# Contents

# 1 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.

## 1.1 Revision D

Revision D was published in April 2018. The following is a summary of the changes in revision D of this document.

- Product image was updated.
- Product features were updated. For information, see Product Overview (see page 2).
- The lead thickness in the package outline drawing was updated. For more information, see Package Outline Drawing (see page 8).

## 1.2 Revision C

Revision C was published in May 2011. The following is a summary of the changes in Revision C of this document.

- Patent Information was removed.
- B-Pack Information was updated.
  - Changed max lead thickness from 0.79 (.031) to 1.016 (.040).

## 1.3 Revision B

Revision B was published in July 2009. The following is a summary of the changes in Revision B of this document.

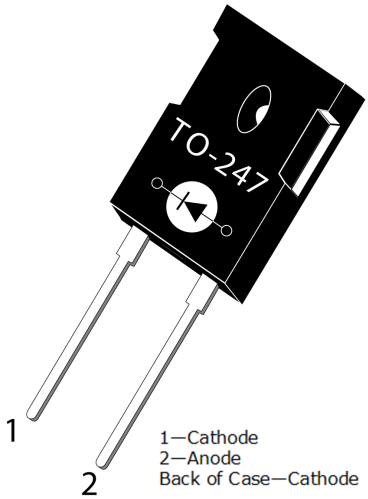
- Graphs were added.

## 1.4 Revision A

Revision A was published in January 2006. It is the first publication of this document.

# 2 Product Overview

This section outlines the product overview for the APT30DQ100BG device.




## 2.1 Features

The following are key features of the APT30DQ100BG device:

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

## 2.2 Benefits

The following are benefits of the APT30DQ100BG device:

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

## 2.3 Applications

The APT30DQ100BG 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

# 3 Electrical Specifications

This section details the electrical specifications for the APT30DQ100BG device.

## 3.1 Absolute Maximum Ratings

The following table shows the maximum ratings for the APT30DQ100BG device.

All ratings: $T_C$ = 25 °C unless otherwise specified.

**Table 1 • Absolute Maximum Ratings**

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $V_R$ | Maximum DC reverse voltage | 1000 | V |
| $V_{RRM}$ | Maximum peak repetitive reverse voltage | 1000 | |
| $V_{RWM}$ | Maximum working peak reverse voltage | 1000 | |
| $I_{F(AV)}$ | Maximum average forward current ($T_C$ = 102 °C, duty cycle = 0.5) | 30 | A |
| $I_{F(RMS)}$ | RMS forward current | 43 | |
| $I_{FSM}$ | Non-repetitive forward surge current ($T_J$ = 45 °C, 8.3 ms) | 150 | |
| $E_{AVL}$ | Avalanche energy (1 A, 40 mH) | 20 | mJ |
| $T_J$ ,$T_{STG}$ | Operating and storage temperature range | –55 to 175 | °C |
| $T_L$ | Lead temperature for 10 s | 300 | |

## 3.2 Electrical Performance

The following table shows the static electrical characteristics of the APT30DQ100BG device.

**Table 2 • Static Electrical Characteristics**

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|---|
| $V_F$ | Forward voltage | $I_F$ = 30 A | | 2.5 | 3.0 | V |
| | | $I_F$ = 60 A | | 3.06 | | |
| | | $I_F$ = 30 A, $T_J$ = 125 °C | | 1.92 | | |
| $I_{RM}$ | Maximum reverse leakage current | $V_R$ = 1000 V | | | 100 | µA |
| | | $V_R$ = 1000 V, $T_J$ = 125 °C | | | 500 | |
| $C_T$ | Junction capacitance | $V_R$ = 200 V | | 26 | | pF |

## 3.3 Dynamic Characteristics

The following table shows the dynamic characteristics of the APT30DQ100BG device.

**Table 3 • 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<br>$V_R$ = 30 V, $T_J$ = 25 °C | | 24 | | ns |
| $t_{rr}$ | Reverse recovery time | $I_F$ = 30 A, $di_F/dt$ = –200 A/µs | | 295 | | |
| $Q_{rr}$ | Reverse recovery charge | $V_R$ = 667 V, $T_C$ = 25 °C | | 440 | | nC |
| $I_{RRM}$ | Maximum reverse recovery current | | | 4 | | A |
| $t_{rr}$ | Reverse recovery time | $I_F$ = 30 A, $di_F/dt$ = –200 A/µs | | 330 | | ns |
| $Q_{rr}$ | Reverse recovery charge | $V_R$ = 667 V, $T_C$ = 125 °C | | 1550 | | nC |
| $I_{RRM}$ | Maximum reverse recovery current | | | 8 | | A |
| $t_{rr}$ | Reverse recovery time | $I_F$ = 30 A, $di_F/dt$ = –1000 A/µs | | 150 | | ns |
| $Q_{rr}$ | Reverse recovery charge | $V_R$ = 667 V, $T_C$ = 125 °C | | 2250 | | nC |
| $I_{RRM}$ | Maximum reverse recovery current | | | 25 | | A |

## 3.4 Thermal and Mechanical Characteristics

This section shows the thermal and mechanical characteristics of the APT30DQ100BG device.

**Table 4 • Thermal and Mechanical Characteristics**

| Symbol | Characteristic/Test Conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-case thermal resistance | | | 0.80 | °C/W |
| $W_T$ | Package weight | | 0.22 | | oz |
| | | | 5.9 | | g |
| Torque | Maximum mounting torque | | | 10 | lb-in |
| | | | | 1.1 | N-m |

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

## 3.5 Typical Performance Curves

This section shows the typical performance curves for the APT30DQ100BG device.

**Figure 1 • Maximum Transient Thermal Impedance**

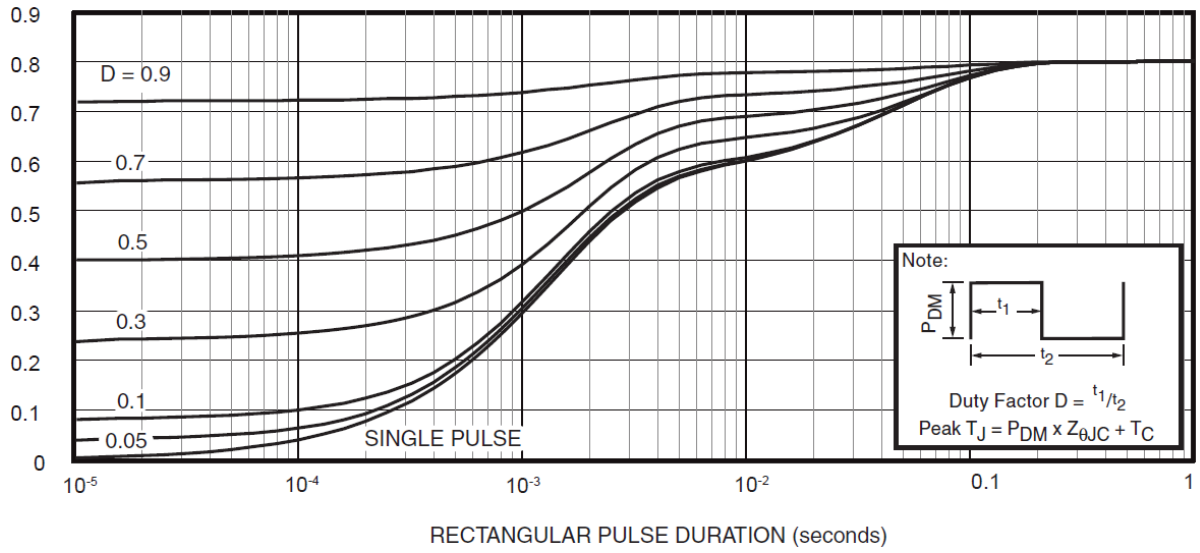



**Figure 2 • Forward Current vs. Forward Voltage**

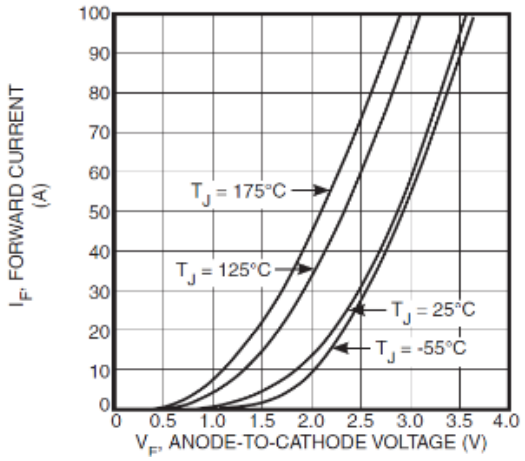



**Figure 3 • trr vs. Current Rate of Change**

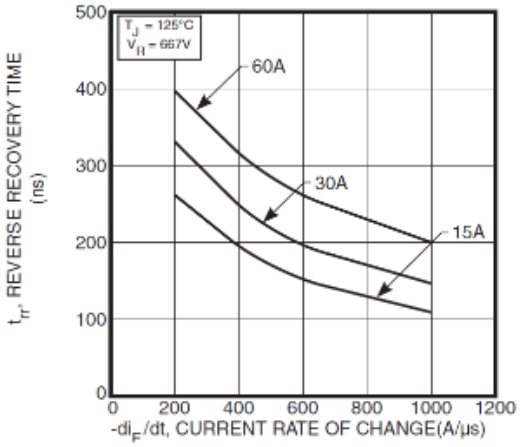


**Figure 4 • Reverse Recovery Charge vs. Current Rate of Change**

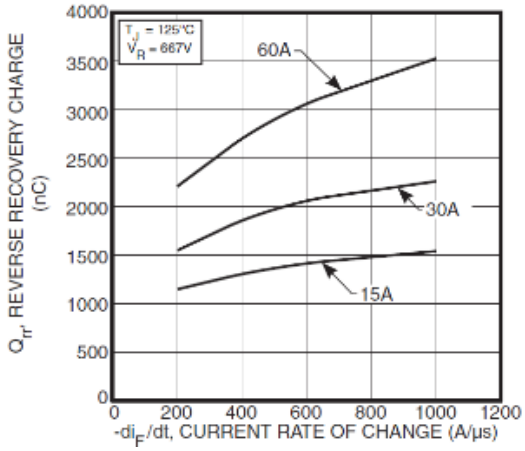



**Figure 5 • Reverse Recovery Current vs. Current Rate of Change**

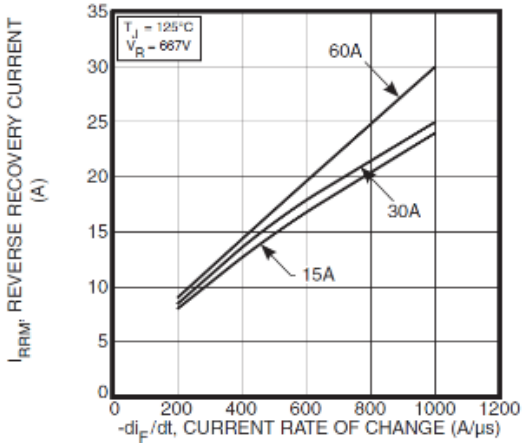



**Figure 6 • Dynamic Parameters vs. Junction Temperature**

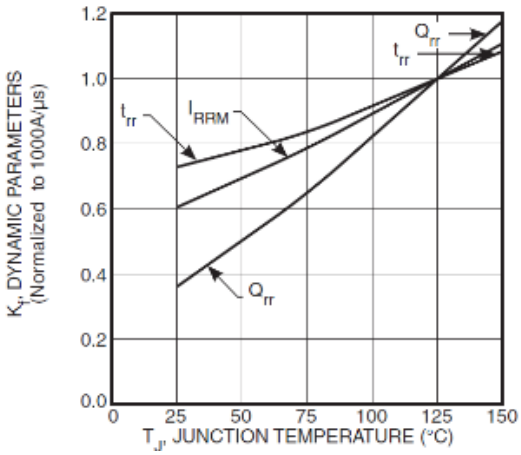



**Figure 7 • Maximum Average Forward Current vs. Case Temperature**

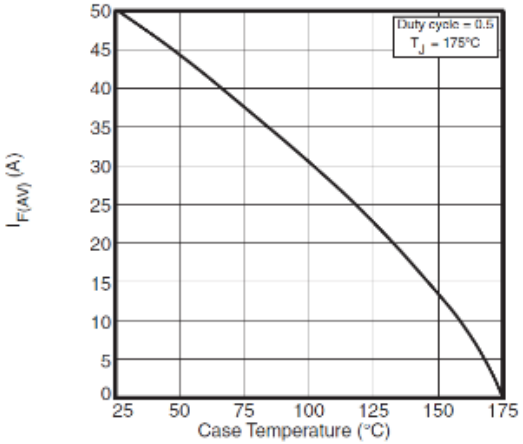
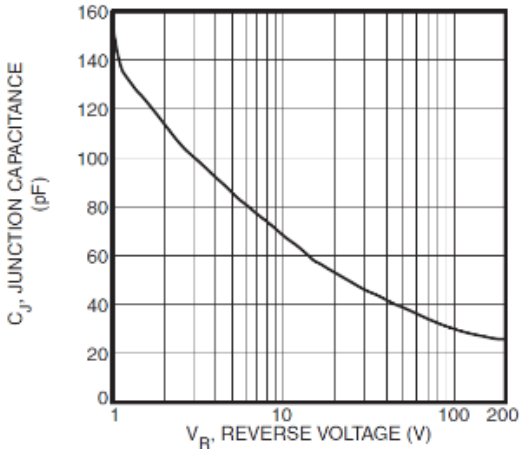



**Figure 8 • Junction Capacitance vs. Reverse Voltage**



## 3.6 Reverse Recovery Overview

The following figures illustrate the reverse recovery testing and measurement information for the APT30DQ100BG device.

**Figure 9 • Diode Test Circuit**

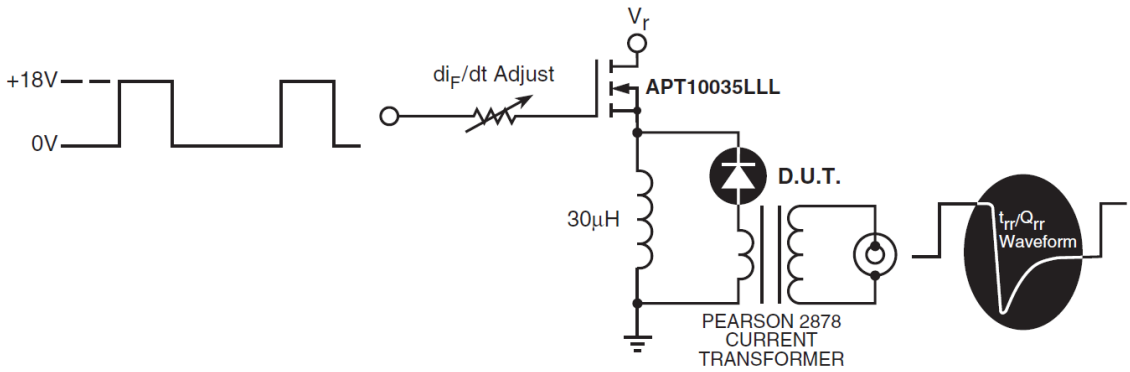
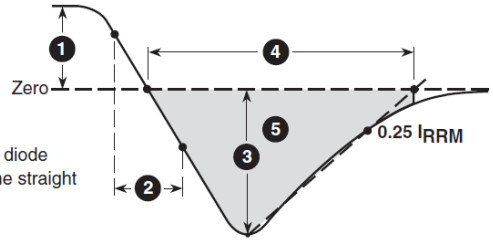



**Figure 10 • Diode Reverse Recovery Waveform and Definitions**




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 $t_{rr}$.

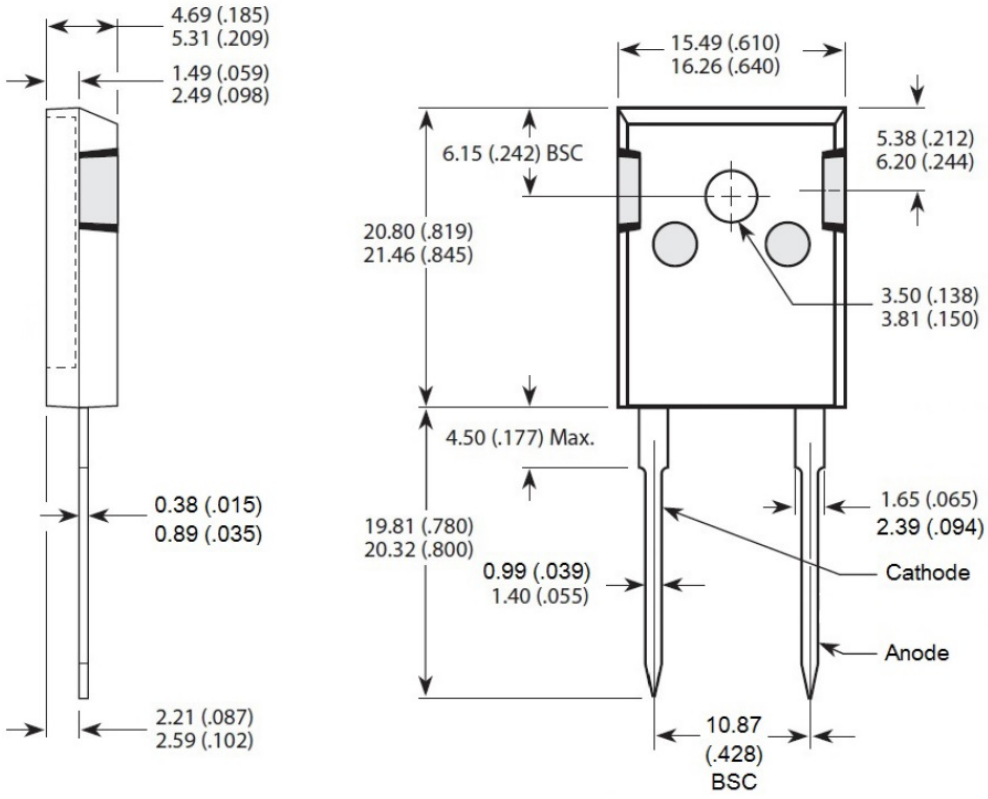
# 4 Package Specification

This section outlines the package specification for the APT30DQ100BG device.

## 4.1 Package Outline Drawing

This section details the TO-247 package drawing of the APT30DQ100BG device.

**Figure 11 • Package Outline Drawing**



**Microsemi Corporate Headquarters**
One Enterprise, Aliso Viejo,
CA 92656 USA
Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Fax: +1 (949) 215-4996
Email: sales.support@microsemi.com
www.microsemi.com





Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees globally. Learn more at www.microsemi.com.

053-4239