_{RRM}	Maximum reverse recovery current			3		A
t_{rr}	Reverse recovery time	I_F = 15 A di_F/dt = –200 A/µs V_R = 800 V T_J = 125 °C		290		ns
Q_{rr}	Reverse recovery change			960		nC
I_{RRM}	Maximum reverse recovery current			6		A
t_{rr}	Reverse recovery time	I_F = 15 A di_F/dt = –1000 A/µs V_R = 800 V T_J = 125 °C		130		ns
Q_{rr}	Reverse recovery change			1340		nC
I_{RRM}	Maximum reverse recovery current			19		A

The following table shows the thermal and mechanical characteristics of the APT15DQ120KG device.

Table 4 • Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			1.18	°C/W
W_T	Package weight		0.07		oz
			1.9		g
Torque	Maximum mounting torque			10	lb-in
				1.1	N-m

3.3 Typical Performance Curves

This section shows the typical performance curves for the APT15DQ120KG device.

Figure 1 • Maximum Transient Thermal Impedance

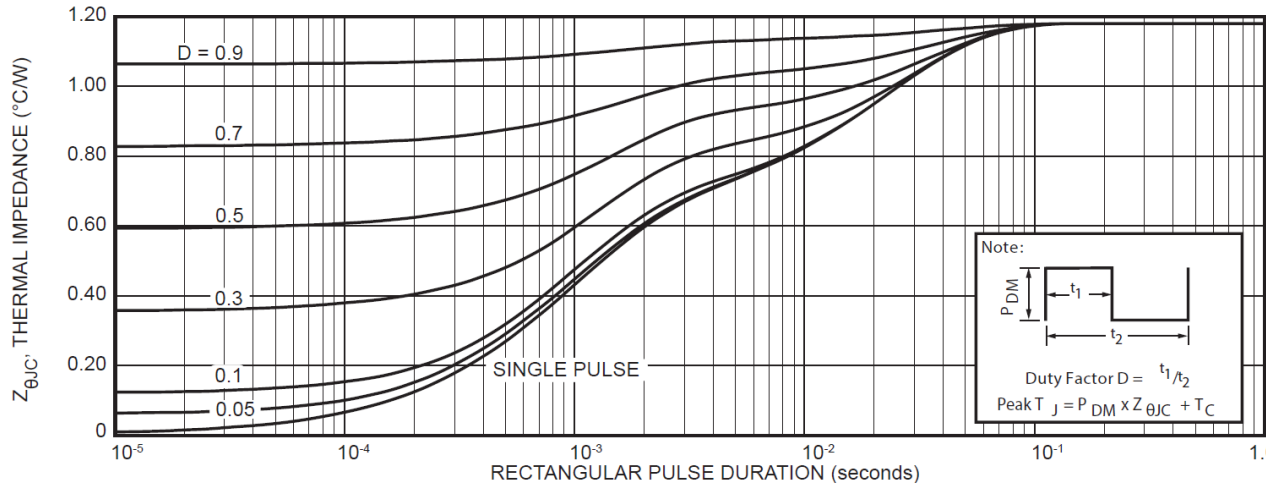


Figure 2 • Forward Current vs. Forward Voltage

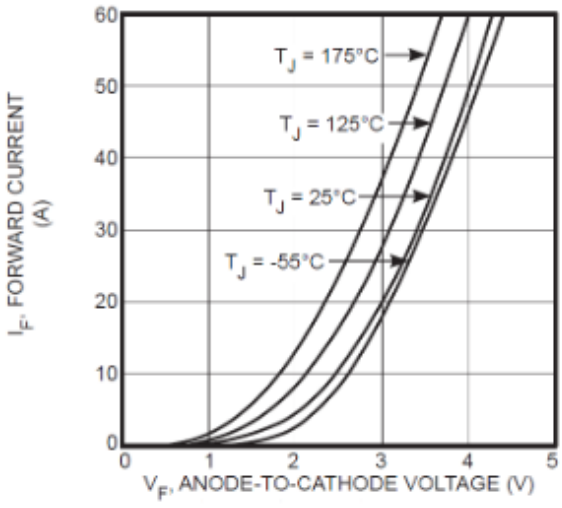


Figure 3 • trr vs. Current Rate of Change

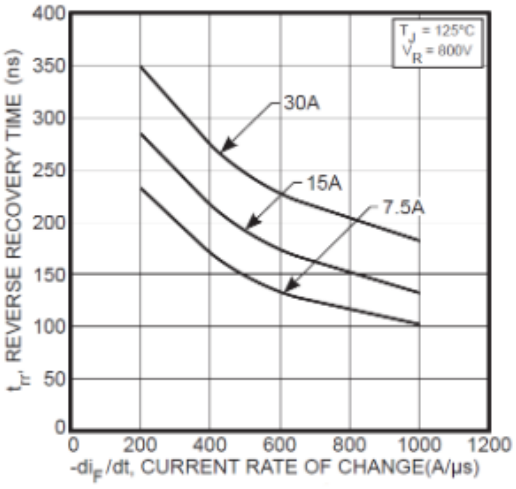


Figure 4 • Qrr vs. Current Rate of Change

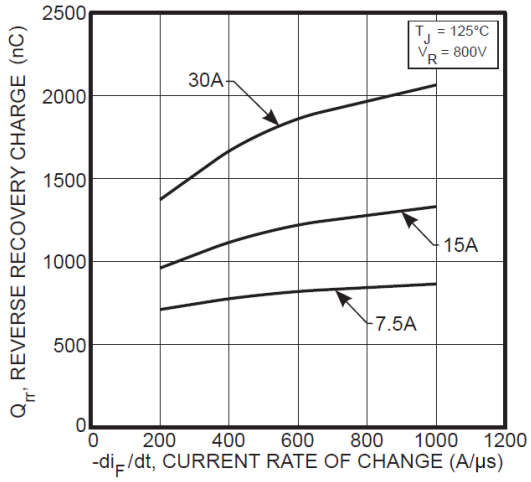


Figure 5 • IRRM vs. Current Rate of Change

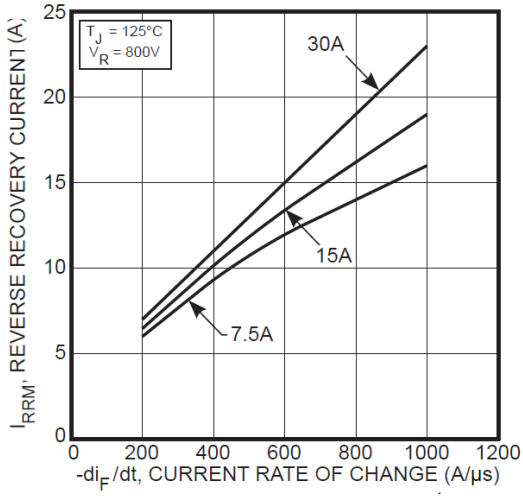


Figure 6 • Dynamic Parameters vs. Junction Temperature

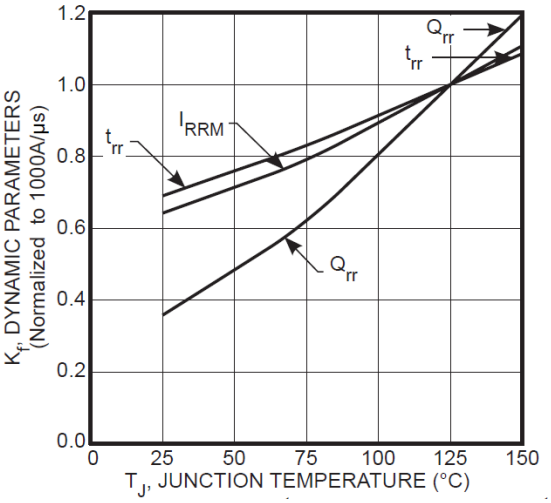


Figure 7 • Maximum Average Forward Current vs. Case Temperature

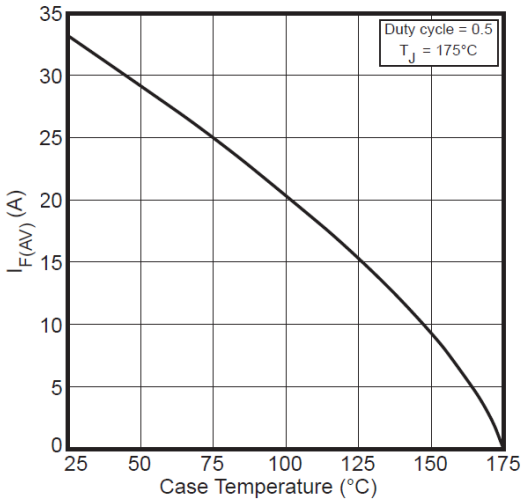
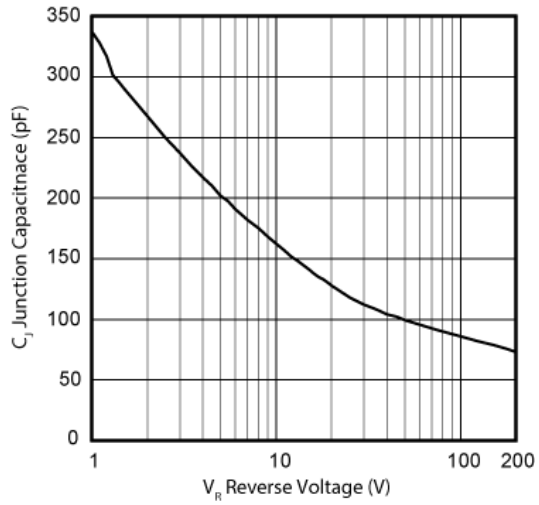


Figure 8 • Junction Capacitance vs. Reverse Voltage



3.4 Reverse Recovery Overview

The following figures illustrate the reverse recovery testing and measurement information for the APT15DQ120KG device.

Figure 9 • Diode Test Circuit

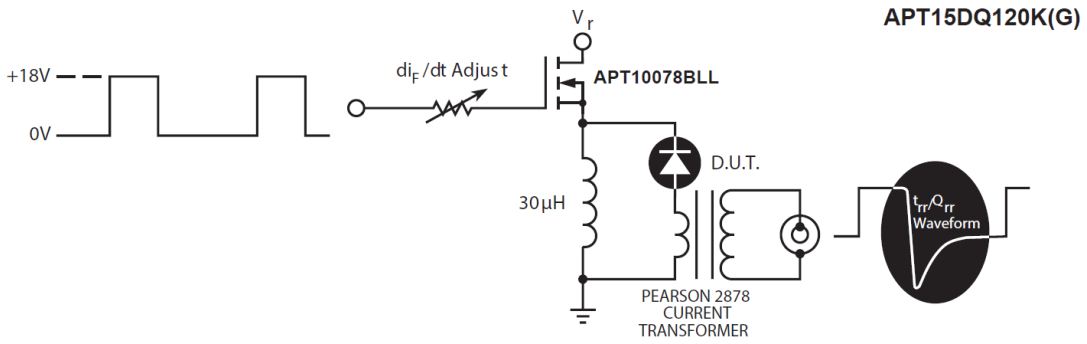
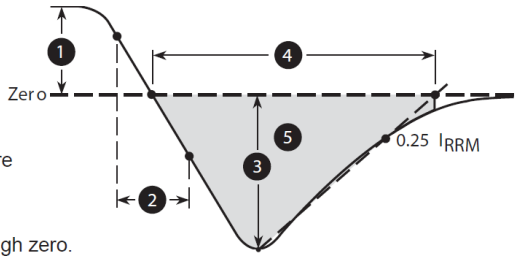


Figure 10 • Diode Reverse Recovery Waveform Definition



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}.

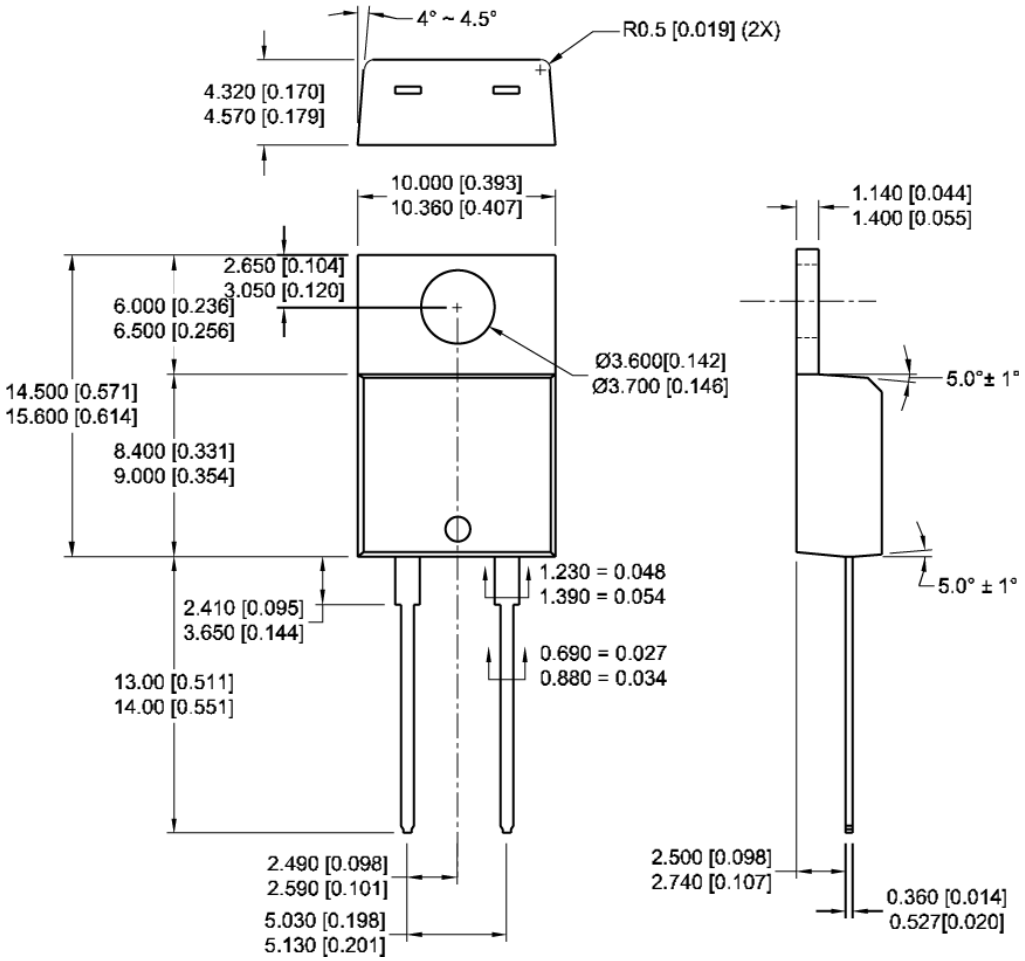
4 Package Specification

This section outlines the package specification for the APT15DQ120KG device.

4.1 Package Outline Drawing

This section details the TO-220 package drawing of the APT15DQ120KG device. Dimensions are in millimeters and (inches).

Figure 11 • Package Outline Drawing



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