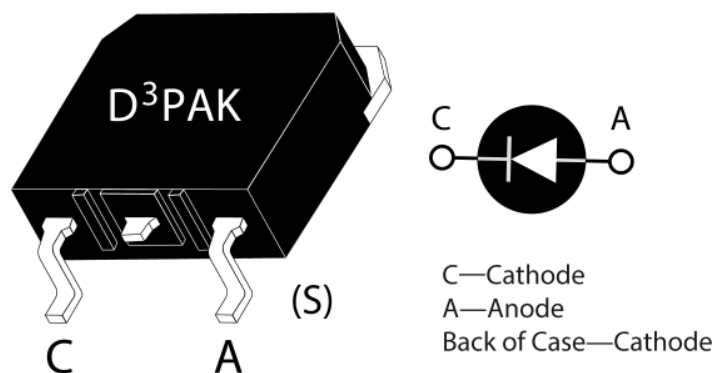


# APT75DQ60SG Ultrafast Soft Recovery Rectifier Diode

## 1 Product Overview

This section outlines the product overview for the APT75DQ60SG device.



### 1.1 Features

The following are key features of the APT75DQ60SG device:

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

### 1.2 Benefits

The following are benefits of the APT75DQ60SG device:

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

### 1.3 Applications

The APT75DQ60SG 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

## 2 Electrical Specifications

This section shows the electrical specifications for the APT75DQ60SG device.

### 2.1 Absolute Maximum Ratings

The following table lists the absolute maximum ratings for the APT75DQ60SG 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	600	V
$V_{RRM}$	Maximum peak repetitive reverse voltage	600	
$V_{RWM}$	Maximum working peak reverse voltage	600	
$I_{F(AV)}$	Maximum average forward current ( $T_c = 108\text{ }^\circ\text{C}$ , duty cycle = 0.5)	75	A
$I_{F(RMS)}$	RMS forward current	117	
$I_{FSM}$	Non-repetitive forward surge current ( $T_J = 45\text{ }^\circ\text{C}$ , 8.3 ms)	600	
$E_{AVL}$	Avalanche energy (1 A, 40 mH)	20	mJ
$T_J, T_{STG}$	Operating and storage temperature range	-55 to 175	$^\circ\text{C}$
$T_L$	Lead temperature for 10 seconds	300	

The following table shows the thermal and mechanical characteristics of the APT75DQ60SG device.

**Table 2 • Thermal and Mechanical Characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			0.34	$^\circ\text{C}/\text{W}$
$Wt$	Package weight		0.14		oz
			4.0		g

### 2.2 Electrical Performance

The following table lists the static characteristics of the APT75DQ60SG device.

**Table 3 • Static Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_F$	Forward voltage	$I_F = 75\text{ A}$		2.0	2.5	V
		$I_F = 150\text{ A}$		2.4		
		$I_F = 75\text{ A}, T_J = 125\text{ }^\circ\text{C}$		1.7		
$I_{RM}$	Maximum reverse leakage current	$V_R = 600\text{ V}$			25	$\mu\text{A}$
		$V_R = 600\text{ V}, T_J = 125\text{ }^\circ\text{C}$			500	
$C_J$	Junction capacitance	$V_R = 200\text{ V}$		110		pF

## 2.3 Dynamic Characteristics

The following table lists the dynamic characteristics of the APT75DQ60SG device.

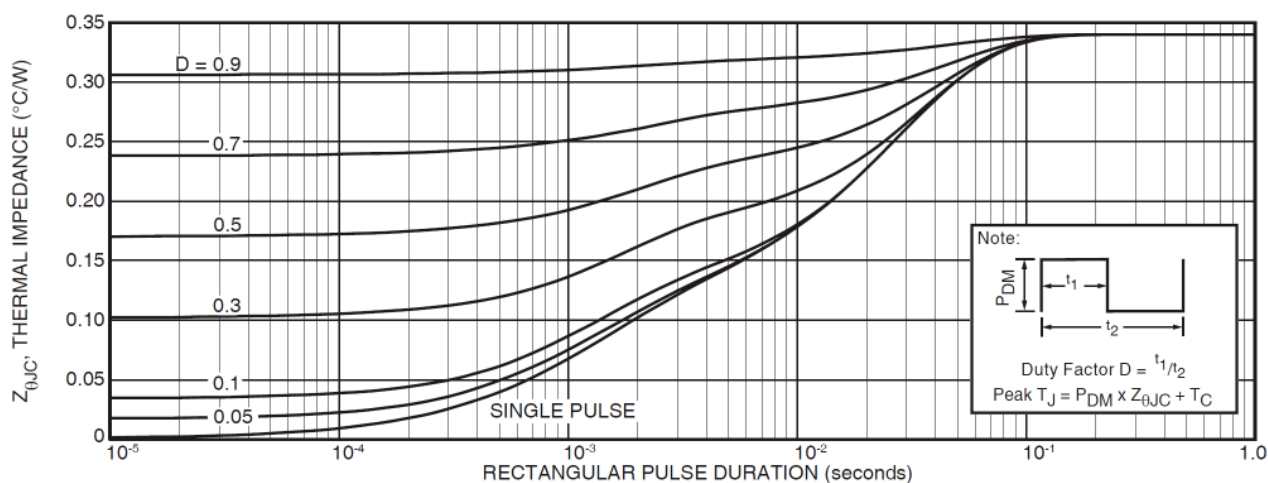
**Table 4 • Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ $di_F/dt = -100\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$ $T_J = 25\text{ }^\circ\text{C}$		29		ns
$t_{rr}$	Reverse recovery time	$I_F = 75\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		31		
$Q_{rr}$	Reverse recovery charge	$V_R = 400\text{ V}$		55		nC
$I_{RRM}$	Maximum reverse recovery current	$T_C = 25\text{ }^\circ\text{C}$		4		A
$t_{rr}$	Reverse recovery time	$I_F = 75\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		140		ns
$Q_{rr}$	Reverse recovery charge	$V_R = 400\text{ V}$		650		nC
$I_{RRM}$	Maximum reverse recovery current	$T_C = 125\text{ }^\circ\text{C}$		9		A
$t_{rr}$	Reverse recovery time	$I_F = 75\text{ A}$ $di_F/dt = -1000\text{ A}/\mu\text{s}$		90		ns
$Q_{rr}$	Reverse recovery charge	$V_R = 400\text{ V}$		1300		nC
$I_{RRM}$	Maximum reverse recovery current	$T_C = 125\text{ }^\circ\text{C}$		27		A

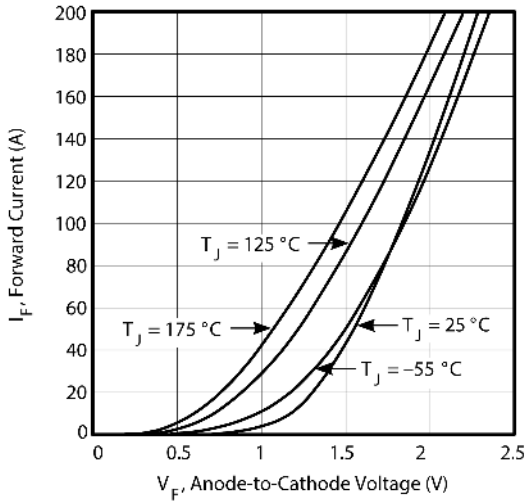
## 2.4 Typical Performance Curves

This section shows the typical performance curves for the APT75DQ60SG device.

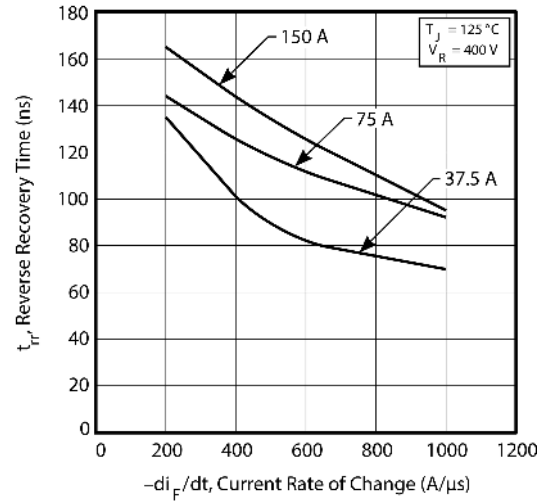
**Figure 1 • Maximum Transient Thermal Impedance**



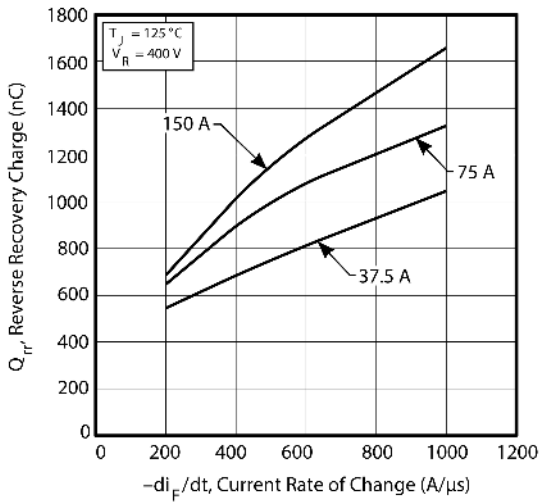
**Figure 2 • Forward Current vs. Forward Voltage**



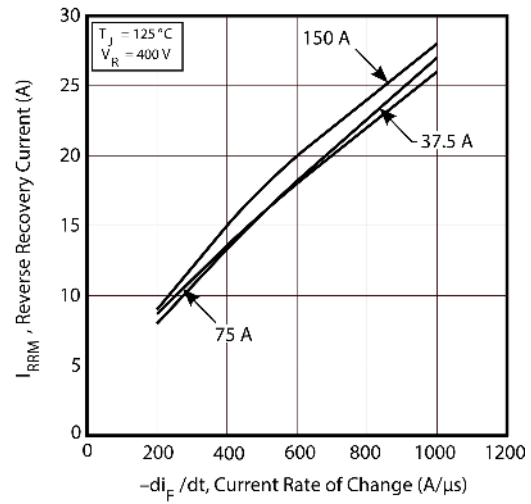
**Figure 3 • RRT vs. Current Rate of Change**



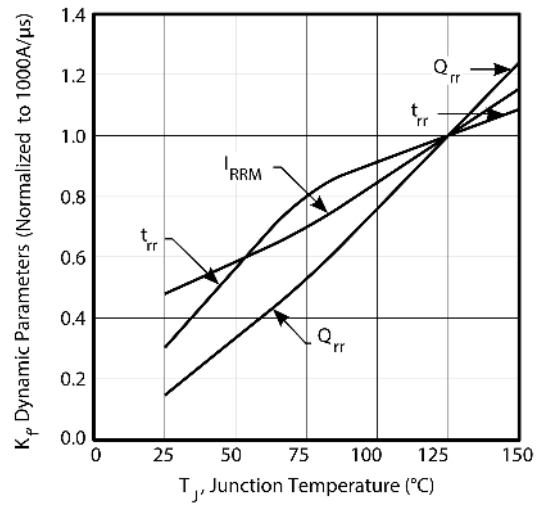
**Figure 4 • Reverse Recovery Charge vs. Current Rate of Change**



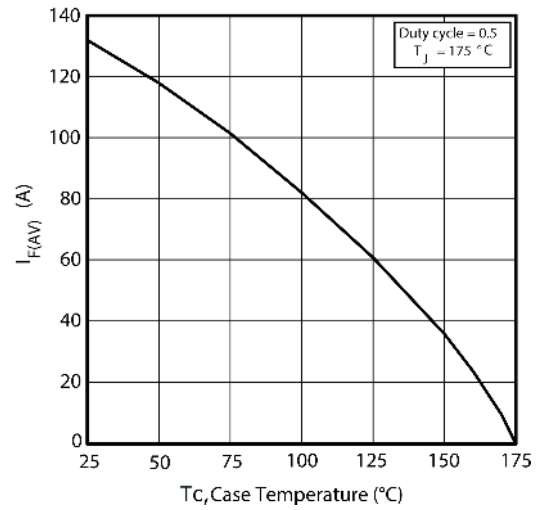
**Figure 5 • Reverse Recovery Current vs. Current Rate of Change**



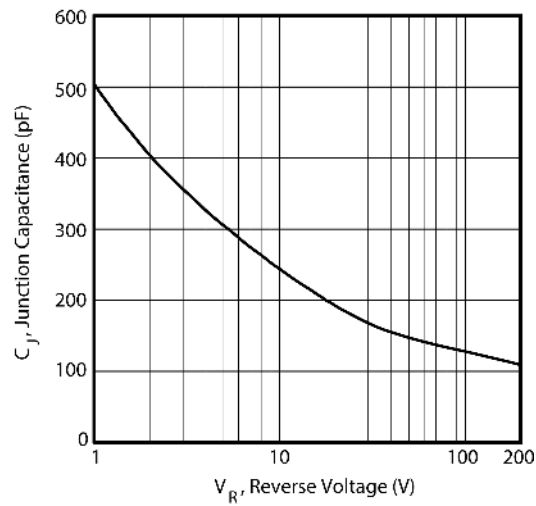
**Figure 6 • Dynamic Parameters vs. Junction Temperature**



**Figure 7 • Maximum Average Forward Current vs. Case Temperature**



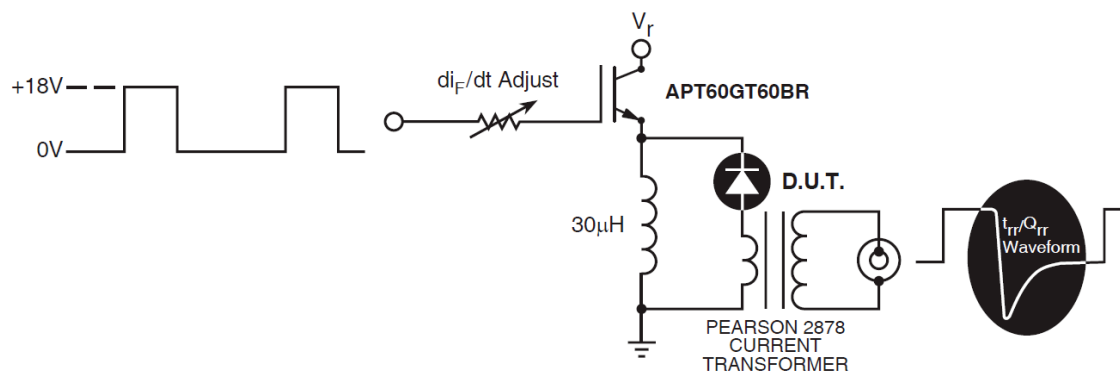
**Figure 8 • Junction Capacitance vs. Reverse Voltage**



## 2.5 Reverse Recovery Overview

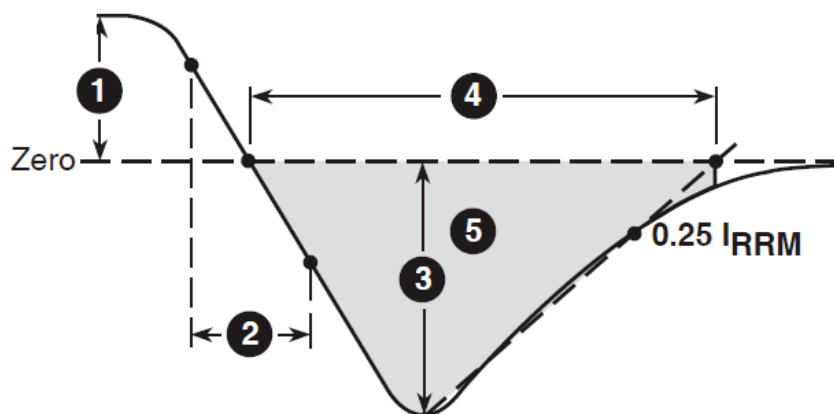
The following figure illustrates the diode test circuit for the APT75DQ60SG device.

Figure 9 • Diode Test Circuit



The following figure illustrates the diode reverse recovery waveform and definitions for the APT75DQ60SG 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  $0.25 \cdot I_{RRM}$  passes through zero.
5.  $Q_{rr}$ —Area under the curve defined by  $I_{RRM}$  and  $t_{rr}$ .

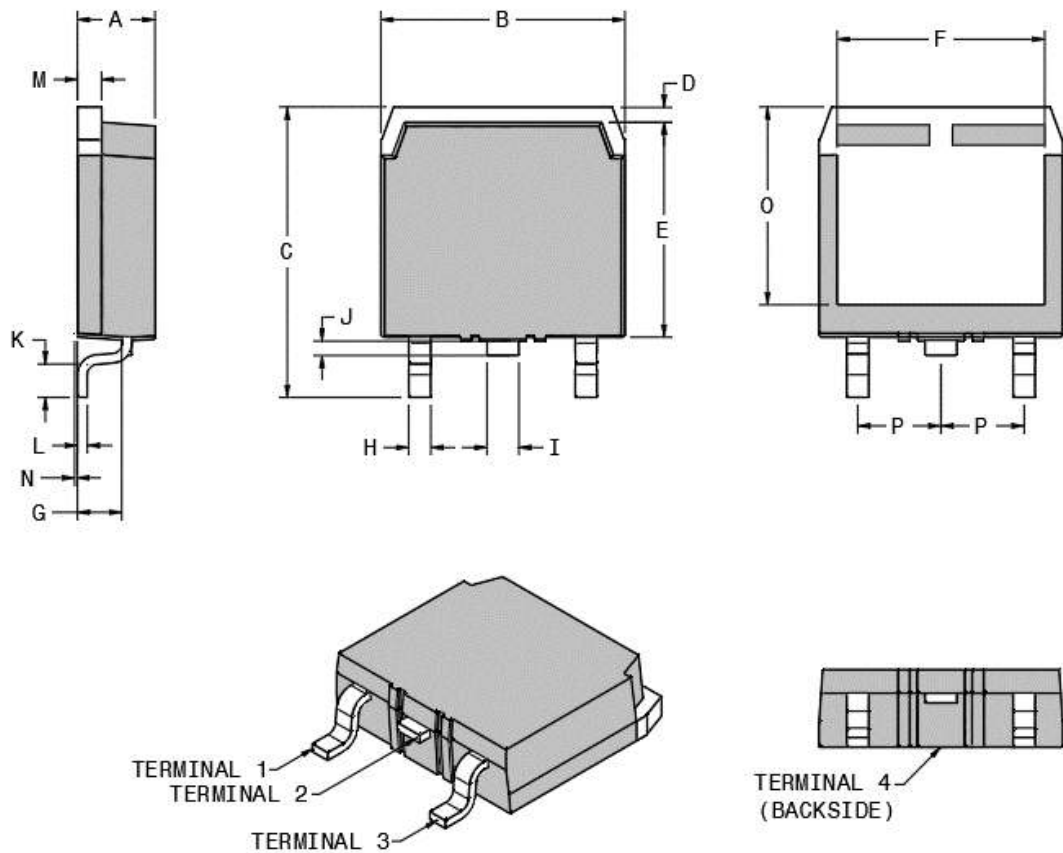
### 3 Package Specification

This section shows the package specification for the APT75DQ60SG device.

#### 3.1 Package Outline Drawing

The following figure illustrates the TO-268 package outline of the APT75DQ60SG device.

Figure 11 • Package Outline Drawing



The following table lists the TO-268 dimensions and should be used in conjunction with the package outline drawing.

**Table 5 • TO-268 Dimensions**

Symbol	Min (mm)	Max (mm)	Min (in.)	Max (in.)
A	4.90	5.10	0.193	0.201
B	15.85	16.20	0.624	0.638
C	18.70	19.10	0.736	0.752
D	1.00	1.25	0.039	0.049
E	13.80	14.00	0.543	0.551
F	13.30	13.60	0.524	0.535
G	2.70	2.90	0.106	0.114
H	1.15	1.45	0.045	0.057
I	1.95	2.21	0.077	0.087
J	0.94	1.40	0.037	0.055
K	2.40	2.70	0.094	0.106
L	0.40	0.60	0.016	0.024
M	1.45	1.60	0.057	0.063
N	0.00	0.18	0.000	0.007
O	12.40	12.70	0.488	0.500
P	5.45 BSC (nom.)		0.215 BSC (nom.)	
Terminal 1	Cathode			
Terminal 2	Cathode			
Terminal 3	Anode			
Terminal 4	Cathode			





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