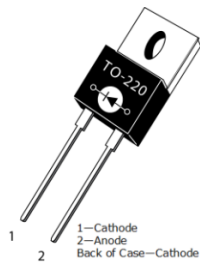


APT30DQ120KG Ultrafast Soft Recovery Rectifier Diode

Product Overview

The APT30DQ120KG is a 1200 V, 30 A Ultrafast Soft Recovery Rectifier diode in a TO-220 package.



Features

The following are key features of the APT30DQ120KG device:

- Ultrafast recovery times
- Soft recovery characteristics
- Low forward voltage
- Low leakage current
- Avalanche-energy rated
- RoHS compliant
- AEC-Q101 qualified

Benefits

The following are benefits of the APT30DQ120KG device:

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

Applications

The APT30DQ120KG 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

Device Specifications

This section shows the specifications of the APT30DQ120KG device.

Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the APT30DQ120KG device. $T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 1 • Absolute Maximum Ratings

| Symbol | Parameter | Ratings | Unit |
|-------------|---|---------|------|
| V_R | Maximum DC reverse voltage | 1200 | V |
| V_{RRM} | Maximum peak repetitive reverse voltage | | |
| V_{RWM} | Maximum working peak reverse voltage | | |
| $I_{F(AV)}$ | Maximum average forward current ($T_C = 103\text{ }^\circ\text{C}$, duty cycle = 0.5) | 30 | A |
| I_{FSM} | Non-repetitive forward surge current ($T_J = 45\text{ }^\circ\text{C}$, 8.3 ms) | 210 | |
| E_{AVL} | Avalanche energy (1 A, 40 mH) | 20 | mJ |

The following table shows the thermal and mechanical characteristics of the APT30DQ120KG device.

Table 2 • Thermal and Mechanical Characteristics

| Symbol | Characteristic/Test Conditions | Min | Typ | Max | Unit |
|-----------------|---|-----|------|------|---------------------------|
| $R_{\theta JC}$ | Junction-to-case thermal resistance | | | 0.80 | $^\circ\text{C}/\text{W}$ |
| T_J, T_{STG} | Operating and storage temperature range | -55 | | 175 | $^\circ\text{C}$ |
| T_L | Lead temperature for 10 seconds | | | 300 | |
| Wt | Package weight | | 0.07 | | oz |
| | | | 1.9 | | 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 APT30DQ120KG device. $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 3 • Static Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|----------|---------------------------------|--|-----|-----|-----|---------------|
| V_F | Forward voltage | $I_F = 30\text{ A}$ | | 2.8 | 3.3 | V |
| | | $I_F = 60\text{ A}$ | | 3.4 | | |
| | | $I_F = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | 2.1 | | |
| I_{RM} | Maximum reverse leakage current | $V_R = 1200\text{ V}$ | | | 100 | μA |
| | | $V_R = 1200\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 500 | |
| C_J | Junction capacitance | $V_R = 200\text{ V}$ | | 36 | | pF |

The following table shows the dynamic characteristics of the APT30DQ120KG device.

Table 4 • Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-----------|----------------------------------|--|-----|------|-----|------|
| t_{rr} | Reverse recovery time | $I_F = 1\text{ A}, di_F/dt = -100\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$ | | 26 | | ns |
| t_{rr} | Reverse recovery time | $I_F = 30\text{ A}, di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}$ | | 320 | | |
| Q_{rr} | Reverse recovery charge | | | 545 | | |
| I_{RRM} | Maximum reverse recovery current | | | 4 | | A |
| t_{rr} | Reverse recovery time | $I_F = 30\text{ A}, di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | 435 | | ns |
| Q_{rr} | Reverse recovery charge | | | 2100 | | nC |
| I_{RRM} | Maximum reverse recovery current | | | 9 | | A |
| t_{rr} | Reverse recovery time | $I_F = 30\text{ A}, di_F/dt = -1000\text{ A}/\mu\text{s}$ $V_R = 800\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | 180 | | ns |
| Q_{rr} | Reverse recovery charge | | | 2975 | | nC |
| I_{RRM} | Maximum reverse recovery current | | | 28 | | A |

Typical Performance Curves

This section shows the typical performance curves of the APT30DQ120KG device.

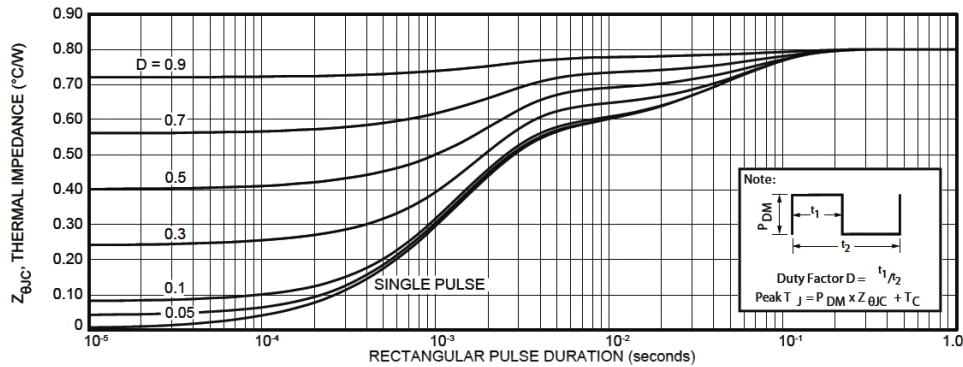


Figure 1 • Maximum Transient Thermal Impedance

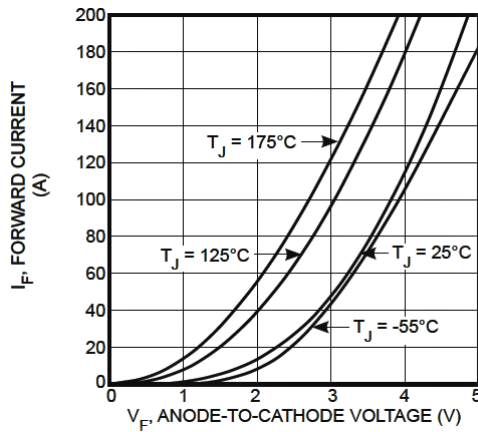


Figure 2 • Forward Current vs. Forward Voltage

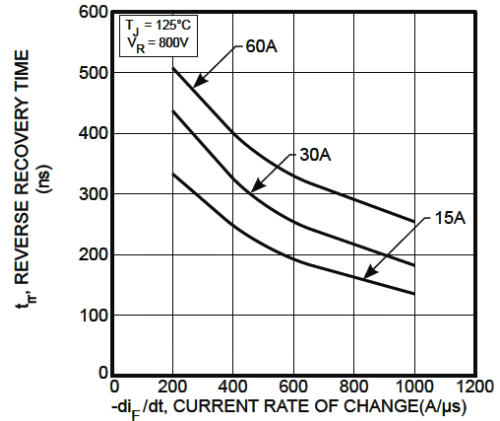


Figure 3 • Reverse Recovery Time vs. Current Rate of Change

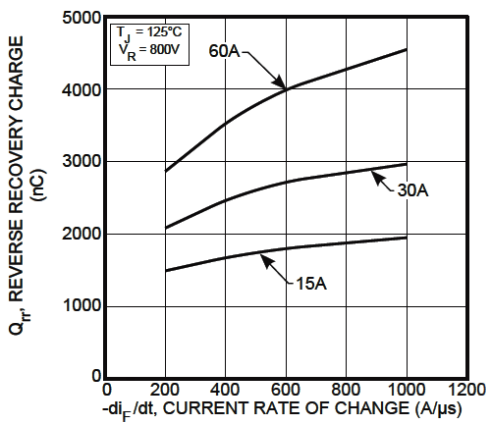


Figure 4 • Reverse Recovery Charge vs. Current Rate of Change

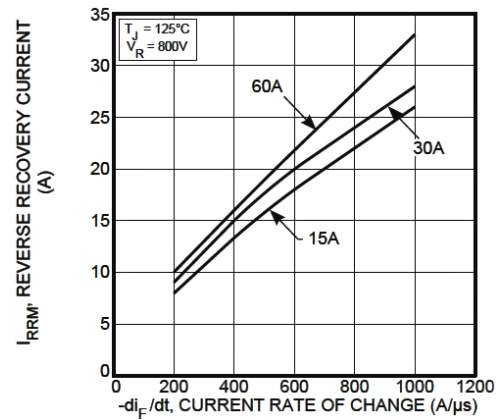


Figure 5 • Reverse Recovery Current vs. Current Rate of Change

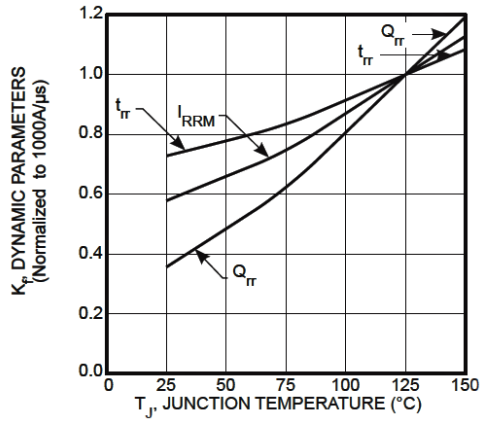


Figure 6 • Dynamic Parameters vs. Junction Temperature

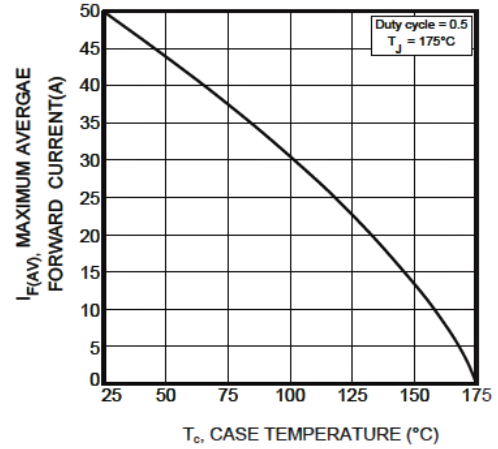


Figure 7 • Maximum Average Forward Current vs. Case Temperature

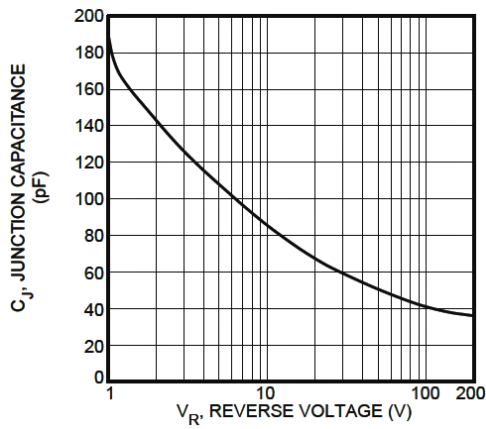


Figure 8 • Junction Capacitance vs. Reverse Voltage

Reverse Recovery Overview

The following figure illustrates the diode test circuit of the APT30DQ120KG device.

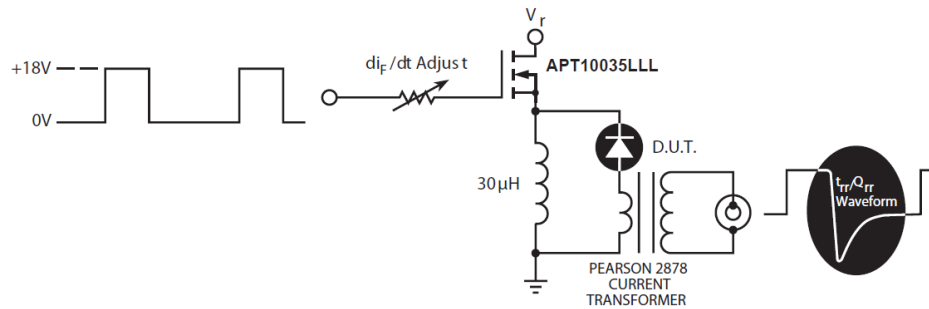


Figure 9 • Diode Test Circuit

The following figure illustrates the diode reverse recovery waveform and definitions of the APT30DQ120KG device.

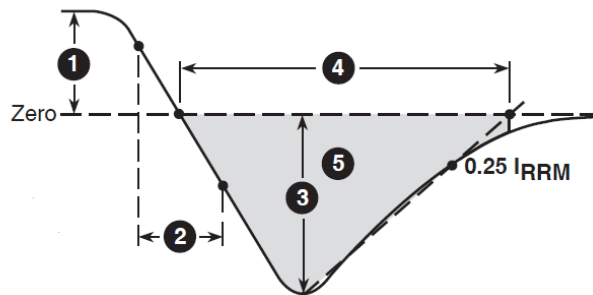


Figure 10 • Diode Reverse Recovery Waveform and Definitions

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}

Package Specification

This section shows the package specification of the APT30DQ120KG device.

Package Outline Drawing

The following figure illustrates the TO-220 package outline of the APT30DQ120KG device.

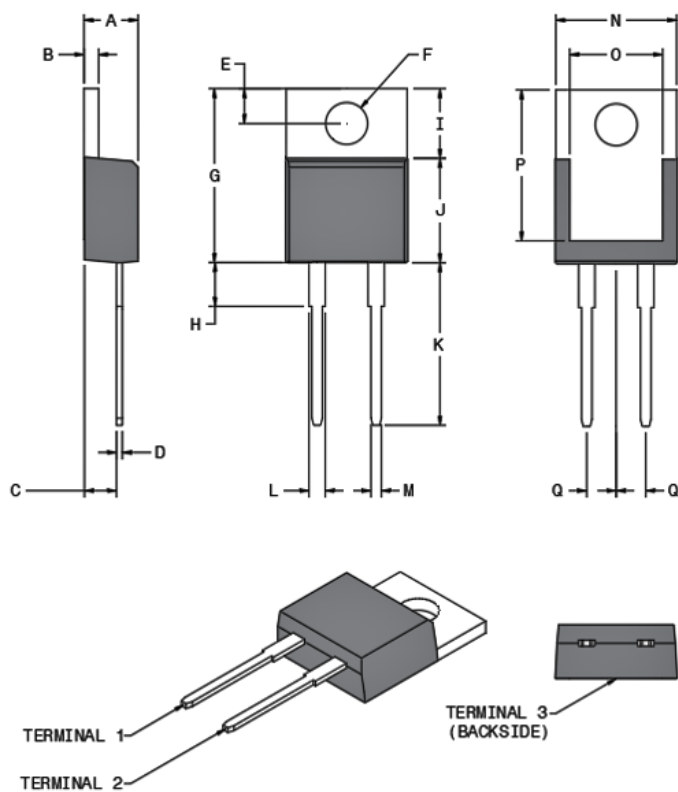


Figure 11 • Package Outline Drawing

The following table shows the TO-220 dimensions and should be used in conjunction with the package outline drawing.

Table 5 • TO-220 Dimensions

| Symbol | Min | Max | Min | Max |
|--------|------|------|--------|-------|
| | (mm) | | (Inch) | |
| A | 4.32 | 4.57 | 0.170 | 0.180 |
| B | 1.14 | 1.40 | 0.045 | 0.055 |
| C | 2.50 | 2.74 | 0.098 | 0.108 |
| D | 0.36 | 0.53 | 0.014 | 0.021 |

| Symbol | Min | Max | Min | Max |
|------------|----------|-------|-----------|-------|
| | (mm) | | (Inch) | |
| E | 2.65 | 3.05 | 0.104 | 0.120 |
| F | 3.60 | 3.96 | 0.142 | 0.156 |
| G | 14.50 | 15.60 | 0.571 | 0.614 |
| H | 2.39 | 3.65 | 0.094 | 0.144 |
| I | 6.00 | 6.80 | 0.236 | 0.268 |
| J | 8.40 | 9.00 | 0.331 | 0.354 |
| K | 13.00 | 14.00 | 0.512 | 0.551 |
| L | 1.23 | 1.39 | 0.048 | 0.055 |
| M | 0.69 | 0.88 | 0.027 | 0.035 |
| N | 10.00 | 10.36 | 0.394 | 0.408 |
| O | 7.57 | 7.90 | 0.298 | 0.311 |
| P | 12.20 | 13.10 | 0.480 | 0.516 |
| Q | 2.54 BSC | | 0.100 BSC | |
| Terminal 1 | CATHODE | | | |
| Terminal 2 | ANODE | | | |
| Terminal 3 | CATHODE | | | |

**Microsemi**

2355 W. Chandler Blvd.
Chandler, AZ 85224 USA

Within the USA: +1 (480) 792-7200
Fax: +1 (480) 792-7277

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