

# LQA20T200C, LQA20N200C

## Qspeed™ Family

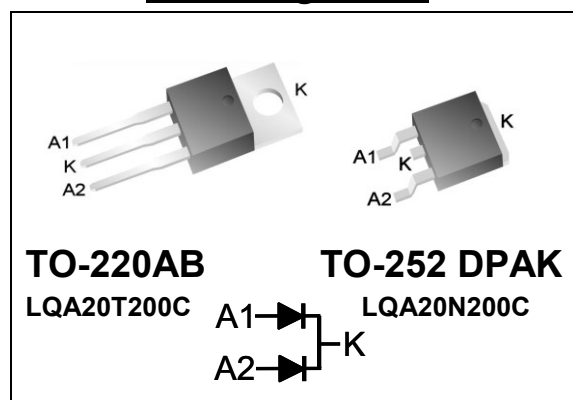


200 V, 20 A Common-Cathode Diode

### Product Summary

|                                    |      |    |
|------------------------------------|------|----|
| $I_{F(AVG)}$ per diode             | 10   | A  |
| $V_{RRM}$                          | 200  | V  |
| $Q_{RR}$ (Typ at 125 °C)           | 48.4 | nC |
| $I_{RRM}$ (Typ at 125 °C)          | 3.29 | A  |
| Softness $t_b/t_a$ (Typ at 125 °C) | 0.34 |    |

### Pin Assignment



### RoHS Compliant

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

### 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      | $T_J = 25\text{ °C}$                                                               | 200        | V     |
| $I_{F(AVG)}$ | Average forward current              | Per Diode, $T_J = 150\text{ °C}$ , $T_C = 124\text{ °C}$                           | 10         | A     |
|              |                                      | Per Device, $T_J = 150\text{ °C}$ , $T_C = 124\text{ °C}$                          | 20         | A     |
| $I_{FSM}$    | Non-repetitive peak surge current    | Per Diode, 60 Hz, 1/2 cycle                                                        | 100        | A     |
| $I_{FSM}$    | Non-repetitive peak surge current    | Per Diode, 1/2 cycle of $t = 28\text{ }\mu\text{s}$ Sinusoid, $T_C = 25\text{ °C}$ | 350        | A     |
| $T_J$        | Operating junction temperature range |                                                                                    | -55 to 150 | °C    |
| $T_{STG}$    | Storage temperature                  |                                                                                    | -55 to 150 | °C    |
|              | Lead soldering temperature           | Leads at 1.6mm from case, 10 sec                                                   | 300        | °C    |
| $P_D$        | Power dissipation                    | $T_C = 25\text{ °C}$                                                               | 41.7       | W     |

### Thermal Resistance

| Symbol          | Resistance from:    | Conditions      | Rating | Units |
|-----------------|---------------------|-----------------|--------|-------|
| $R_{\theta JA}$ | Junction to ambient | TO-220AB (only) | 62     | °C/W  |
| $R_{\theta JC}$ | Junction to case    | Per Diode       | 3.0    | °C/W  |
|                 |                     | Per Device      | 1.5    | °C/W  |

### General Description

This device has the lowest  $Q_{RR}$  of any 200 V Silicon diode. Its recovery characteristics increase efficiency, reduce EMI and eliminate snubbers.

### Applications

- AC/DC and DC/DC output rectification
  - Output and freewheeling diodes
- Motor drive circuits
- DC-AC inverters

### Features

- Low  $Q_{RR}$ , Low  $I_{RRM}$ , Low  $t_{RR}$
- High  $dI_F/dt$  capable (1000A/ $\mu\text{s}$ )
- Soft recovery

### Benefits

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

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

| Symbol                            | Parameter                                   | Conditions                                                                         | Min                     | Typ  | Max  | Units |    |
|-----------------------------------|---------------------------------------------|------------------------------------------------------------------------------------|-------------------------|------|------|-------|----|
| DC Characteristics per diode      |                                             |                                                                                    |                         |      |      |       |    |
| I <sub>R</sub>                    | Reverse current per diode                   | V <sub>R</sub> = 200 V, T <sub>J</sub> = 25 °C                                     | -                       | -    | 500  | μA    |    |
|                                   |                                             | V <sub>R</sub> = 200 V, T <sub>J</sub> = 125 °C                                    | -                       | 0.35 | -    | mA    |    |
| V <sub>F</sub>                    | Forward voltage per diode                   | I <sub>F</sub> = 10 A, T <sub>J</sub> = 25 °C                                      | -                       | 0.98 | 1.15 | V     |    |
|                                   |                                             | I <sub>F</sub> = 10 A, T <sub>J</sub> = 150 °C                                     | -                       | 0.85 | -    | V     |    |
| C <sub>J</sub>                    | Junction capacitance per diode              | V <sub>R</sub> = 10 V, 1 MHz                                                       | -                       | 38   | -    | pF    |    |
| Dynamic Characteristics per diode |                                             |                                                                                    |                         |      |      |       |    |
| t <sub>RR</sub>                   | Reverse recovery time, per diode            | dI <sub>F</sub> /dt = 200 A/μs<br>V <sub>R</sub> = 130 V,<br>I <sub>F</sub> = 10 A | T <sub>J</sub> = 25 °C  | -    | 16   | -     | ns |
|                                   |                                             |                                                                                    | T <sub>J</sub> = 125 °C | -    | 23.5 | -     | ns |
| Q <sub>RR</sub>                   | Reverse recovery charge, per diode          | dI <sub>F</sub> /dt = 200 A/μs<br>V <sub>R</sub> = 130 V,<br>I <sub>F</sub> = 10 A | T <sub>J</sub> = 25 °C  | -    | 20   | 32    | nC |
|                                   |                                             |                                                                                    | T <sub>J</sub> = 125 °C | -    | 48.4 | -     | nC |
| I <sub>RRM</sub>                  | Maximum reverse recovery current, per diode | dI <sub>F</sub> /dt = 200 A/μs<br>V <sub>R</sub> = 130 V,<br>I <sub>F</sub> = 10 A | T <sub>J</sub> = 25 °C  | -    | 2.1  | 3.05  | A  |
|                                   |                                             |                                                                                    | T <sub>J</sub> = 125 °C | -    | 3.29 | -     | A  |
| S                                 | Softness per diode = $\frac{t_b}{t_a}$      | dI <sub>F</sub> /dt = 200 A/μs<br>V <sub>R</sub> = 130 V,<br>I <sub>F</sub> = 10 A | T <sub>J</sub> = 25 °C  | -    | 0.41 | -     |    |
|                                   |                                             |                                                                                    | T <sub>J</sub> = 125 °C | -    | 0.34 | -     |    |

**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 traditional Schottky test setups. (For further details, see application note AN-300.)

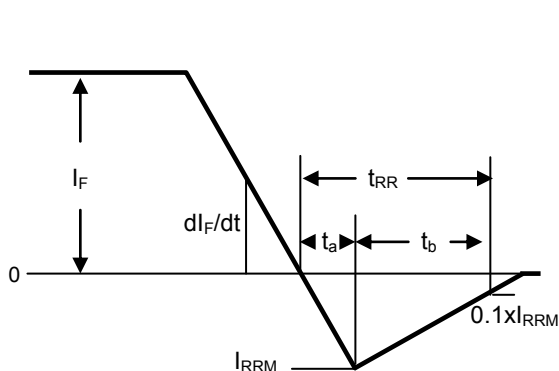


Figure 1. Reverse Recovery Definitions

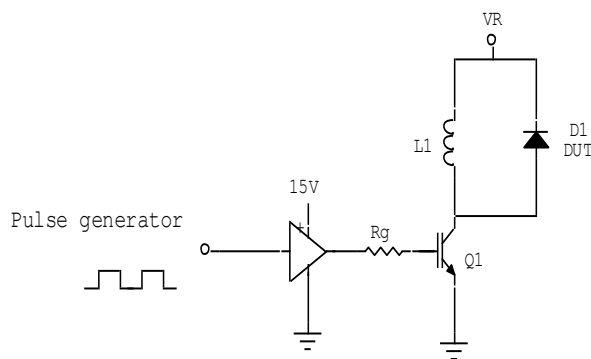


Figure 2. Reverse Recovery Test Circuit

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

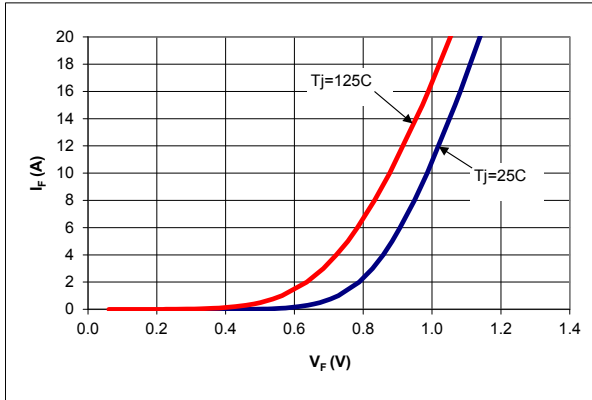
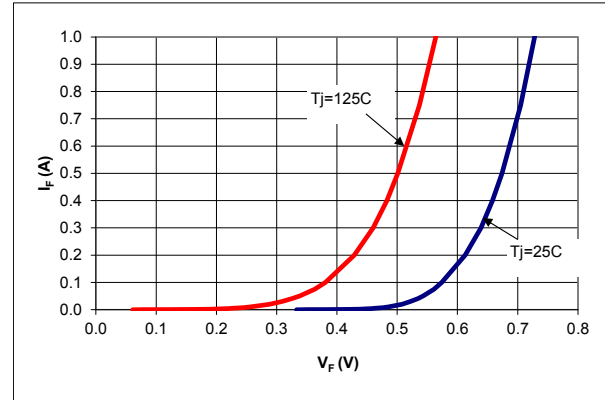
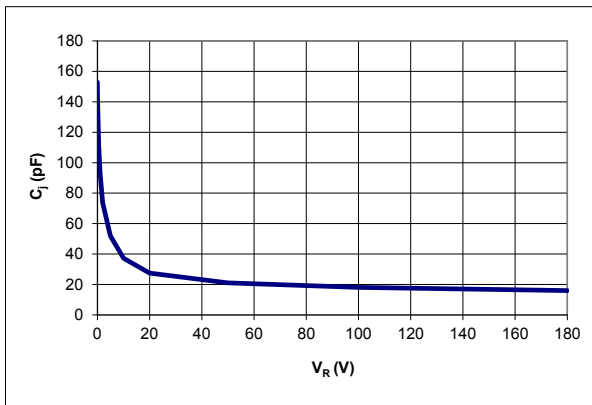
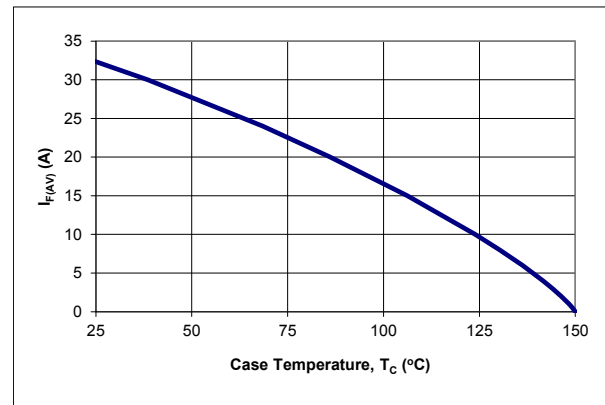
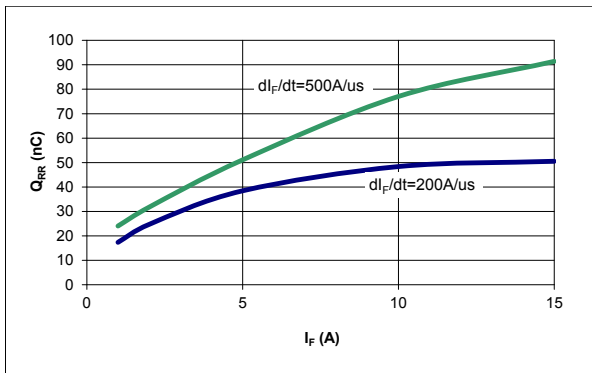
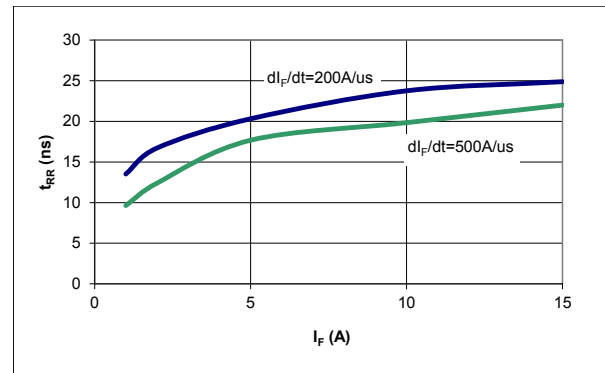
Figure 3. Typical  $I_F$  vs  $V_F$ Figure 4. Typical  $I_F$  vs  $V_F$ Figure 5. Typical  $C_i$  vs  $V_R$ 

Figure 6. DC Current Derating Curve

Figure 7. Typical  $Q_{RR}$  vs  $I_F$  at  $T_J = 125^\circ\text{C}$ Figure 8. Typical  $t_{RR}$  vs  $I_F$  at  $T_J = 125^\circ\text{C}$

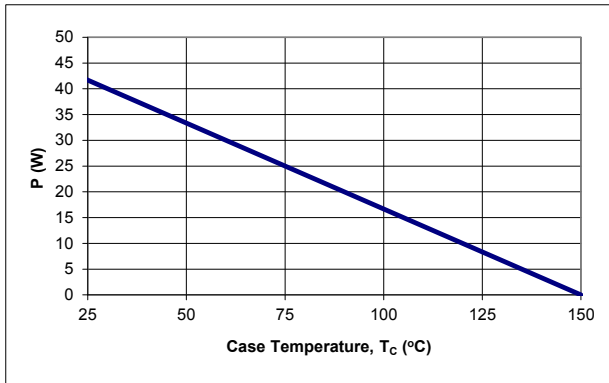


Figure 9. Power Derating Curve

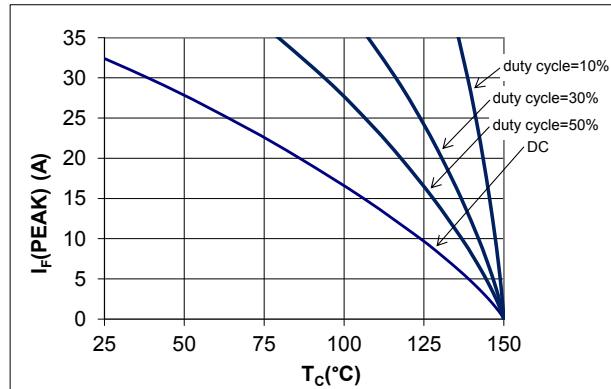


Figure 10. IF (Peak) vs TC, f = 70 kHz

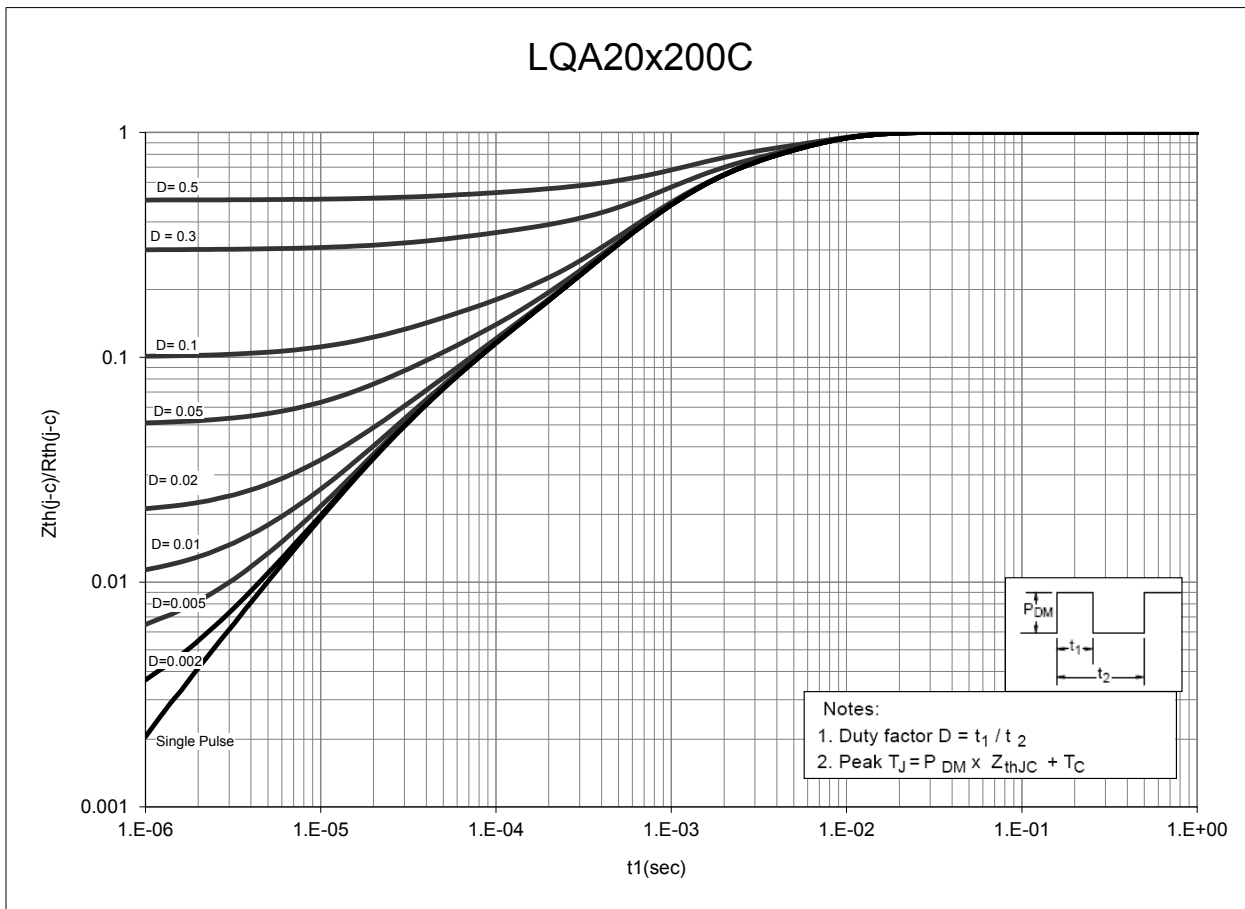
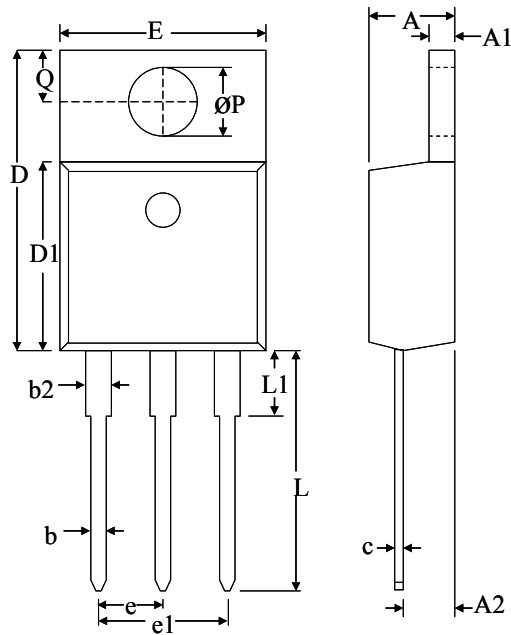


Figure 11. Normalized Maximum Transient Thermal Impedance

## Dimensional Outline Drawings

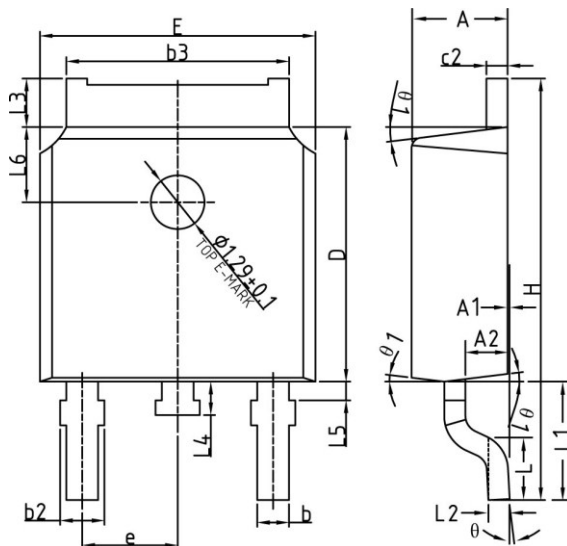
TO-220AB



| Dim | Millimeters |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 4.32        | 4.70  |
| A1  | 1.11        | 1.38  |
| A2  | 2.59        | 2.79  |
| b   | 0.77        | 1.00  |
| b2  | 1.23        | 1.36  |
| C   | 0.34        | 0.47  |
| D   | 14.71       | 15.75 |
| D1  | 9.05        | 9.25  |
| E   | 9.96        | 10.36 |
| e   | 2.44        | 2.64  |
| e1  | 4.98        | 5.18  |
| L   | 12.70       | 14.22 |
| L1  | –           | 3.90  |
| ØP  | 3.71        | 3.96  |
| Q   | 2.54        | 2.90  |

| 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 <sup>2</sup> ) or 175 lbf/in <sup>2</sup> |

TO-252 DPAK



| Dim | Millimeters |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 2.20        | 2.38  |
| A1  | 0           | 0.10  |
| A2  | 0.90        | 1.10  |
| b   | 0.72        | 0.85  |
| b2  | 0.72        | 0.90  |
| b3  | 5.13        | 5.46  |
| c2  | 0.47        | 0.60  |
| D   | 6.00        | 6.20  |
| E   | 6.50        | 6.70  |
| e   | 2.186       | 2.386 |
| H   | 9.80        | 10.40 |
| L   | 1.40        | 1.70  |
| L1  | 2.90 REF    |       |
| L2  | 0.51 BSC    |       |
| L3  | 0.90        | 1.25  |
| L4  | 0.60        | 1.00  |
| L5  | 0.15        | 0.75  |
| L6  | 1.80 REF    |       |
| θ   | 0°          | 8°    |
| θ1  | 5°          | 9°    |

**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         |
|-------------|-------------|-----------------|
| LQA20T200C  | TO-220AB    | 50 units/tube   |
| LQA20N200C  | TO-252 DPAK | 2500 units/reel |

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

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| Revision | Notes           | Date  |
|----------|-----------------|-------|
| 1.0      | Initial Release | 04/13 |

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