



ZRC330Q

AUTOMOTIVE COMPLIANT LOW KNEE CURRENT 3.3V VOLTAGE REFERENCE

Description

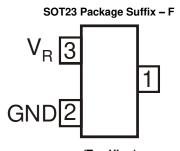
The ZRC330Q uses a bandgap circuit design to achieve a precision micropower voltage reference of 3.3 volts. The device is available in a small outline surface mount package, ideal for applications where space saving is important.

The ZRC330Q design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRC330Q is recommended for operation between 20 μ A and 5mA, and so is ideally suited to low power and battery powered applications.

Excellent performance is maintained to an absolute maximum of 25mA, however the rugged design and 20 volt processing allows the reference to withstand transient effects and currents up to 200mA. Superior switching capability allows the device to reach stable operating conditions in only a few microseconds.

The ZRC330Q has been qualified to AEC-Q100 Grade 1 and is Automotive Compliant supporting PPAPs.

Pin Assignments

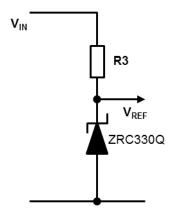


(Top View)
Pin 1 should be left floating or Connected to Pin 2

Features

- Temperature Range: -40°C to +125°C
- Low Knee Current, 15µA Typical
- Reference Voltage Tolerance at +25°C
 - 1%: ZRC330QF01
 - 2%: ZRC330QF02
- No Stabilizing Capacitor Required
- Typical Slope Resistance: 0.6Ω
- ±1% Tolerance
- Operating Current 20µA to 5mA
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q100 Standards for High Reliability
 - AEC-Q100 Grade 1
 - PPAP Capable (Note 4)

Typical Application Circuit



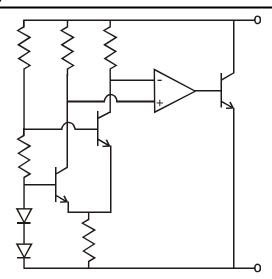
Applications

Notes:

- Automotive Measurement Systems
- Automotive Instrumentation
- Automotive Reference
- Automotive Data Acquisition Systems
- Precision Power Supplies
 - 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 - See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 - 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - 4. Automotive products are AEC-Q100 qualified and are PPAP capable. Refer to http://www.diodes.com/quality/product_compliance_definitions/.



Functional Block Diagram



Absolute Maximum Ratings

| | Parameter | Rating | Unit |
|----------------------|----------------------|-------------|------|
| Reverse Cu | ırrent | 25 | mA |
| Forward Cu | rrent | 25 | mA |
| Junction Temperature | | +150 | °C |
| Storage Temperature | | -55 to +125 | °C |
| | ESD Susceptibility | | |
| НВМ | Human Body Model | 4 | kV |
| MM | Machine Model | 100 | V |
| CDM | Charged Device Model | 1 | kV |

Caution: Stresses greater than the 'Absolute Maximum Ratings' specified above, may cause permanent damage to the device. These are stress ratings only; functional operation of the device at conditions between maximum recommended operating conditions and absolute maximum ratings is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.

(Semiconductor devices are ESD sensitive and may be damaged by exposure to ESD events. Suitable ESD precautions should be taken when handling and transporting these devices.)

Package Thermal Data

| Package | θJA | P _{DIS} | |
|---|---------|------------------|--|
| SOT23 (T _A = +25°C, T _J = +125°C) | 380°C/W | 260mW | |

Recommended Operating Conditions

| Parameter | Rating | Unit |
|----------------------|-------------|------|
| Reverse Current | 5 | mA |
| Ambient Temperature | -40 to +125 | °C |
| Junction Temperature | -40 to +125 | °C |



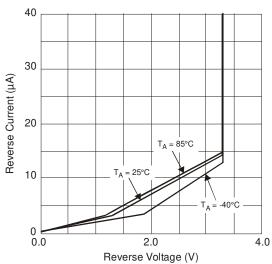
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Symbol | Parameter | Condition | | Min. | Тур. | Max. | Unit |
|------------------|--|---|------------|-------|------|-------|---------|
| ., | Reverse Breakdown Voltage | I _R = 150μA | ZRC330QF01 | 3.27 | 3.3 | 3.33 | V |
| V _R | | | ZRC330QF02 | 3.234 | _ | 3.366 | |
| I _{MIN} | Minimum Operating Current | _ | | _ | 15 | 20 | μΑ |
| I _R | Recommended Operating Current | _ | | 0.02 | _ | 5 | mA |
| T _C | Average Reverse Breakdown Voltage Temperature Coefficient (Note 5) | I _{R(MIN)} to I _{R(MAX)} | | _ | 15 | 50 | ppm/°C |
| Rs | Slope resistance (Note 6) | | | _ | 0.6 | 2 | Ω |
| Z _R | Reverse Dynamic Impedance | I _R = 1mA, f = 100Hz I _{AC} = 0.1I _R | | _ | 0.5 | 1.2 | Ω |
| E _N | Wideband Noise Voltage | I _R = 150μA, f = 10Hz to 10kHz | | _ | 75 | _ | μV(rms) |

Notes: 5.
$$T_C = \frac{\left(V_{R(MAX)} - V_{R(MIN)}\right) x 1000000}{V_R x \left(T_{(MAX)} - T_{(MIN)}\right)}$$

where: VR(MAX) - VR(MIN) is the maximum deviation in reference voltage measured over the full operating temperature range

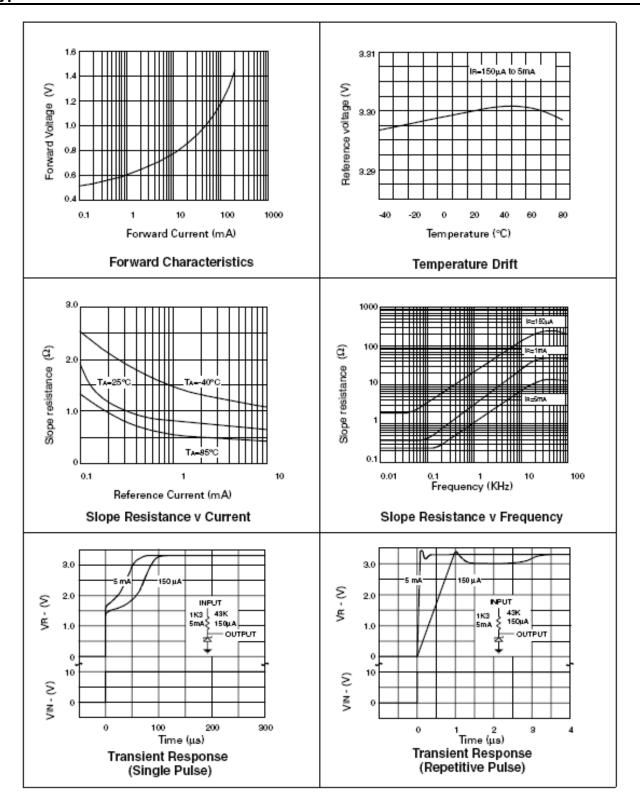
6.
$$R_S = \frac{V_R Change(I_{R(MIN)} toI_{R(MAX)})}{I_{R(MAX)} - I_{R(MIN)}}$$



April 2016

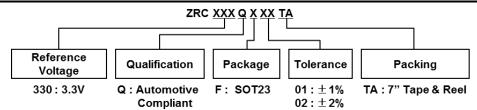


Typical Characteristics





Ordering Information (Note 7)



| Part Number | Tol (%) | Package (Note 7) | Package Code | Identification Code | Reel Size (inches) | Quantity per Reel | Tape Width (mm) | Qualification Grade (Note 8) |
|--------------|------------|---------------------|-----------------|------------------------|-----------------------|-------------------|-----------------|---------------------------------|
| ZRC330QF01TA | 1 | SOT23 | F | 33C | 7", 180mm | 3,000 | 8 | Automotive Compliant |
| ZRC330QF02TA | 2 | SOT23 | F | 33B | 7", 180mm | 3,000 | 8 | Automotive Compliant |

Notes:

- For packaging details, go to our website at http://www.diodes.com/products/packages.html.

 ZRC330Q has been qualified to AEC-Q100 grade 1 and is classified as "Automotive Compliant" supporting PPAP documentation. Automotive, AEC-Q100 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/quality/product_compliance_definitions/. See ZRC330 datasheet for commercial qualified versions.

Marking Information



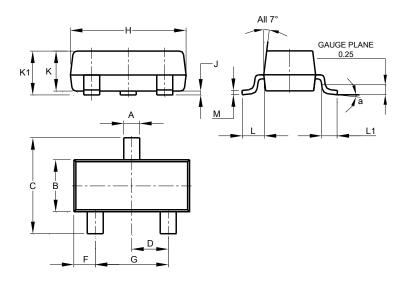
| Part Number | XXX : Identification Code |
|--------------|---------------------------|
| ZRC330QF01TA | 33C |
| ZRC330QF02TA | 33B |



Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for latest version.

SOT23

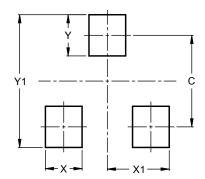


| SOT23 | | | | | |
|----------------------|---------|-------|-------|--|--|
| Dim | Min Max | | Тур | | |
| Α | 0.37 | 0.51 | 0.40 | | |
| В | 1.20 | 1.40 | 1.30 | | |
| C | 2.30 | 2.50 | 2.40 | | |
| D | 0.89 | 1.03 | 0.915 | | |
| F | 0.45 | 0.60 | 0.535 | | |
| G | 1.78 | 2.05 | 1.83 | | |
| Н | 2.80 | 3.00 | 2.90 | | |
| 7 | 0.013 | 0.10 | 0.05 | | |
| K | 0.890 | 1.00 | 0.975 | | |
| K1 | 0.903 | 1.10 | 1.025 | | |
| L | 0.45 | 0.61 | 0.55 | | |
| L1 | 0.25 | 0.55 | 0.40 | | |
| М | 0.085 | 0.150 | 0.110 | | |
| а | 0° | 8° | _ | | |
| All Dimensions in mm | | | | | |

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for latest version.

SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| С | 2.0 |
| Х | 0.8 |
| X1 | 1.35 |
| Υ | 0.9 |
| Y1 | 29 |



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