

LQA05TC600

Qspeed™ Family

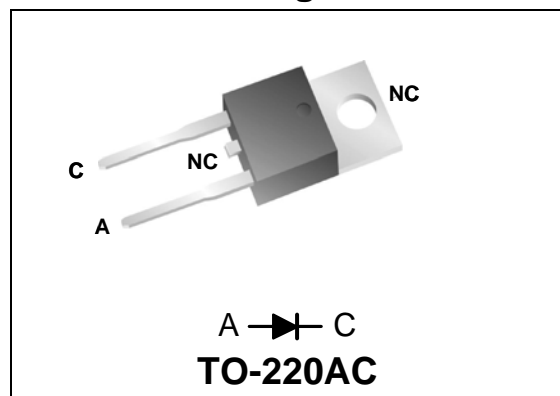


600 V, 5 A Q-Series PFC Diode

Product Summary

| | | |
|------------------------------------|------|----|
| $I_{F(AVG)}$ | 5 | A |
| V_{RRM} | 600 | V |
| Q_{RR} (Typ at 125 °C) | 27 | nC |
| I_{RRM} (Typ at 125 °C) | 1.65 | A |
| Softness t_b/t_a (Typ at 125 °C) | 1.4 | |

Pin Assignment



RoHS Compliant

Package uses Lead-free plating and Green mold compound.
Halogen free per IEC 61249-2-21.

General Description

This device has the lowest Q_{RR} of any 600 V Silicon diode. Its recovery characteristics increase efficiency, reduce EMI and eliminate snubbers.

Applications

- Power Factor Correction (PFC) Boost Diode
- Motor drive circuits
- DC-AC Inverters

Features

- Low Q_{RR} , Low I_{RRM} , Low t_{RR}
- High di_f/dt capable (1000A/ μ s)
- Soft recovery

Benefits

- Increases efficiency
 - Eliminates need for snubber circuits
 - Reduces EMI filter component size & count
- Enables extremely fast switching

Absolute Maximum Ratings

Absolute maximum ratings are the values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

| Symbol | Parameter | Conditions | Rating | Units |
|--------------|-----------------------------------|---|------------|-------|
| V_{RRM} | Peak repetitive reverse voltage | | 600 | V |
| $I_{F(AVG)}$ | Average forward current | $T_J = 150\text{ °C}$, $T_C = 115\text{ °C}$ | 5 | A |
| I_{FSM} | Non-repetitive peak surge current | 60 Hz, ½ cycle | 50 | A |
| I_{FSM} | Non-repetitive peak surge current | ½ cycle of $t=28\ \mu$ s Sinusoid, $T_C=25\text{ °C}$ | 350 | A |
| $T_{J(MAX)}$ | Maximum junction temperature | | 150 | °C |
| T_{STG} | Storage temperature | | -55 to 150 | °C |
| | Lead soldering temperature | Leads at 1.6 mm from case, 10 sec | 300 | °C |
| V_{ISOL} | Isolation voltage (leads-to-tab) | DC, + to tab | 2500 | V |
| P_D | Power dissipation | $T_C = 25\text{ °C}$ | 43.1 | W |

Thermal Resistance

| Symbol | Resistance from: | Conditions | Rating | Units |
|-----------------|---------------------|------------|--------|-------|
| $R_{\theta JA}$ | Junction to ambient | TO-220 | 62 | °C/W |
| $R_{\theta JC}$ | Junction to case | TO-220 | 2.9 | °C/W |

Electrical Specifications at $T_J = 25\text{ }^\circ\text{C}$ (unless otherwise specified)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units | |
|--------------------------------|-------------------------------------|---|-----------------------------------|-------|------|---------------|----|
| DC Characteristics | | | | | | | |
| I_R | Reverse current | $V_R = 600\text{V}, T_J = 25\text{ }^\circ\text{C}$ | - | - | 15 | μA | |
| | | $V_R = 600\text{V}, T_J = 125\text{ }^\circ\text{C}$ | - | 0.4 | - | mA | |
| V_F | Forward voltage | $I_F = 5\text{A}, T_J = 25\text{ }^\circ\text{C}$ | - | 2.825 | 3.14 | V | |
| | | $I_F = 5\text{A}, T_J = 150\text{ }^\circ\text{C}$ | - | 2.28 | - | V | |
| C_J | Junction capacitance | $V_R = 10\text{V}, 1\text{ MHz}$ | - | 21 | - | pF | |
| Dynamic Characteristics | | | | | | | |
| t_{RR} | Reverse recovery time | $di/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 5\text{A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 11 | 15 | ns |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 24 | - | ns |
| Q_{RR} | Reverse recovery charge | $di/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 5\text{A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 6 | 10 | nC |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 27 | - | nC |
| I_{RRM} | Maximum reverse recovery current | $di/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 5\text{A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 0.95 | 1.3 | A |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 1.65 | - | A |
| S | Softness factor = $\frac{t_b}{t_a}$ | $di/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 5\text{A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 1 | - | |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 1.4 | - | |

Note to component engineers: Q-Series diodes employ Schottky technologies in their design and construction. Therefore, Component Engineers should plan their test setups to be similar to those for traditional Schottky test setups. (For additional details, see Application Note AN-300.)

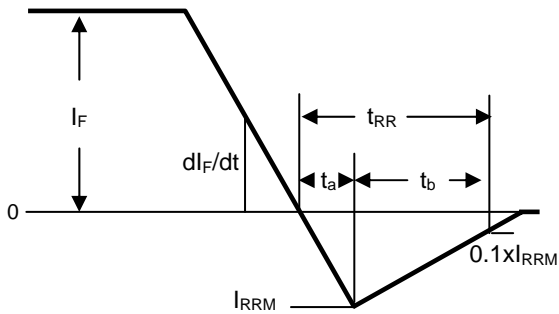


Figure 1. Reverse Recovery Definitions

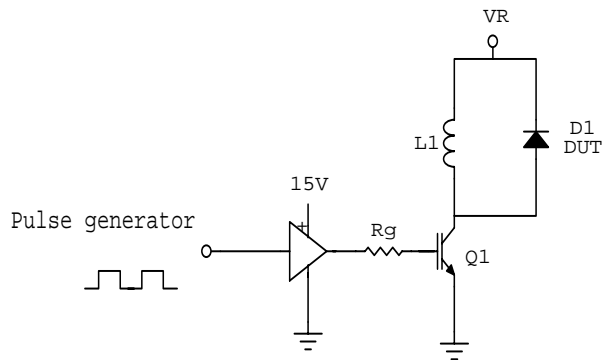


Figure 2. Reverse Recovery Test Circuit

Electrical Specifications at $T_J = 25\text{ }^\circ\text{C}$ (unless otherwise specified)

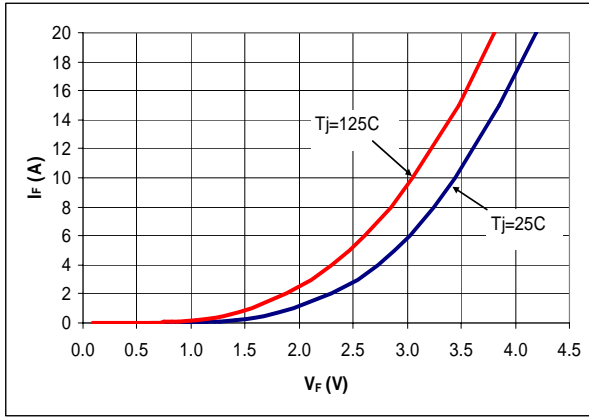


Figure 3. Typical I_F vs V_F

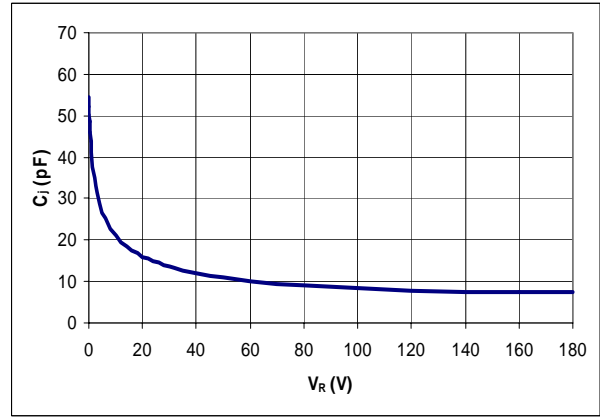


Figure 4. Typical C_i vs V_R

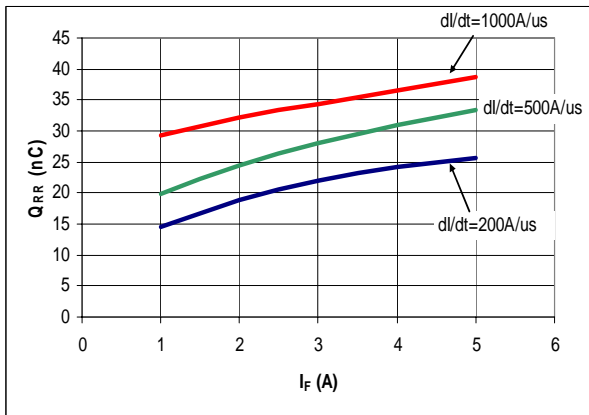


Figure 5. Typical Q_{RR} vs I_F at $T_J = 125\text{ }^\circ\text{C}$

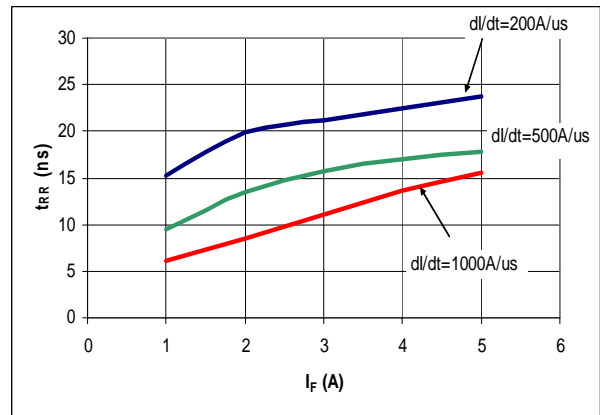


Figure 6. Typical t_{RR} vs I_F at $T_J = 125\text{ }^\circ\text{C}$

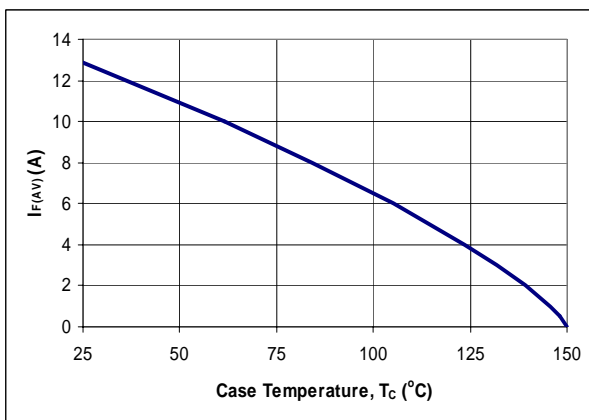


Figure 7. DC Current Derating Curve

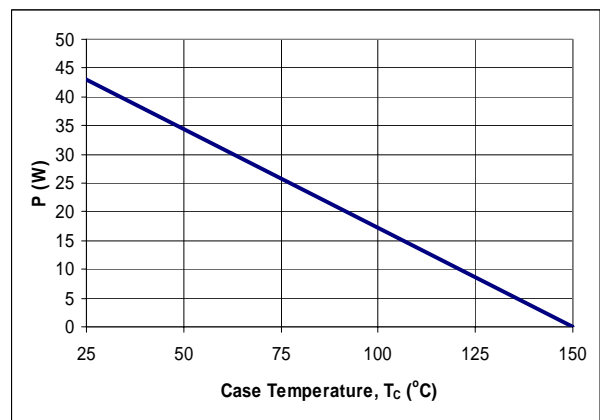


Figure 8. Power Derating Curve

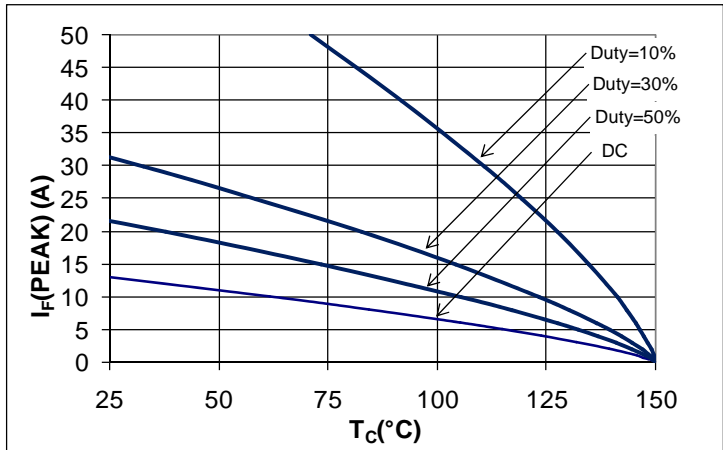


Figure 9. $I_F(\text{PEAK})$ vs T_c , $f=70$ kHz

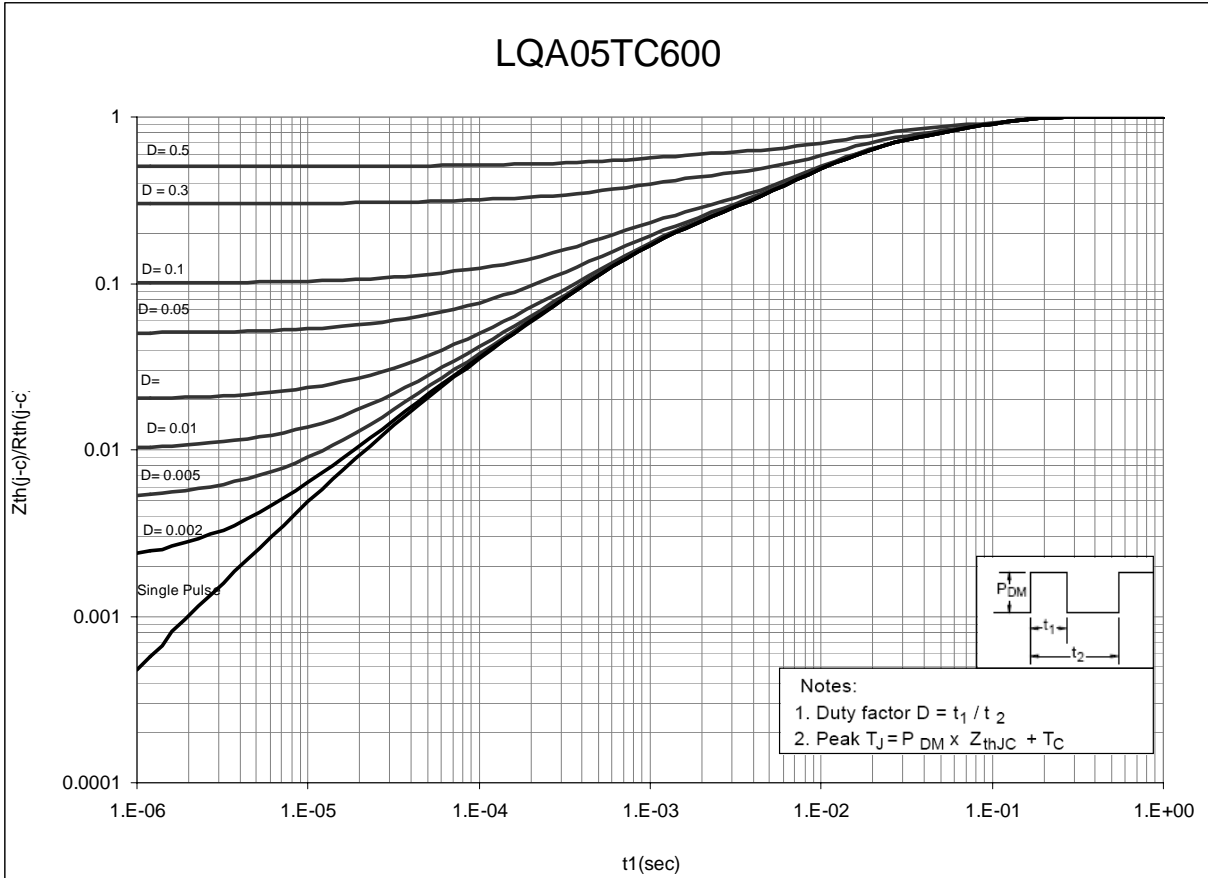
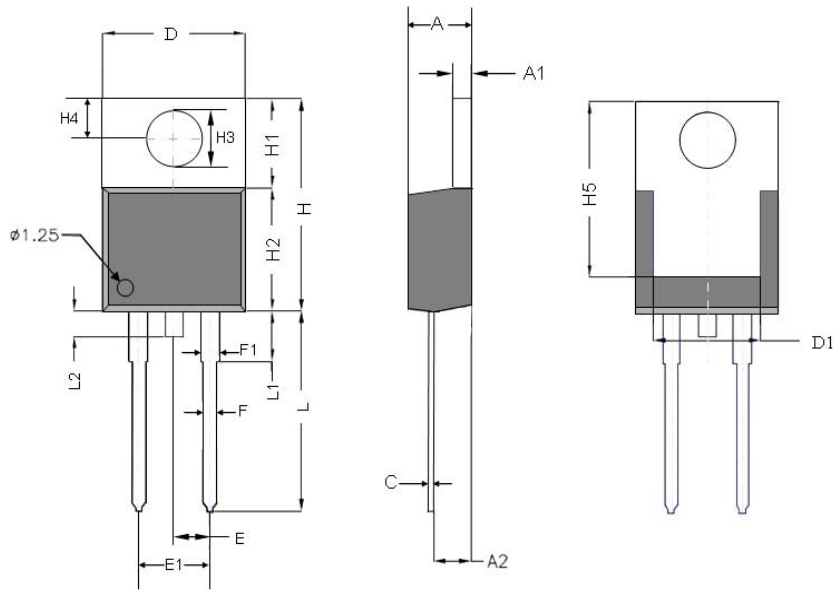


Figure 10. Normalized Maximum Transient Thermal Impedance

Dimensional Outline Drawings



| Dim | Millimeters | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 4.32 | 4.57 |
| A1 | 1.14 | 1.40 |
| A2 | 2.59 | 2.74 |
| C | 0.37 | 0.44 |
| D | 10.13 | 10.24 |
| D1 | 7.57 | 7.68 |
| E | 2.49 | 2.59 |
| E1 | 5.03 | 5.13 |
| F | 0.787 | 1.00 |
| F1 | 1.23 | 1.36 |
| H | 14.71 | 15.31 |
| H1 | 6.20 | 6.55 |
| H2 | 8.51 | 8.76 |
| H3 | 3.71 | 3.96 |
| H4 | 2.54 | 2.79 |
| H5 | 12.34 | 12.45 |
| L | 13.72 | 14.22 |
| L1 | - | 6.36 |
| L2 | 1.27 | 1.78 |

TO-220AC package conforms to JEDEC outline TO-220AC

| Mechanical Mounting Method | Maximum Torque / Pressure specification |
|-----------------------------------|---|
| Screw through hole in package tab | 1 Newton Meter (nm) or 8.8 inch-pounds (lb-in) |
| Clamp against package body | 12.3 kilogram-force per square centimeter (kgf/cm ²) or 175 lbf/in ² |

Soldering time and temperature: This product has been designed for use with high-temperature, lead-free solder. The component leads can be subjected to a maximum temperature of 300 °C, for up to 10 seconds. See Application Note AN-303, for more details.

Ordering Information

| Part Number | Package | Packing |
|-------------|----------|---------------|
| LQA05TC600 | TO-220AC | 50 units/tube |

The information contained in this document is subject to change without notice.

LQA05TC600

| Revision | Notes | Date |
|----------|--|-------|
| 1.8 | Released by Qspeed | 05/09 |
| 1.9 | Converted to Power Integrations Document | 01/11 |

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