

General Description

The AQ102 is a low voltage combined reference/amplifier suited for the control loop of low voltage power supplies. In order to allow operation down to very low voltages, the error amplifier output and the supply terminal have been isolated to separate functional pins. The nominal reference voltage is 600 mV, the COMP output can sink 20mA at 300mV.

Functionally, the AQ120 can be applied similarly to industry standard TL431, except that the reference is 600 mV and this requires a separate Vcc connection to a supply above 2.2V. Additionally, the output of the AQ120 can swing close to ground.

In the SC-70 package, the AQ102 is a replacement for the MAX8515 part.

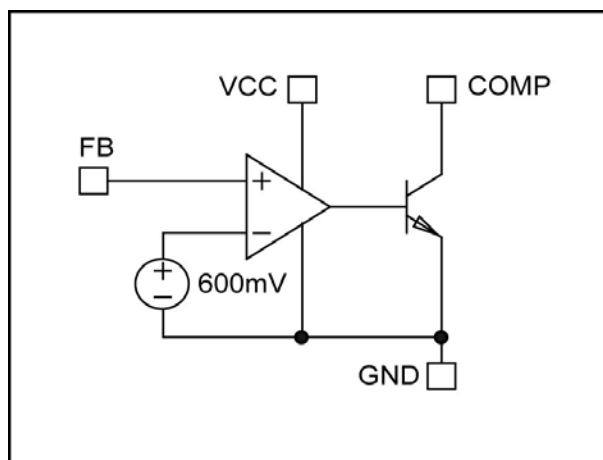
Applications

- Power supply control loop
- Power supply supervisory functions

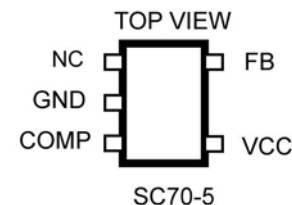
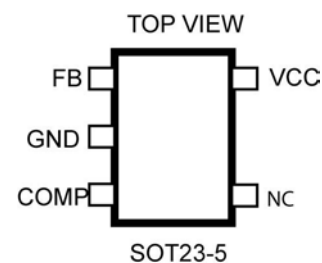
Features

- Low input voltage reference
- 600mV high accuracy voltage reference
- Low TC voltage reference
- High PSRR and line regulation
- Low current consumption
- Offered in ultra small SC70-5 package
- Zero offset error amplifier
- Open collector output
- **RoHS compliant**

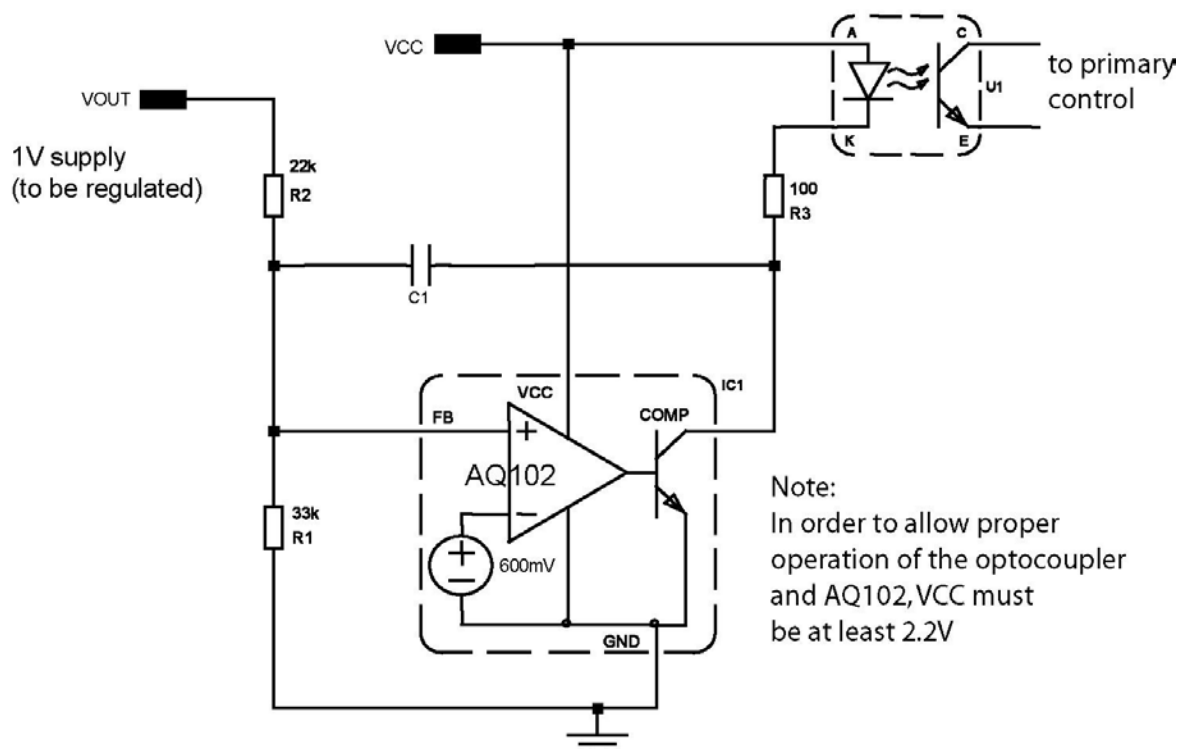
Block Diagram



Pin Configuration



Typical Application



Pin Descriptions

| Pin | Pin Name | Function |
|-----|----------|---|
| 1 | FB | Inverting input to error amplifier; will have threshold of 600mV. |
| 2 | GND | Ground |
| 3 | COMP | Output of error amplifier; 20 mA source/sink capability |
| 4 | N/C | - |
| 5 | VCC | Positive supply |

Ordering Information

| Device | Operating Tj | %Tol | Pkg Type | VOUT | Wrap | Ordering Number |
|--------|---------------|------|----------|------|------|-------------------|
| AQ102 | -40C° ≤ 105C° | 1.0 | SOT-23-5 | 0.6V | T&R | AQ102BY-M5-06-TRL |
| AQ102 | -40C° ≤ 105C° | 1.0 | SC70-5 | 0.6V | T&R | AQ102BY-C5-06-TRL |

Note: The TRL parts are Lead Free and RoHS compliant.

Absolute Maximum Ratings

| Parameter | Value | Units |
|---|-------------|-------|
| V _{CC} Voltage | 20 | V |
| COMP Voltage | 20 | V |
| REF Voltage | 20 | V |
| V _{CC} , COMP, REF Current | 50 | mA |
| Operating Junction Temperature | 150 | °C |
| Lead Temperature (soldering 10 seconds) | 260 | °C |
| Storage Temperature Range | -65 to +150 | °C |

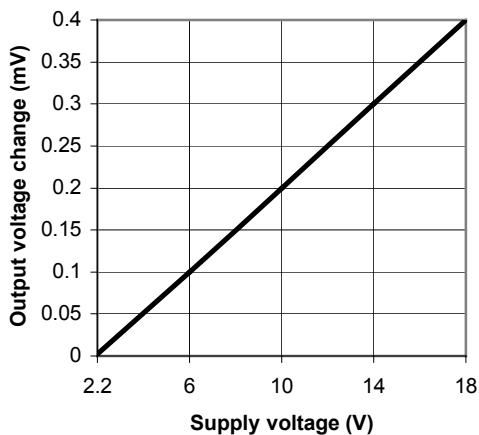
Electrical Specifications

Electrical characteristics are guaranteed over the full temperature range $-40^{\circ}\text{C} < T_j < 105^{\circ}\text{C}$. Ambient temperature must be de-rated based upon power dissipation and package thermal characteristics. Unless otherwise stated, test conditions are V_{CC} = 3V, V_{COMP} = V_FB, I_{COMP} = 1mA

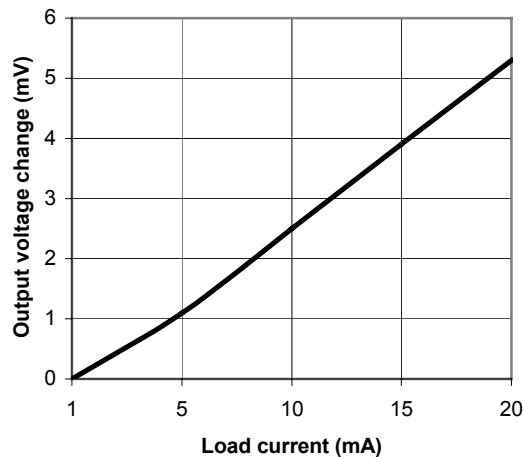
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---------------------|----------------------------------|---|------|-----|-----|--------|
| V _{ccmin} | Minimum Input Voltage | | | | 2.2 | V |
| I _{cc} | Quiescent Supply Current | V _{COMP} =1V | | 0.3 | 0.5 | mA |
| V _{cc} | Supply Voltage | | 2.2 | | 18 | V |
| V _{ref} | Reference Voltage | T _j =25°C | 594 | 600 | 606 | mV |
| | | -40°C < T _j < 105°C | 592 | | 608 | |
| DV _{cc} | Line regulation | 2.2V < V _{CC} < 18V | | 0.5 | 1 | mV |
| DV _{iload} | Load Regulation | I _{COMP} =1mA to 10mA | | 4 | 8 | mV |
| T _{cref} | Reference Temperature Deviation | -40°C < T _j < 105°C | | 25 | 50 | ppm/°C |
| I _F B | REF input current | | -500 | | 500 | nA |
| PSRR | Reference Power Supply Rejection | Freq.=300KHz | 35 | 45 | | dB |
| A _v | Error Amplifier Open Loop Gain | I _{COMP} =2mA, COMP=1V | 60 | 80 | | dB |
| BW | Unity Gain Frequency | I _{COMP} =2mA, COMP=1V | 1 | 2 | | MHz |
| V _{COMP} | Output Saturation Voltage | I _{COMP} =20mA, V _F B=700mV | | 100 | 250 | mV |
| TRANSC | Output Transconductance | I _{COMP} =1mA to 20mA | | 2.5 | | mA/mV |
| I _{leak} | Output Leakage Current | V _{COMP} =16 V _F B=0 | | 200 | 400 | nA |

Typical Performance Characteristics

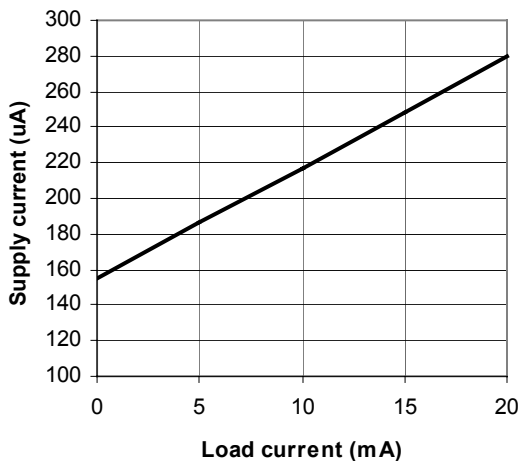
Line regulation (at 1mA)



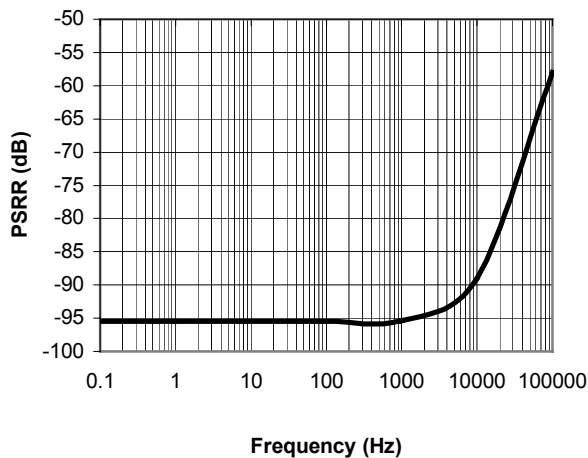
Load regulation



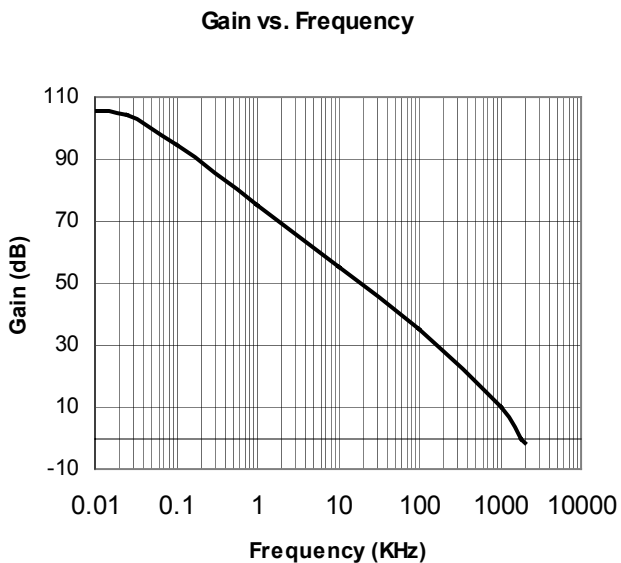
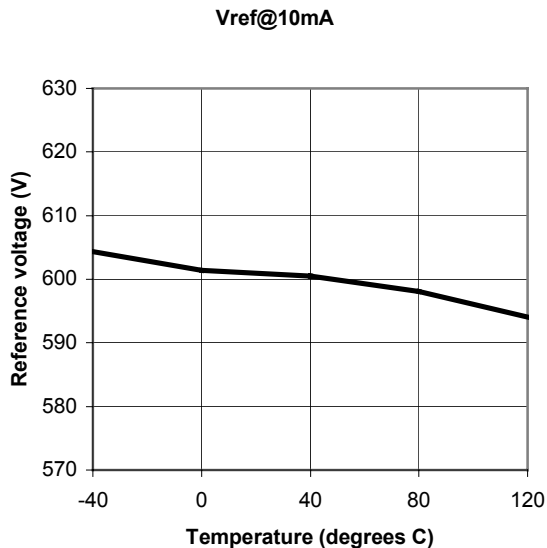
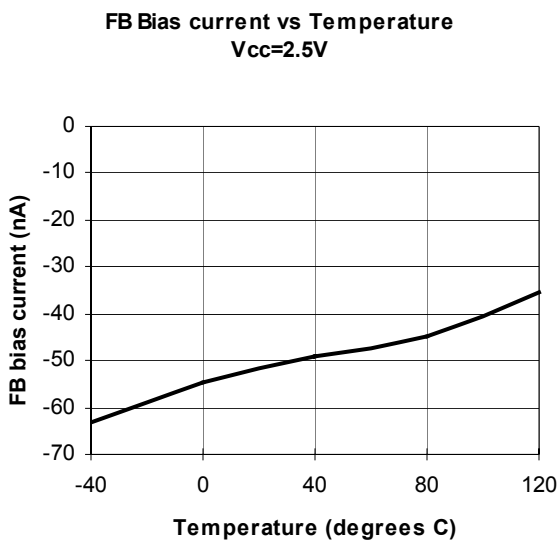
Supply current vs load current



Power-supply rejection ratio vs frequency

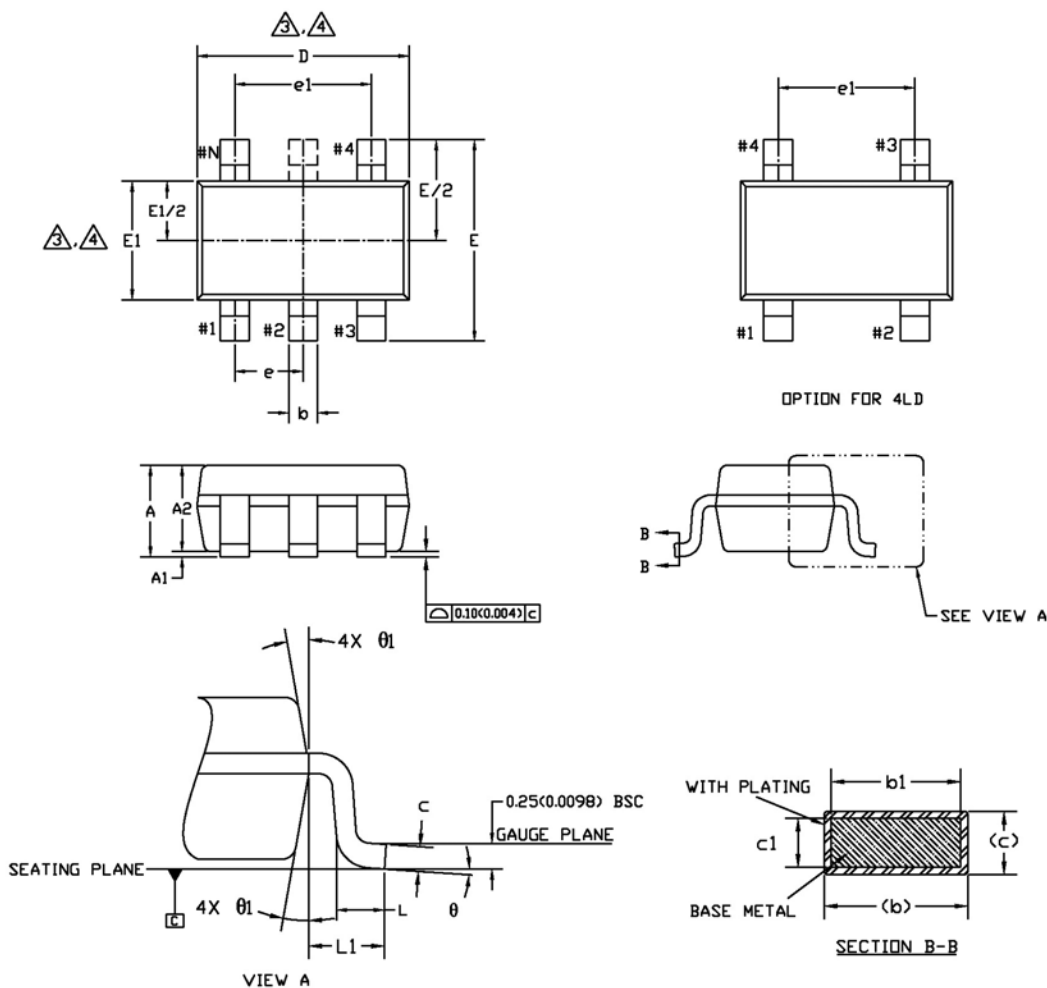


Typical Performance Characteristics (contd.)



Package Dimensions

SOT23-3, SOT23-4, SOT23-5, SOT23-6



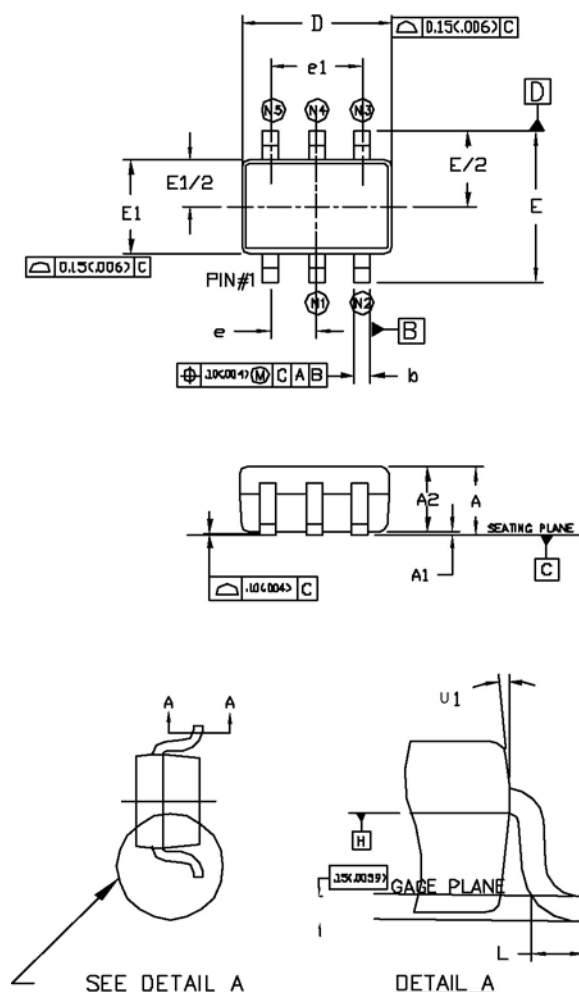
| SYMBOL | COMMON | | | | | |
|--------|-----------------------|------|------|-----------------|-------|-------|
| | DIMENSIONS MILLIMETER | | | DIMENSIONS INCH | | |
| | MIN. | NDM. | MAX. | MIN. | NDM. | MAX. |
| A | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| A1 | 0.05 | - | 0.15 | 0.002 | - | 0.006 |
| A2 | 0.90 | 1.15 | 1.30 | 0.035 | 0.045 | 0.051 |
| b | 0.35 | - | 0.50 | 0.013 | - | 0.020 |
| b1 | 0.35 | 0.40 | 0.45 | 0.013 | 0.015 | 0.017 |
| c | 0.08 | - | 0.22 | 0.003 | - | 0.008 |
| c1 | 0.08 | 0.13 | 0.20 | 0.003 | 0.005 | 0.007 |
| D | 2.90 BSC | | | 0.114 BSC | | |
| E | 2.80 BSC | | | 0.110 BSC | | |
| E1 | 1.60 BSC | | | 0.062 BSC | | |
| e | 0.95 BSC | | | 0.037 BSC | | |
| e1 | 1.90 BSC | | | 0.074 BSC | | |
| L | 0.35 | 0.45 | 0.55 | 0.013 | 0.017 | 0.021 |
| L1 | 0.60 REF. | | | 0.023 REF. | | |
| θ | 0° | 4° | 8° | 0° | 4° | 8° |
| θ1 | 10° TYP | | | 10° TYP | | |

NOTE :

1. Dimensioning and tolerancing per ASME Y 14.5 M - 1994.
2. Dimensions are in millimeters. Converted inch dimension are not necessarily exact.
3. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 0.15 mm per side. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.15 mm per side.
4. Top package may be smaller than the bottom package. Dimension D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash gate burrs and interlead flash.
5. Terminal numbers are shown for reference only. Die is facing up for molding. Die is facing down for trim/form.

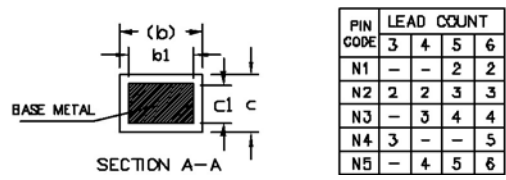
Package Dimensions (contd.)

SC70-3, SC70-4, SC70-5, SC70-6



- NOTE :
1. CONTROLLING DIMENSION : MILLIMETER. CONVERTED INCH DIMENSION ARE NOT NECESSARILY EXACT.
 2. DIMENSIONING AND TOLERANCING PER ANSI Y145M-1994.
 3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR, MOLD FLASH, PROTRUSION OR GATE BURR SHALL NOT EXCEED 0.15MM(0.006") PER END. DIMENSION E1 DO NOT INCLUDE INTER-LEAD FLASH OR PROTRUSION, INTER-LEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15MM (0.006") PER SIDE.
 4. THE PACKAGE TOP BE SMALLER THAN THE PACKAGE BOTTOM. DIMENSION D AND E1 ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY

| SYMBOL | COMMON | | | | | |
|--------|-----------------------|------|------|-----------------|-------|-------|
| | DIMENSIONS MILLIMETER | | | DIMENSIONS INCH | | |
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.80 | - | 1.10 | 0.031 | - | 0.043 |
| A1 | 0 | - | 0.10 | 0 | - | 0.004 |
| A2 | 0.80 | 0.90 | 1.00 | 0.031 | 0.035 | 0.040 |
| b | 0.15 | - | 0.30 | 0.006 | - | 0.012 |
| b1 | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| c | 0.08 | - | 0.25 | 0.003 | - | 0.010 |
| c1 | 0.08 | 0.13 | 0.20 | 0.003 | 0.005 | 0.008 |
| D | 1.90 | 2.10 | 2.15 | 0.074 | 0.082 | 0.084 |
| E | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |
| E1 | 1.15 | 1.25 | 1.35 | 0.045 | 0.050 | 0.055 |
| e | 0.65 BSC | | | 0.0255 BSC | | |
| e1 | 1.30 BSC | | | 0.0512 BSC | | |
| L | 0.26 | 0.36 | 0.46 | 0.010 | 0.014 | 0.018 |
| U | 0° | - | 8° | 0° | - | 8° |
| U1 | 4° | - | 10° | 4° | - | 10° |



| PIN CODE | LEAD COUNT | | | |
|----------|------------|---|---|---|
| N1 | 3 | 4 | 5 | 6 |
| N2 | - | - | 2 | 2 |
| N3 | 2 | 2 | 3 | 3 |
| N4 | 3 | - | - | 5 |
| N5 | - | 4 | 5 | 6 |

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