

Product Overview

The APTDX450A120D16AG device is a 1200V, 450A fast diode phase-leg power module. The following figures show the electrical diagram and pinout location of the device.

Figure 1. Electrical Diagram

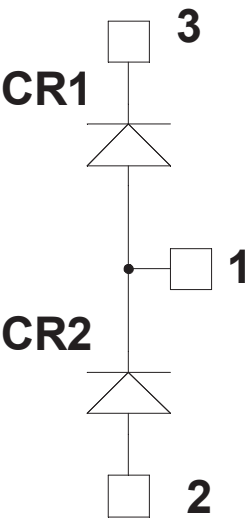
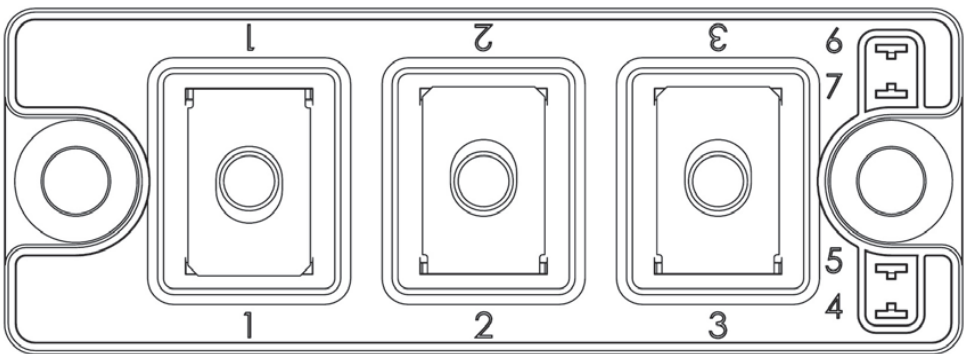


Figure 2. Pinout Location



Note: All ratings are at $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified.



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

Features

The APTDX450A120D16AG 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 APTDX450A120D16AG device has the following benefits:

- Low losses
- Low-noise switching
- Direct mounting to heatsink (isolated package)
- Low junction-to-case thermal resistance
- RoHS compliant

Application

The APTDX450A120D16AG 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 APTDX450A120D16AG device.

1.1 Diode Characteristics (Per Diode)

The following table lists the absolute maximum ratings of the APTDX450A120D16AG 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		$T_C = 25\text{ }^{\circ}\text{C}$	700 ¹	A
			$T_C = 95\text{ }^{\circ}\text{C}$	450	
I_{FSM}	Non-repetitive forward surge current	$t_p = 8.3\text{ ms}$	$T_C = 45\text{ }^{\circ}\text{C}$	2250	
I_{FRM}	Repetitive forward current	$t_p = 1\text{ ms}$	—	900	

Note:

1. Specification of the diode device, but the output current must be limited due to the size of the power connectors.

The following table lists the electrical characteristics of the APTDX450A120D16AG device.

Table 1-2. Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min.	Typ.	Max.	Unit
V_F	Diode forward voltage	$I_F = 450\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	—	1.75	2	V
			$T_J = 125\text{ }^{\circ}\text{C}$	—	1.6	—	
			$T_J = 175\text{ }^{\circ}\text{C}$	—	1.52	—	
I_{RRM}	Reverse leakage current	$V_R = 1200\text{ V}$		—	—	30	μA

The following table lists the dynamic characteristics of the APTDX450A120D16AG device.

Table 1-3. Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min.	Typ.	Max.	Unit
I _{rm}	Reverse recovery current	I _F = 450A V _R = 600V di/dt = 5100 A/μs	T _J = 25 °C	—	195	—	A
			T _J = 125 °C	—	276	—	
			T _J = 175 °C	—	321	—	
Q _{rr}	Reverse recovery charge		T _J = 25 °C	—	30.9	—	μC
			T _J = 125 °C	—	65.1	—	
			T _J = 175 °C	—	85.8	—	
E _{rr}	Reverse recovery energy		T _J = 25 °C	—	9.9	—	mJ
			T _J = 125 °C	—	21.9	—	
			T _J = 175 °C	—	29.7	—	
R _{thJC}	Junction-to-case thermal resistance			—	—	0.116	°C/W

1.2 Thermal and Package Characteristics

The following table lists the thermal and package characteristics of the APTDX450A120D16AG 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

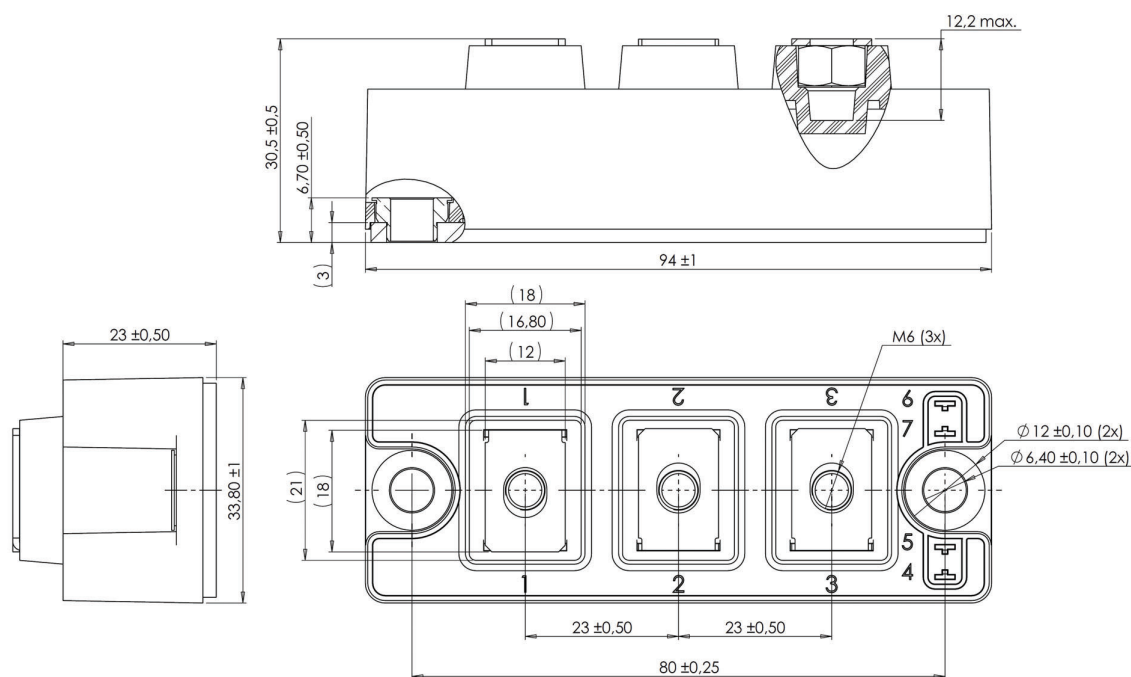
2. Package Specifications

The following section describes the package specification of the APTDX450A120D16AG device.

2.1 Package Outline

The following figure shows the package outline drawing of the APTDX450A120D16AG 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 APTDX450A120D16AG device.

Figure 3-1. Maximum Thermal Impedance

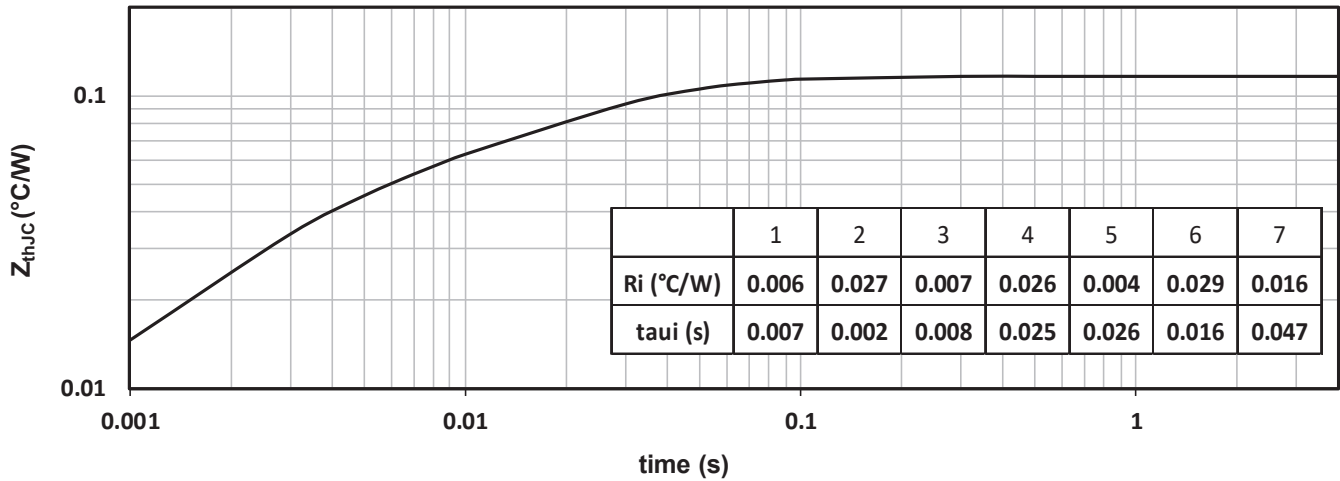


Figure 3-2. Forward Current vs. Forward Voltage

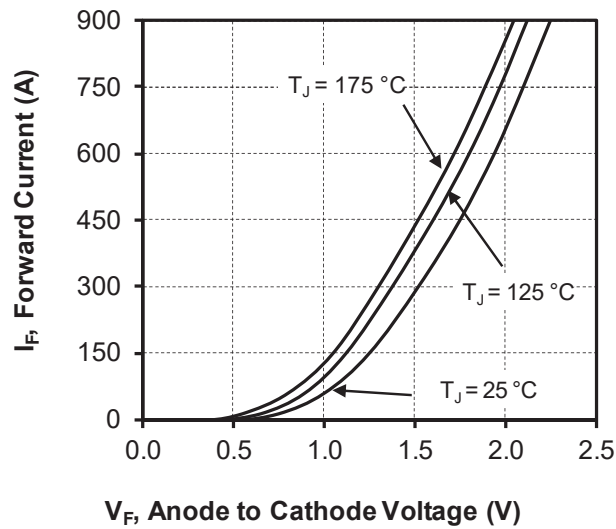


Figure 3-3. Energy Losses vs. Forward Current

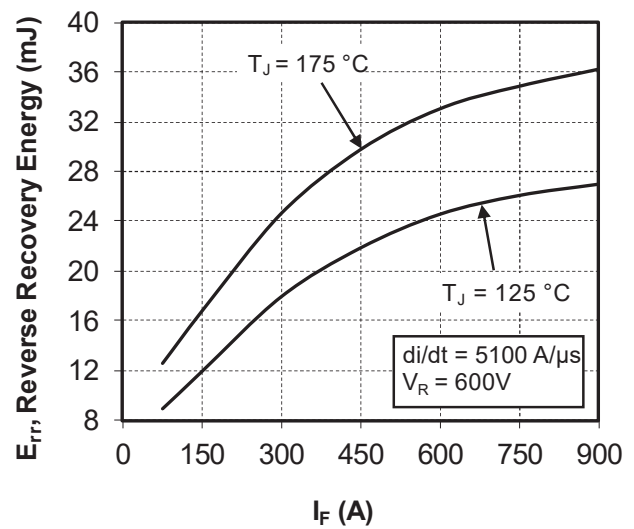
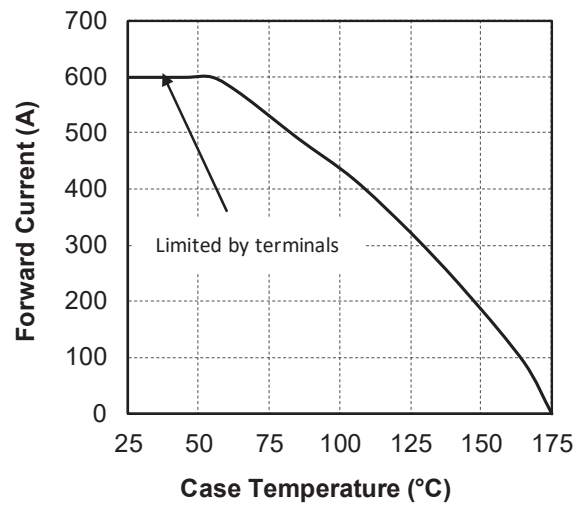


Figure 3-4. Forward Current vs. Case Temperature



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	02/2024	Initial revision

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