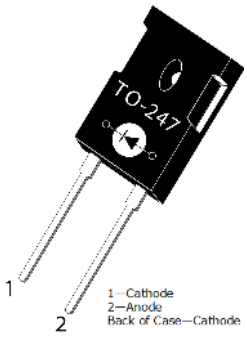
APT60D40BG Fast Soft Recovery Rectifier Diode

Product Overview

The APT60D40BG is a 400 V, 60 A Fast Soft Recovery Rectifier Si diode in a TO-247 package.



Features

The following are key features of the APT60D40BG device:

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

Benefits

The following are benefits of the APT60D40BG device:

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

Applications

The APT60D40BG device is designed for the following applications:

- Power factor correction (PFC)
- Anti-parallel diode
  - Switchmode power supply
  - Inverters
- Freewheeling diode
  - Motor controllers
  - Inverters/converters
- Snubber diode

Device Specifications

This section shows the specifications of the APT60D40BG device.

Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the APT60D40BG device. T_C = 25 °C unless otherwise specified.

Table 1 • Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_R	Maximum DC reverse voltage	400	V
V_{RRM}	Maximum peak repetitive reverse voltage		
V_{RWM}	Maximum working peak reverse voltage		
$I_{F(AV)}$	Maximum average forward current (T_C = 140 °C, duty cycle = 0.5)	60	A
I_{FSM}	Non-repetitive forward surge current (T_J = 45 °C, 8.3 ms)	600	

The following table shows the thermal and mechanical characteristics of the APT60D40BG device.

Table 2 • Thermal and Mechanical Characteristics

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			0.34	°C/W
$R_{\theta JA}$	Junction-to-ambient thermal resistance			40	
T_J , T_{STG}	Operating and storage temperature range	–55		175	°C
T_L	Lead temperature for 10 seconds			300	
Wt	Package weight		0.22		oz
			6.2		g
	Mounting torque, 6-32 or M3 screw			10	lbf-in
				1.1	N-m

Electrical Performance

The following table shows the static characteristics of the APT60D40BG device. T_J = 25 °C unless otherwise specified.

Table 3 • Static Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_F	Forward voltage	I_F = 60 A		1.3	1.5	V
		I_F = 120 A		1.6		
		I_F = 60 A, T_J = 125 °C		1.2		
I_{RM}	Maximum reverse leakage current	V_R = V_R Rated			250	µA
		V_R = V_R Rated, T_J = 125 °C			500	
C_J	Junction capacitance	V_R = 200 V		120		pF

The following table shows the dynamic characteristics of the APT60D40BG device.

Table 4 • 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		30		ns
t_{rr}	Reverse recovery time	I_F = 60 A, di_F/dt = –200 A/µs V_R = 266 V		37		
Q_{rr}	Reverse recovery charge			80		nC
I_{RRM}	Maximum reverse recovery current			4		A
t_{rr}	Reverse recovery time	I_F = 60 A, di_F/dt = –200 A/µs V_R = 266 V, T_J = 125 °C		110		ns
Q_{rr}	Reverse recovery charge			540		nC
I_{RRM}	Maximum reverse recovery current			10		A
t_{rr}	Reverse recovery time	I_F = 60 A, di_F/dt = –800 A/µs V_R = 266 V, T_J = 125 °C		65		ns
Q_{rr}	Reverse recovery charge			1050		nC
I_{RRM}	Maximum reverse recovery current			27		

Typical Performance Curves

This section shows the typical performance curves of the APT60D40BG device.

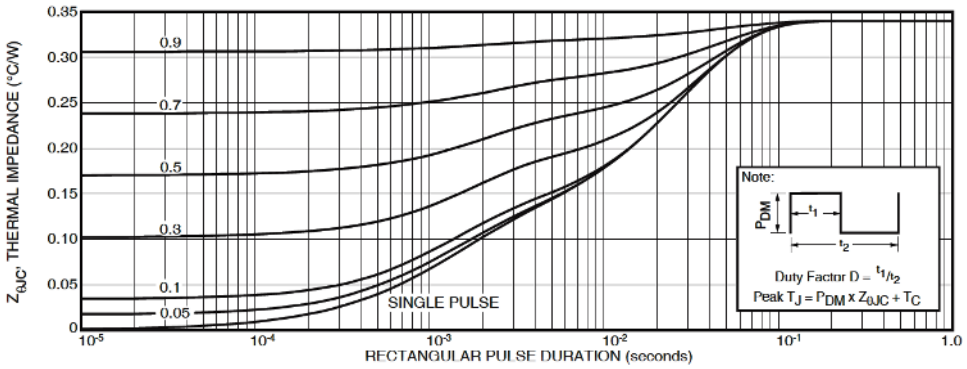


Figure 1 • Maximum Transient Thermal Impedance

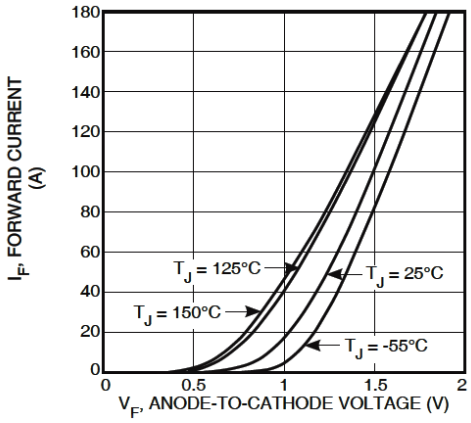


Figure 2 • Forward Current vs. Forward Voltage

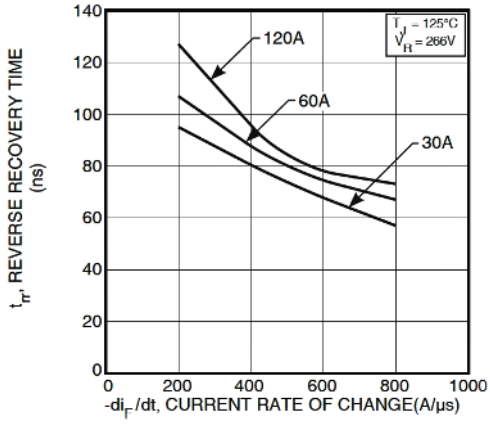


Figure 3 • Reverse Recovery Time vs. Current Rate of Change

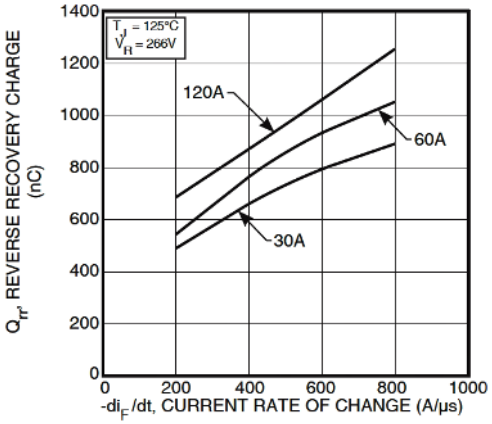


Figure 4 • Reverse Recovery Charge vs. Current Rate of Change

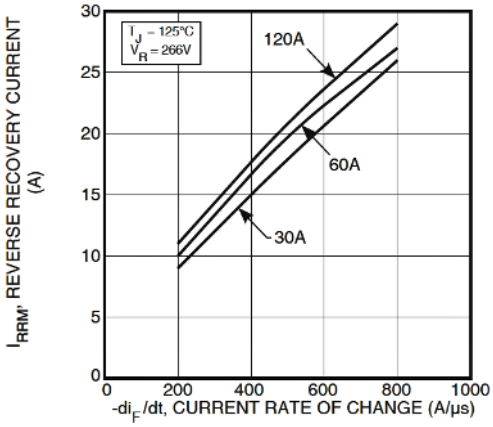


Figure 5 • Reverse Recovery Current vs. Current Rate of Change

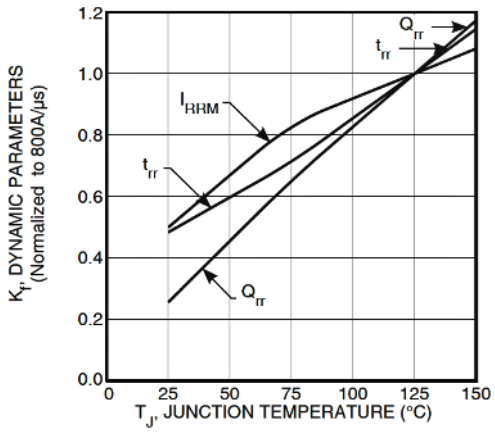


Figure 6 • Dynamic Parameters vs. Junction Temperature

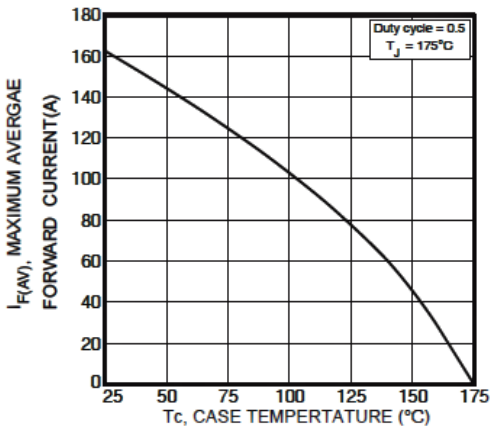


Figure 7 • Maximum Average Forward Current vs. Case Temperature

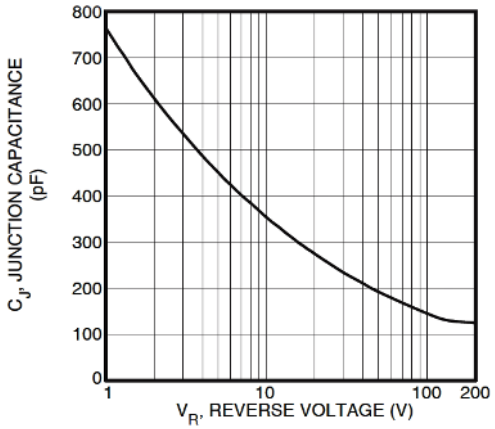


Figure 8 • Junction Capacitance vs. Reverse Voltage

Reverse Recovery Overview

The figure illustrates the diode test circuit of the APT60D40BG device.

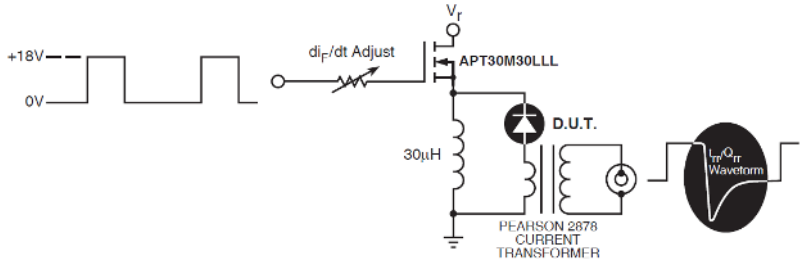


Figure 9 • Diode Test Circuit

The following figure illustrates the diode reverse recovery waveform and definitions of the APT60D40BG device.

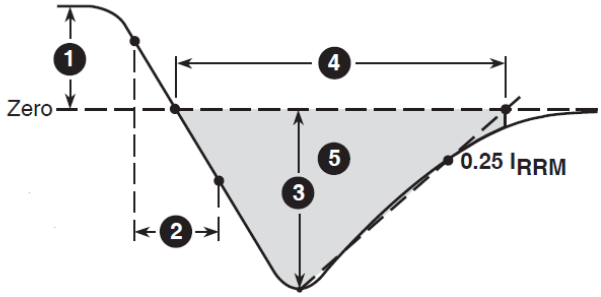


Figure 10 • Diode Reverse Recovery Waveform and Definitions

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 $0.25 \bullet I_{RRM}$ passes through zero.
5. Q_{rr} — Area under the curve defined by I_{RRM} and t_{rr}.

Package Specification

This section shows the package specification of the APT60D40BG device.

Package Outline Drawing

The following figure illustrates the TO-247 package outline of the APT60D40BG device.

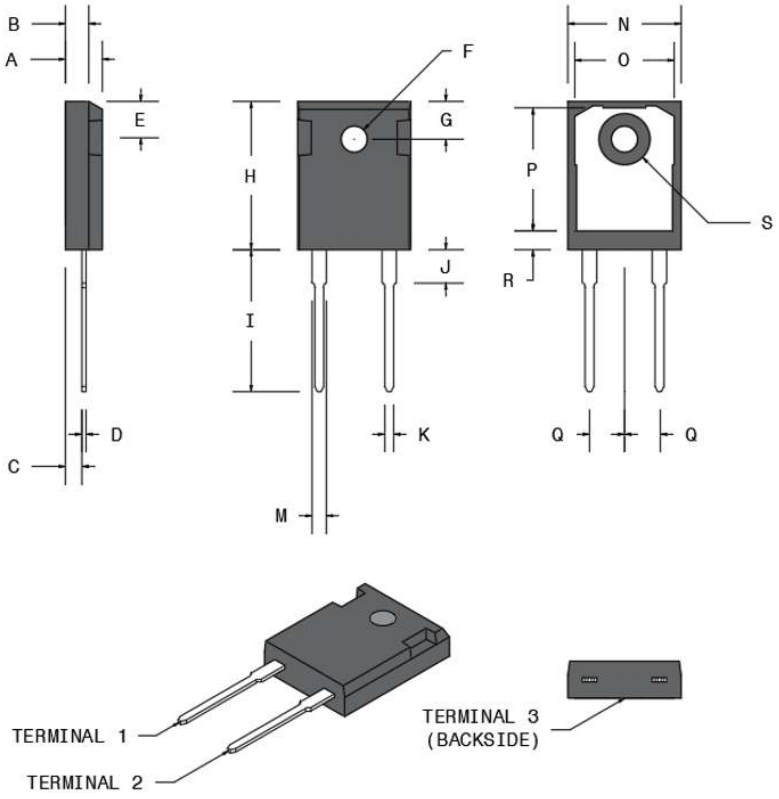


Figure 11 • Package Outline Drawing

The following table shows the TO-247 dimensions and should be used in conjunction with the package outline drawing.

Table 5 • TO-247 Dimensions

Symbol	Min	Max	Min	Max
	(mm)		(Inch)	
A	4.69	5.31	0.185	0.209
B	1.49	2.49	0.059	0.098
C	2.21	2.59	0.087	0.102
D	0.40	0.79	0.016	0.031
E	5.38	6.20	0.212	0.244

Symbol	Min	Max	Min	Max
	(mm)		(Inch)	
F	3.50	3.81	0.138	0.150
G	6.15 BSC	0.242 BSC		
H	20.80	21.46	0.819	0.845
I	19.81	20.32	0.780	0.800
J	4.00	4.50	0.157	0.177
K	1.01	1.40	0.040	0.055
L	2.87	3.12	0.113	0.123
M	1.65	2.13	0.065	0.084
N	15.49	16.26	0.610	0.640
O	13.50	14.50	0.531	0.571
P	16.50	17.50	0.650	0.689
Q	5.45 BSC	0.215 BSC		
R	2.00	2.75	0.079	0.108
S	7.10	7.50	0.280	0.295
TERMINAL 1	CATHODE			
TERMINAL 2	ANODE			
TERMINAL 3	CATHODE			

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