Fast Diode Common-Cathode Power Module

APTDF300KK120D16AG

Product Overview

The APTDF300KK120D16AG device is a 1200V, 300A fast diode common-cathode power module.

The following figures show the electrical diagram and pinout location of the device.

Figure 1. Electrical Diagram

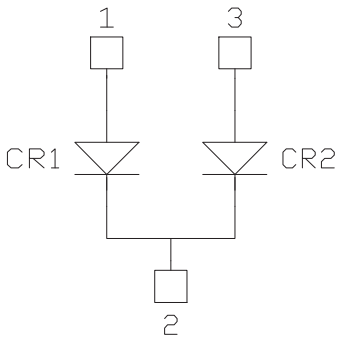
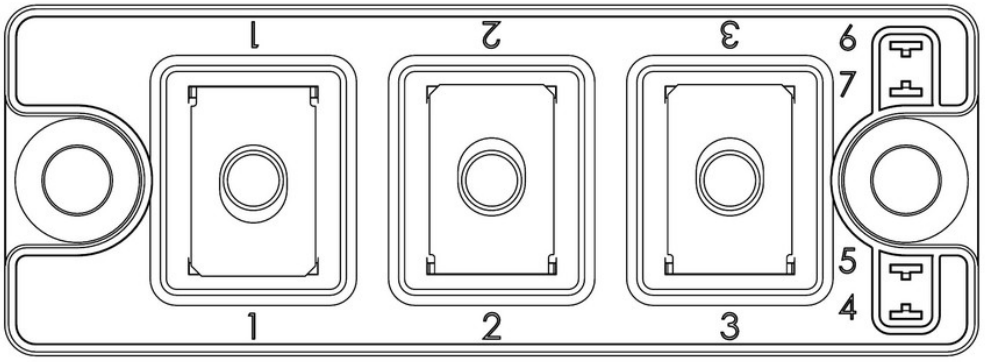


Figure 2. Pinout Location



Note: All ratings are at T_J = 25 °C, unless otherwise specified.

CAUTION These devices are sensitive to electrostatic discharge. Proper handling procedures must be followed.

Features

The APTDF300KK120D16AG device has the following key features:

- Fast-recovery times
- Soft-recovery characteristics
- High-blocking voltage
- High current
- Low-leakage current
- M6 power connectors
- Aluminum Nitride (AlN) substrate for improved thermal performance

Benefits

The APTDF300KK120D16AG device has the following benefits:

- Outstanding performance at high-frequency operation
- Low losses
- Low-noise switching
- Direct mounting to heatsink (isolated package)
- Low junction-to-case thermal resistance
- RoHS Compliant

Application

The APTDF300KK120D16AG device has the following applications:

- Uninterruptible Power Supply (UPS)
- Induction heating
- Welding equipment
- High-speed rectifiers

1. Electrical Specification

The following sections describe the electrical specifications of the APTDF300KK120D16AG device.

1.1 Diode Characteristics (Per Diode)

The following table lists the absolute maximum ratings of the APTDF300KK120D16AG device.

Table 1-1. Absolute Maximum Ratings

Symbol	Parameter			Maximum Ratings	Unit
V_{RRM}	Peak repetitive reverse voltage			1200	V
I_F	DC forward current		T_C = 25 °C	490	A
			T_C = 100 °C	300	
I_{FSM}	Non-repetitive forward surge current	t_P = 8.3 ms	T_C = 45 °C	1500	
I_{FRM}	Repetitive forward current	t_P = 1 ms	—	600	

The following table lists the electrical characteristics of the APTDF300KK120D16AG device.

Table 1-2. Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min.	Typ.	Max.	Unit
V_F	Diode forward voltage	I_F = 300A		—	2.8	3.8	V
		I_F = 600A		—	3.5	—	
		I_F = 300A	T_J = 125 °C	—	2.2	—	
I_{RRM}	Reverse leakage current	V_R = 1200V		—	—	400	µA
C_T	Junction capacitance	V_R = 200V		—	200	—	pF

The following table lists the dynamic characteristics of the APTDF300KK120D16AG device.

Table 1-3. Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 300A V_R = 800V di/dt = 800 A/µs	T_J = 25 °C	—	325	—	ns
			T_J = 125 °C	—	420	—	
Q_{rr}	Reverse recovery charge		T_J = 25 °C	—	0.29	—	µC
			T_J = 125 °C	—	13.3	—	
I_{rm}	Reverse recovery current		T_J = 25 °C	—	20	—	A
			T_J = 125 °C	—	52	—	
t_{rr}	Reverse recovery time	I_F = 300A V_R = 800V di/dt = 4000 A/µs	T_J = 125 °C	—	195	—	ns
Q_{rr}	Reverse recovery charge			—	23.2	—	µC
I_{rm}	Reverse recovery current			—	168	—	A
R_{thJC}	Junction-to-case thermal resistance			—	—	0.126	°C/W

1.2 Thermal and Package Characteristics

The following table lists the thermal and package characteristics of the APTDF300KK120D16AG device.

Table 1-4. Thermal and Package Characteristics

Symbol	Characteristic			Min.	Max.	Unit
V_{ISOL}	RMS isolation voltage, any terminal to case, t = 1 min, 50/60Hz			4000	—	V
T_J	Operating junction temperature range			–40	175	°C
T_{JOP}	Recommended junction temperature under switching conditions			–40	T_{Jmax} – 25	
T_{STG}	Storage temperature range			–40	125	
T_C	Operating case temperature			–40	125	
Torque	Mounting torque	For terminals	M6	3	5	N.m
		To heatsink				
Wt	Package weight			—	160	g

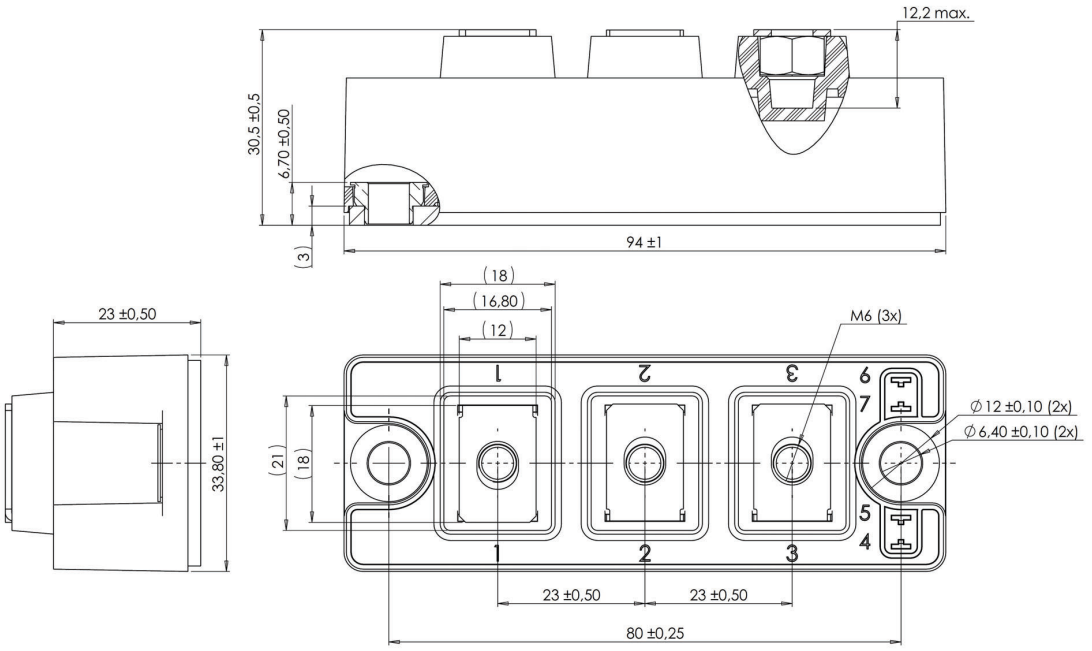
2. Package Specifications

The following section describes the package specification of the APTDF300KK120D16AG device.

2.1 Package Outline

The following figure shows the package outline drawing of the APTDF300KK120D16AG device. The dimensions in the following figure are in millimeters.

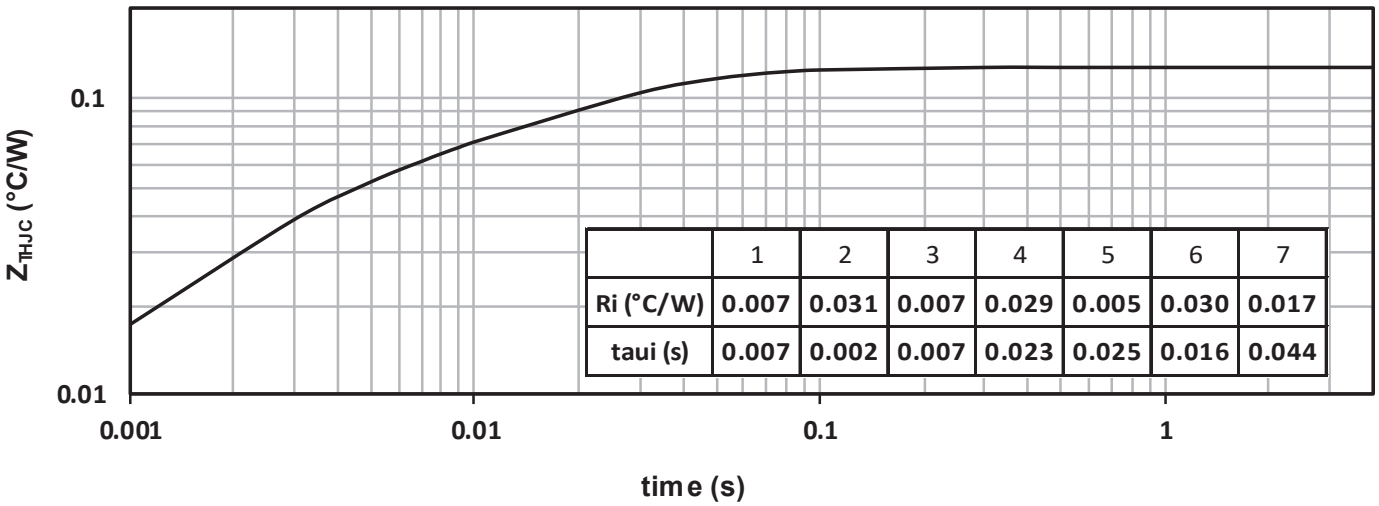
Figure 2-1. Package Outline Drawing



3. Typical Performance Curve

The following figures show the performance curves of the APTDF300KK120D16AG device.

Figure 3-1. Maximum Thermal Impedance



	1	2	3	4	5	6	7
Ri (°C/W)	0.007	0.031	0.007	0.029	0.005	0.030	0.017
taui (s)	0.007	0.002	0.007	0.023	0.025	0.016	0.044

Figure 3-2. Forward Current vs. Forward Voltage

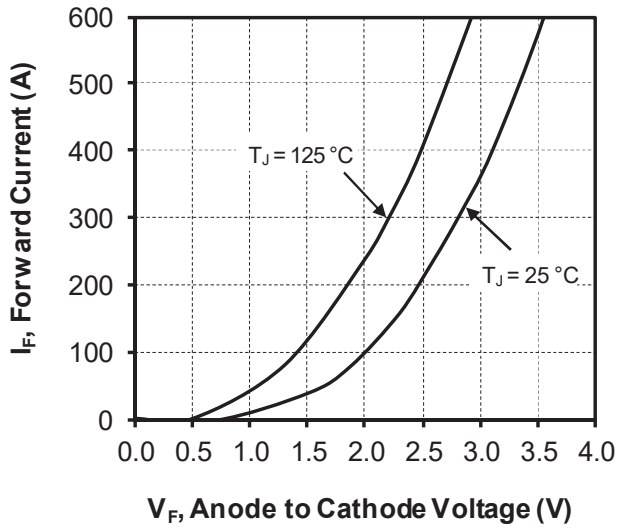


Figure 3-3. t_{rr} vs. Current Rate of Charge

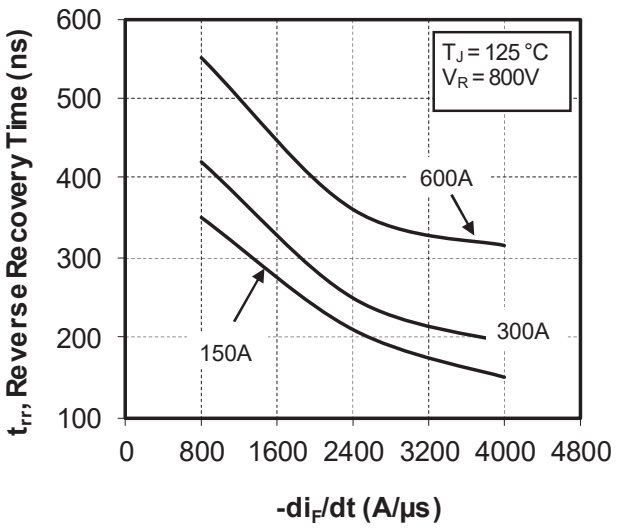


Figure 3-4. Q_{rr} vs. Current Rate Charge

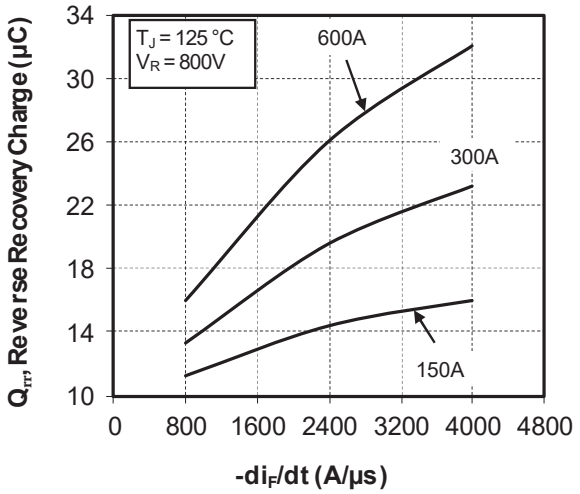


Figure 3-5. I_{RRM} vs. Current Rate of Charge

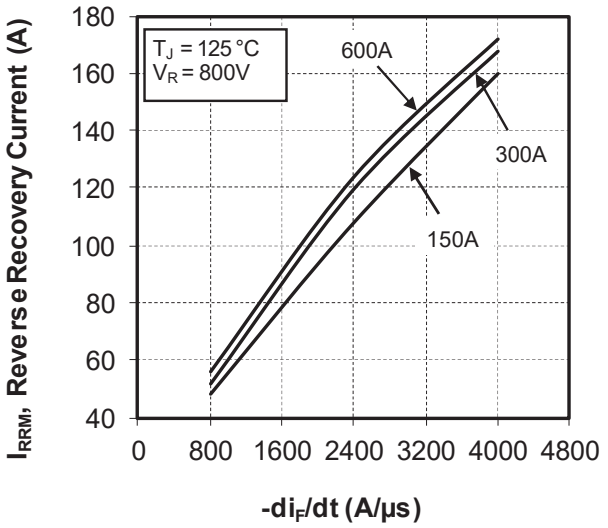


Figure 3-6. Capacitance vs. Reverse Voltage

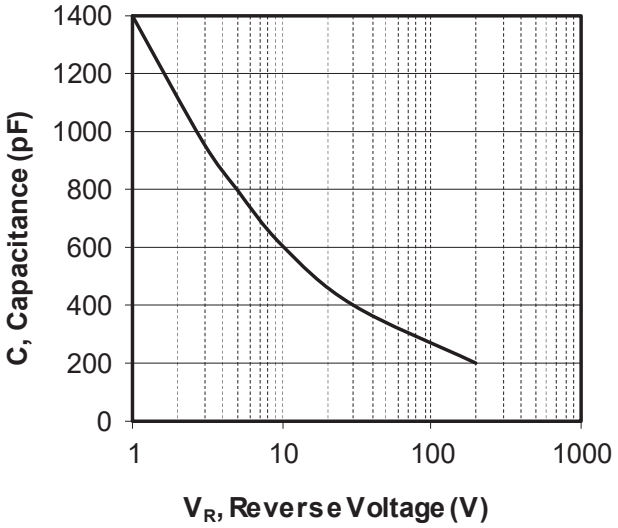
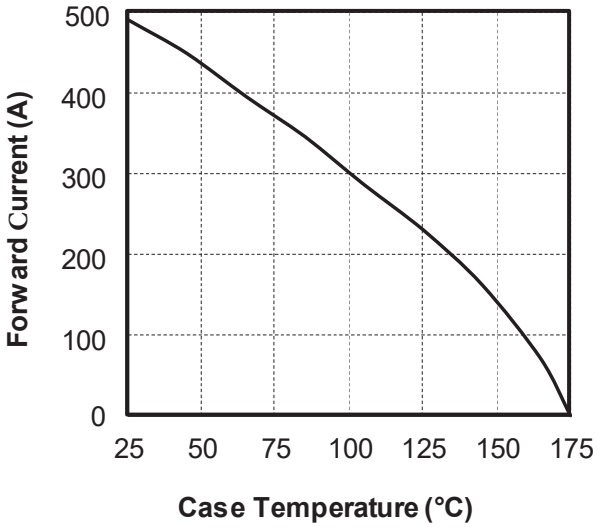


Figure 3-7. Forward Current vs. Case Temperature



4. 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.

Revision	Date	Description
A	01/2024	Initial revision

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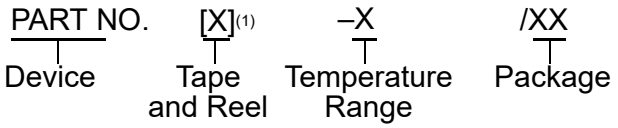

Device:	Device A, Device B, etc	
Tape and Reel Option:	Blank	= Standard packaging (tube or tray)
	T	= Tape and Reel(1)
Temperature Range:	I	= -40°C to +85°C (Industrial)
	E	= -40°C to +125°C (Extended)
Package:(2)	JQ	= UQFN
	P	= PDIP
	ST	= TSSOP
	SL	= SOIC-14
	SN	= SOIC-8
	RF	= UDFN
Pattern:	QTP, SQTP^{SM} (Serial Quick Turn Programming capability), Code or Special Requirements (blank otherwise)	

- Device A - I/P Industrial temperature, PDIP package
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