

Features

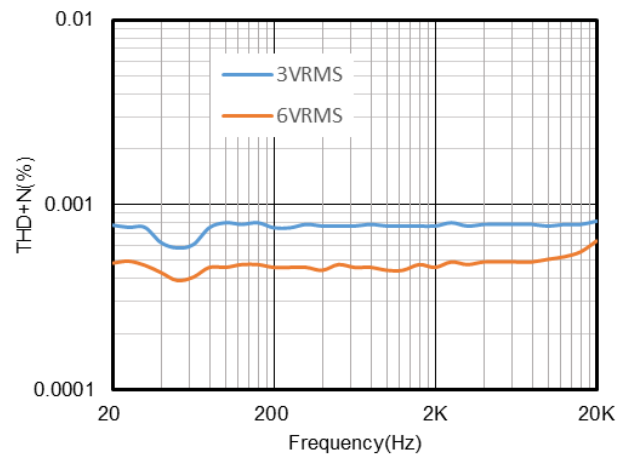
- Supply Voltage: 3V to 36V
- Differential Input Voltage Range to Supply Rail
- Input Rail to $-V_s$, Rail to Rail Output
- Fast Response: 10 MHz Bandwidth, 8V/ μ s Slew Rate, 100ns Overload Recovery
- Low Offset Voltage:
 - ±3mV Maximum at 25°C,
 - ±3.5mV Maximum at -40°C to 85°C
 - ±4mV Maximum at -40°C to 125°C
- Very Low THD+N: 0.0007% at Gain = 1, 20kHz
- Excellent EMIRR: 58dB at 900MHz
- 2KV HBM, 1KV CDM, 150mA Latch Up
- -40°C to 125°C Operation Temperature Range

Applications

- Audio
- Sensor Interface
- Motor Control

Description

The TP258X series amplifiers are newest high supply voltage amplifiers with low offset, low power and stable high frequency response. They incorporate 3PEAK's proprietary and patented design techniques to achieve very good AC performance with 10MHz bandwidth, 8V/ μ s slew rate, and 100ns overload recovery time while drawing only 3mA of quiescent current per amplifier; the TP258X family achieve the best THD+N performance in audio signal range, it's the ideal choices for motor control and audio amplification.



Pin Configuration

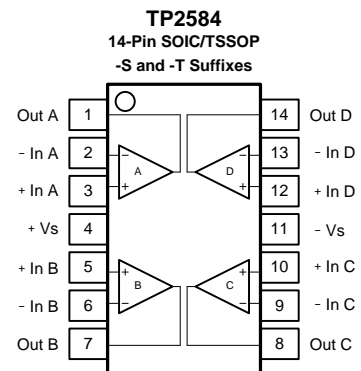
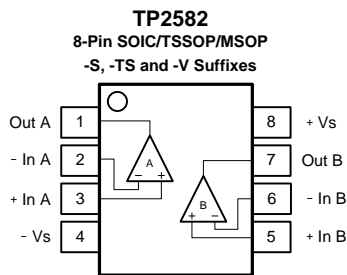
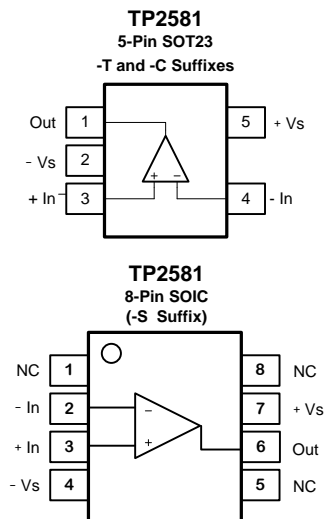


Table of Contents

| | |
|--|----|
| Features | 1 |
| Applications..... | 1 |
| Description..... | 1 |
| Pin Configuration | 1 |
| Table of Contents | 2 |
| Revision History | 2 |
| Order Information..... | 3 |
| Absolute Maximum Ratings ^{Note 1} | 4 |
| ESD Rating..... | 4 |
| Thermal Information | 4 |
| Electrical Characteristics | 5 |
| Typical Performance Characteristics | 7 |
| Tape and Reel Information | 10 |
| Package Outline Dimensions..... | 11 |
| SOT23-5..... | 11 |
| SOIC-8 | 11 |
| TSSOP-8..... | 12 |
| MSOP-8 | 12 |
| SOIC-14 | 13 |
| TSSOP-14..... | 13 |

Revision History

| Date | Revision | Notes |
|------------|----------|--|
| 2018/7/21 | Rev.Pre | Pre-Release Version |
| 2019/3/1 | Rev.0 | Initial Version |
| 2019/10/23 | Rev.0.01 | Add new product: TP2581-TR |
| 2019/12/6 | Rev.0.02 | Update Iq Spec of TP2581 |
| 2020/4/25 | Rev.A | Add Figure: PSRR vs. Freq, CMRR vs. Freq |
| 2020/7/21 | Rev.A.1 | Update Figure: PSRR vs. Freq |
| 2020/9/24 | Rev.A.2 | Update the description of Absolute Maximum Ratings: "Maximum Junction Temperature" -> "Maximum Operating Junction Temperature" |

Order Information

| Order Number | Operating Temperature Range | Package | Marking Information | MSL | Transport Media, Quantity |
|-----------------------------|-----------------------------|--------------|--------------------------------|-----|---------------------------|
| TP2581-SR ^{Note 2} | -40 to 125°C | 8-Pin SOIC | 2581 XXXX ^{Note 1} | 3 | Tape and Reel, 4000 |
| TP2581-TR | -40 to 125°C | 5-Pin SOT23 | 258XX ^{Note 1} | 3 | Tape and Reel, 3000 |
| TP2582-SR | -40 to 125°C | 8-Pin SOIC | 2582 XXXX ^{Note 1} | 3 | Tape and Reel, 4000 |
| TP2582-TSR | -40 to 125°C | 8-Pin TSSOP | 2582 XXXX ^{Note 1} | 3 | Tape and Reel, 3000 |
| TP2582-VR | -40 to 125°C | 8-Pin MSOP | 2582 XXXX ^{Note 1} | 3 | Tape and Reel, 3000 |
| TP2584-SR | -40 to 125°C | 14-Pin SOIC | 2584 XXXX ^{Note 1} | 3 | Tape and Reel, 2500 |
| TP2584-TR | -40 to 125°C | 14-Pin TSSOP | 2584 XXXX ^{Note 1} | 3 | Tape and Reel, 3000 |

Note 1: "XXXX" and "XX" identify the manufacture site and date code information.

Note 2: The sample will be ready in 1 month.

Absolute Maximum Ratings ^{Note 1}

| Parameters | Rating |
|--|--|
| Supply Voltage, (+V _S)– (-V _S) | 40 V |
| Input Voltage | (-V _S) – 0.3 to (+V _S) + 0.3 |
| Differential Input Voltage | (+V _S) - (-V _S) |
| Input Current: +IN, –IN ^{Note 2} | ±10mA |
| Output Short-Circuit Duration ^{Note 3} | Infinite |
| Maximum Operating Junction Temperature | 150°C |
| Operating Temperature Range | –40 to 125°C |
| Storage Temperature Range | –65 to 150°C |
| Lead Temperature (Soldering, 10 sec) | 260°C |

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 300mV beyond the power supply, the input current should be limited to less than 10mA.

Note 3: A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

ESD Rating

| Symbol | Parameter | Condition | Minimum Level | Unit |
|--------|--------------------------|------------------------|---------------|------|
| HBM | Human Body Model ESD | ANSI/ESDA/JEDEC JS-001 | 2 | kV |
| CDM | Charged Device Model ESD | ANSI/ESDA/JEDEC JS-002 | 1 | kV |

Thermal Information

| Package Type | θ _{JA} | θ _{JC} | Unit |
|--------------|-----------------|-----------------|------|
| 5-Pin SOT23 | 250 | 81 | °C/W |
| 8-Pin SOIC | 158 | 43 | °C/W |
| 8-Pin TSSOP | 191 | 44 | °C/W |
| 8-Pin MSOP | 210 | 45 | °C/W |
| 14-Pin SOIC | 120 | 36 | °C/W |
| 14-Pin TSSOP | 180 | 35 | °C/W |

Electrical Characteristics

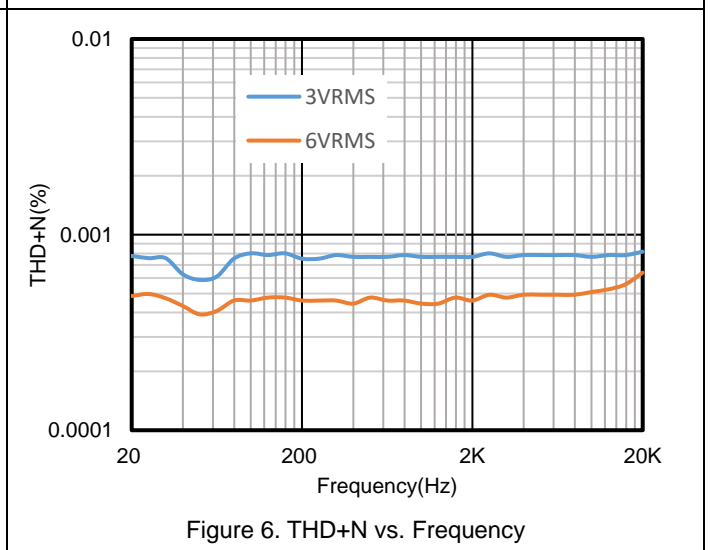
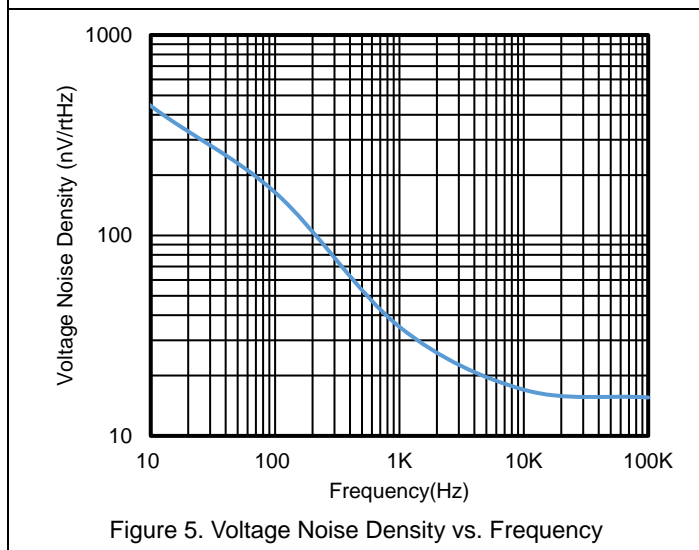
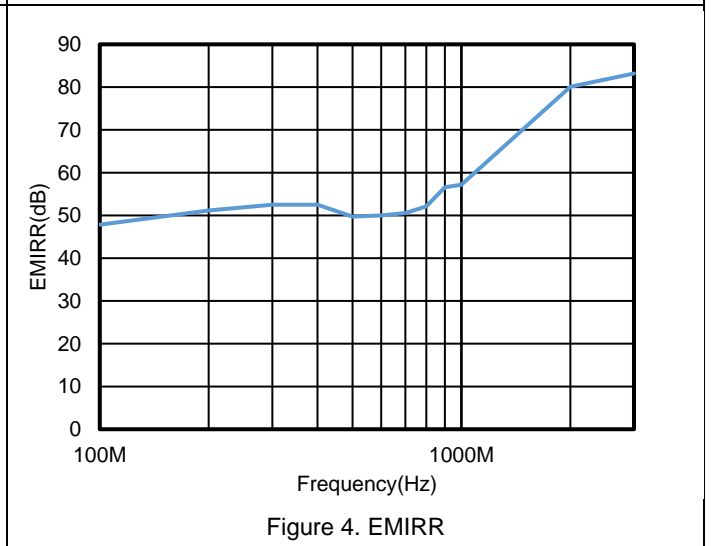
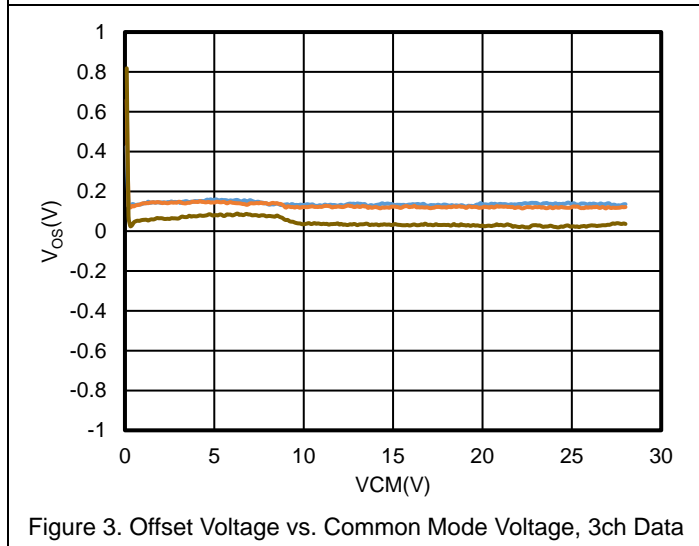
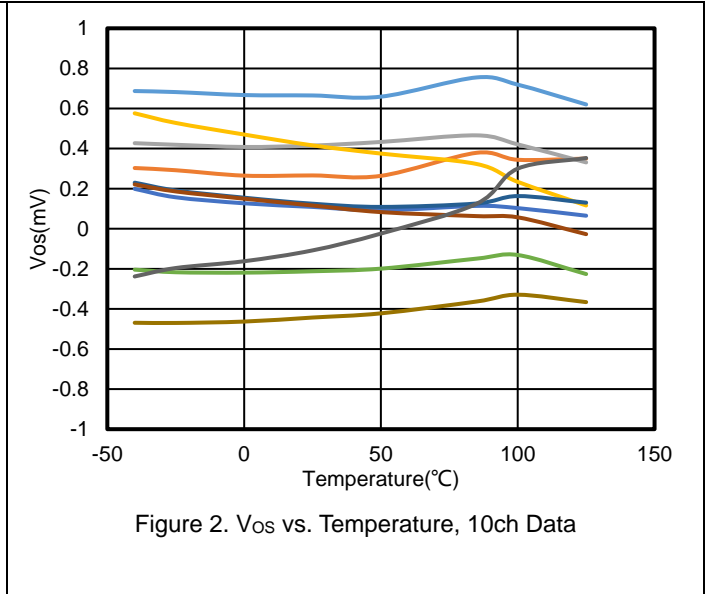
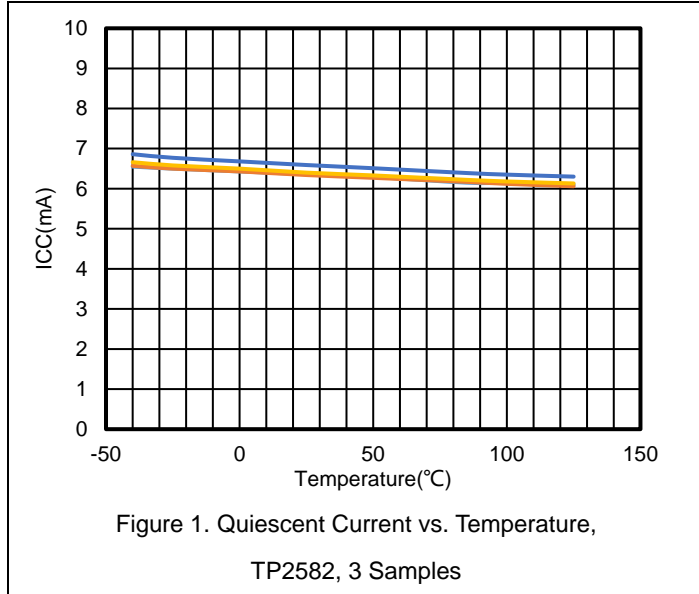
All test condition is $V_S = 30V$, $T_A = 25^\circ C$, $R_L = 10k\Omega$, unless otherwise noted.

| Symbol | Parameter | Conditions | T_A | Min | Typ | Max | Unit |
|------------------------------|---------------------------------|--------------------------------------|----------------|------|------|------------|-------|
| Power Supply | | | | | | | |
| V_S | Supply Voltage Range | | | 3 | | 36 | V |
| I_Q | Quiescent Current per Amplifier | $V_S = 30V$, TP2581 | | | 4.2 | 5.4 | mA |
| | | | -40°C to 125°C | | | 5.9 | mA |
| | | $V_S = 5V$, TP2581 | | | 3.5 | 4.9 | mA |
| | | | -40°C to 125°C | | | 5.2 | mA |
| | | $V_S = 30V$, TP2582/TP2584 | | | 3 | 4 | mA |
| | | | -40°C to 125°C | | | 4.5 | mA |
| $V_S = 5V$, TP2582/TP2584 | | | 2.5 | 3.75 | mA | | |
| | -40°C to 125°C | | | 4 | mA | | |
| PSRR | Power Supply Rejection Ratio | $V_S = 3V$ to 36V | | 95 | 120 | | dB |
| | | | -40°C to 125°C | 90 | | | dB |
| Input Characteristics | | | | | | | |
| V_{OS} | Input Offset Voltage | $V_S = 30V$, $V_{CM} = 0V$ to 28.5V | | -3 | 0.1 | 3 | mV |
| | | | -40°C to 85°C | -3.5 | | 3.5 | mV |
| | | | -40°C to 125°C | -4 | | 4 | mV |
| | | $V_S = 5V$, $V_{CM} = 2.5V$ | | -3 | 0.1 | 3 | mV |
| | | | -40°C to 125°C | -4 | | 4 | mV |
| $V_{OS\ TC}$ | Input Offset Voltage Drift | | -40°C to 125°C | | 2 | | μV/°C |
| I_B | Input Bias Current | | | | 25 | | pA |
| | | | -40°C to 85°C | | 80 | | pA |
| | | | -40°C to 125°C | | 1000 | | pA |
| I_{OS} | Input Offset Current | | | | 25 | | pA |
| I_{IN} | Different Input Current | $V_S = 36V$, $V_{ID} = 36V$ | | | 10 | | nA |
| | | | -40°C to 125°C | | | 100 | |
| C_{IN} | Input Capacitance | Differential Mode | | | 5 | | pF |
| | | Common Mode | | | 2.5 | | pF |
| A_v | Open-loop Voltage Gain | | | 105 | 120 | | dB |
| | | | -40°C to 125°C | 95 | | | dB |
| V_{CMR} | Common-mode Input Voltage Range | | | (V-) | | (V+) - 1.5 | V |
| CMRR | Common Mode Rejection Ratio | $V_{CM} = 0V$ to 28V | | 105 | 130 | | dB |
| | | | -40°C to 125°C | 100 | | | dB |

| Output Characteristics | | | | | | | |
|------------------------|-------------------------------------|--|----------------|-----|--------|-----|-------------------|
| V _{OH} | Output Swing from Positive Rail | R _{LOAD} = 10kΩ to V _S /2 | | | 0.4 | 0.7 | V |
| | | | -40°C to 125°C | | | 1.2 | V |
| | | R _{LOAD} = 2kΩ to V _S /2 | | | 1.3 | 1.7 | V |
| | | | -40°C to 125°C | | | 2.5 | V |
| V _{OL} | Output Swing from Negative Rail | R _{LOAD} = 10kΩ to V _S /2 | | | 0.2 | 0.5 | V |
| | | | -40°C to 125°C | | | 1 | V |
| | | R _{LOAD} = 2kΩ to V _S /2 | | | 0.8 | 1.2 | V |
| | | | -40°C to 125°C | | | 2 | V |
| I _{SC} | Output Short-Circuit Current | | | 25 | 32 | | mA |
| | | -40°C to 85°C | 20 | | | | mA |
| | | -40°C to 125°C | 15 | | | | mA |
| AC Specifications | | | | | | | |
| GBW | Gain-Bandwidth Product | | | | 10 | | MHz |
| SR | Slew Rate | G = 1, 10V step | | | 8 | | V/μs |
| | | Open Loop | | 6.5 | 8 | | V/μs |
| | | | -40°C to 125°C | 5.5 | | | V/μs |
| t _{OR} | Overload Recovery | | | | 100 | | ns |
| t _S | Settling Time, 0.1% | G = 11, 2.5V step | | | 0.8 | | μs |
| | Settling Time, 0.01% | | | | 1 | | μs |
| PM | Phase Margin | V _S = 36V, R _L =10K, C _L =100pF | | | 60 | | ° |
| GM | Gain Margin | V _S = 36V, R _L =10K, C _L =100pF | | | 15 | | dB |
| Noise Performance | | | | | | | |
| E _N | Input Voltage Noise | f = 0.1Hz to 10Hz | | | 1.2 | | μV _{RMS} |
| e _N | Input Voltage Noise Density | f = 1kHz | | | 35 | | nV/√Hz |
| | | f = 10kHz | | | 17 | | nV/√Hz |
| i _N | Input Current Noise | f = 1kHz | | | 2 | | fA/√Hz |
| THD+N | Total Harmonic Distortion and Noise | f = 1kHz, G = 1, R _L = 10kΩ, V _{OUT} = 6V _{RMS} | | | 0.0005 | | % |

Typical Performance Characteristics

$V_s = \pm 15V$, $V_{CM} = 0V$, $R_L = 10k\Omega$, unless otherwise specified.



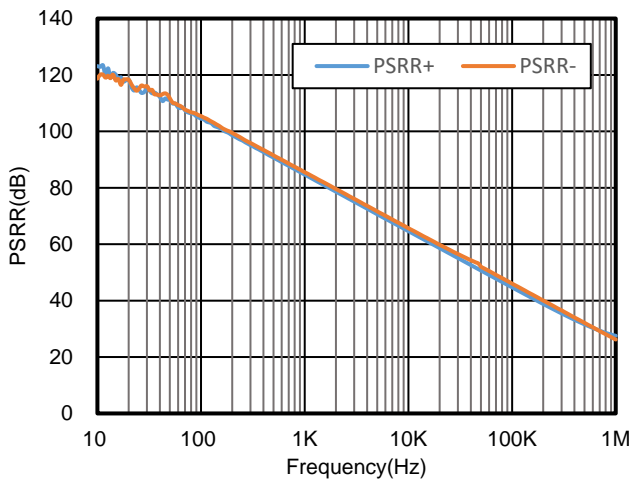


Figure 7. PSRR vs. Frequency

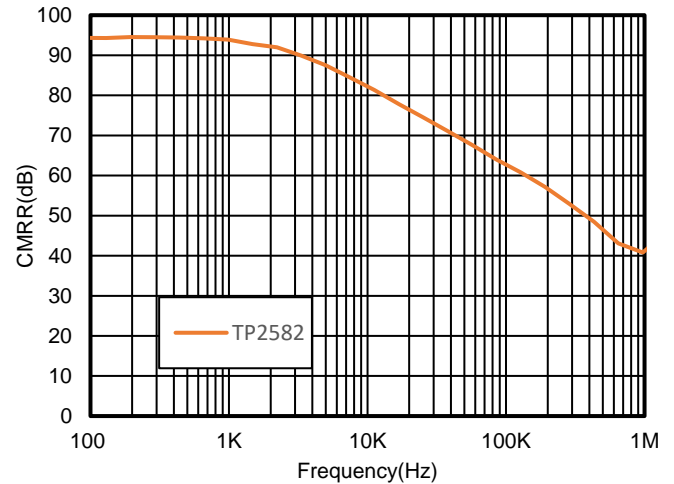


Figure 8. CMRR vs. Frequency

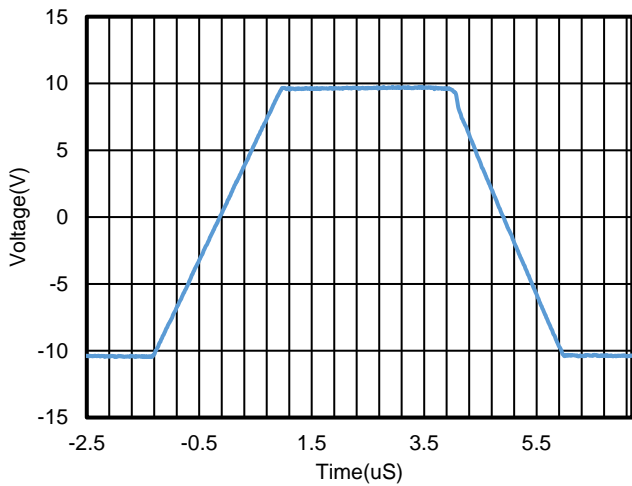


Figure 9. Large Signal Step Response,
G = 1, R_L = 10k Ω , C_L = 100pF

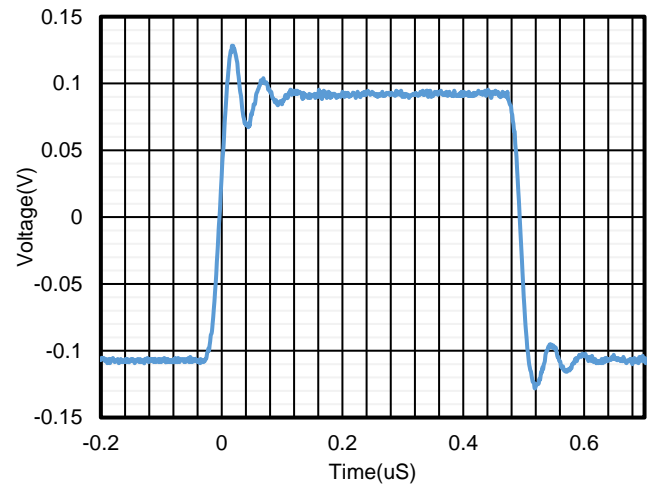


Figure 10. Small Signal Step Response,
G = 1, R_L = 10k Ω , C_L = 100pF

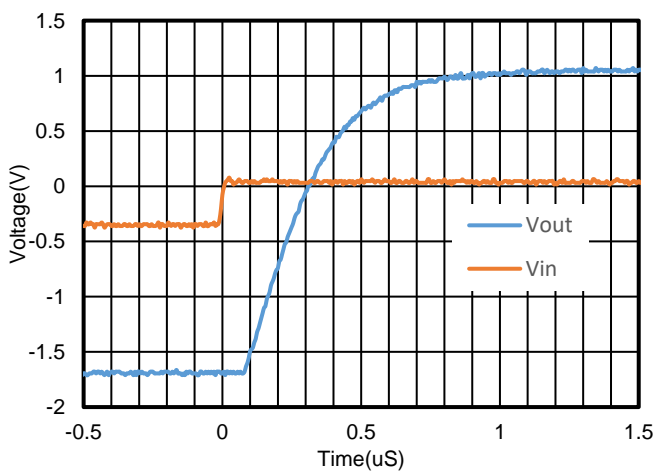


Figure 11. Positive Settling Time,
V_S = 3.3V, V_{CM} = 1.65V, G = 11

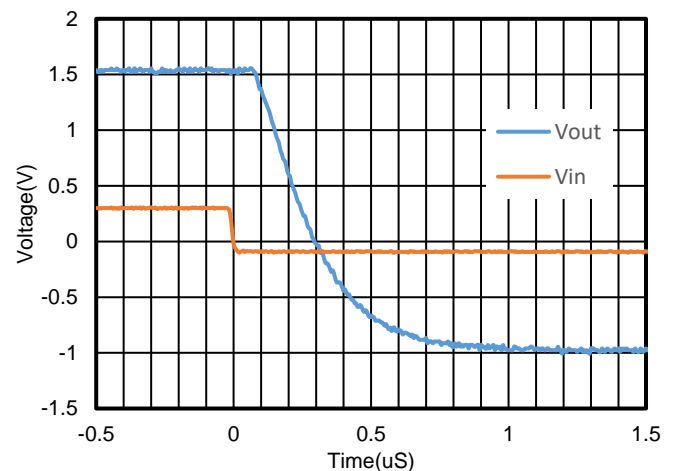


Figure 12. Negative Settling Time,
V_S = 3.3V, V_{CM} = 1.65V, G = 11

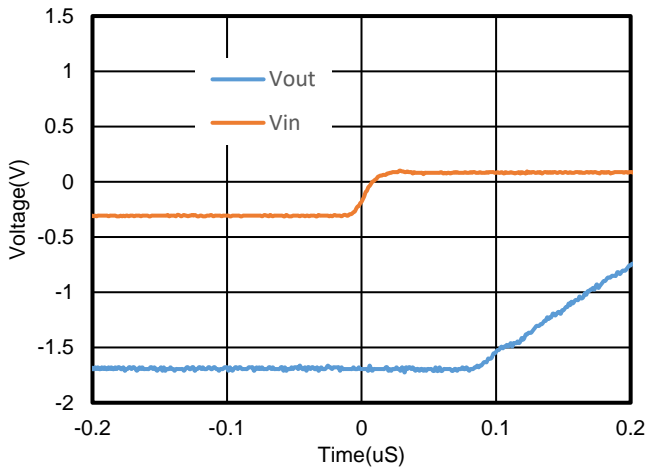


Figure 13. Positive Overload Recovery,
 $V_S = 3.3\text{V}$, $V_{CM} = 1.65\text{V}$, $G = 11$

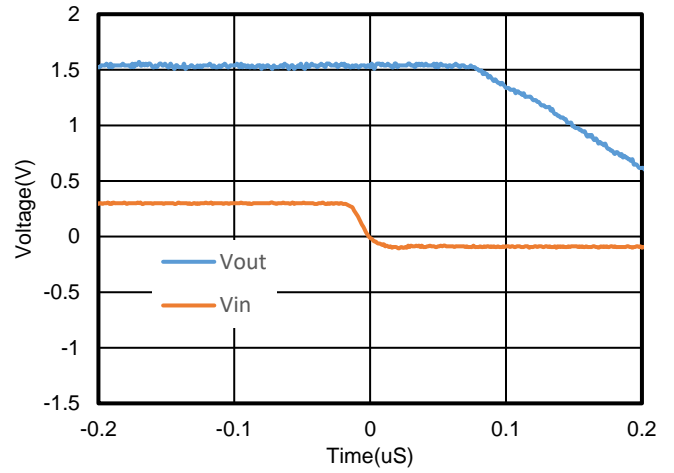
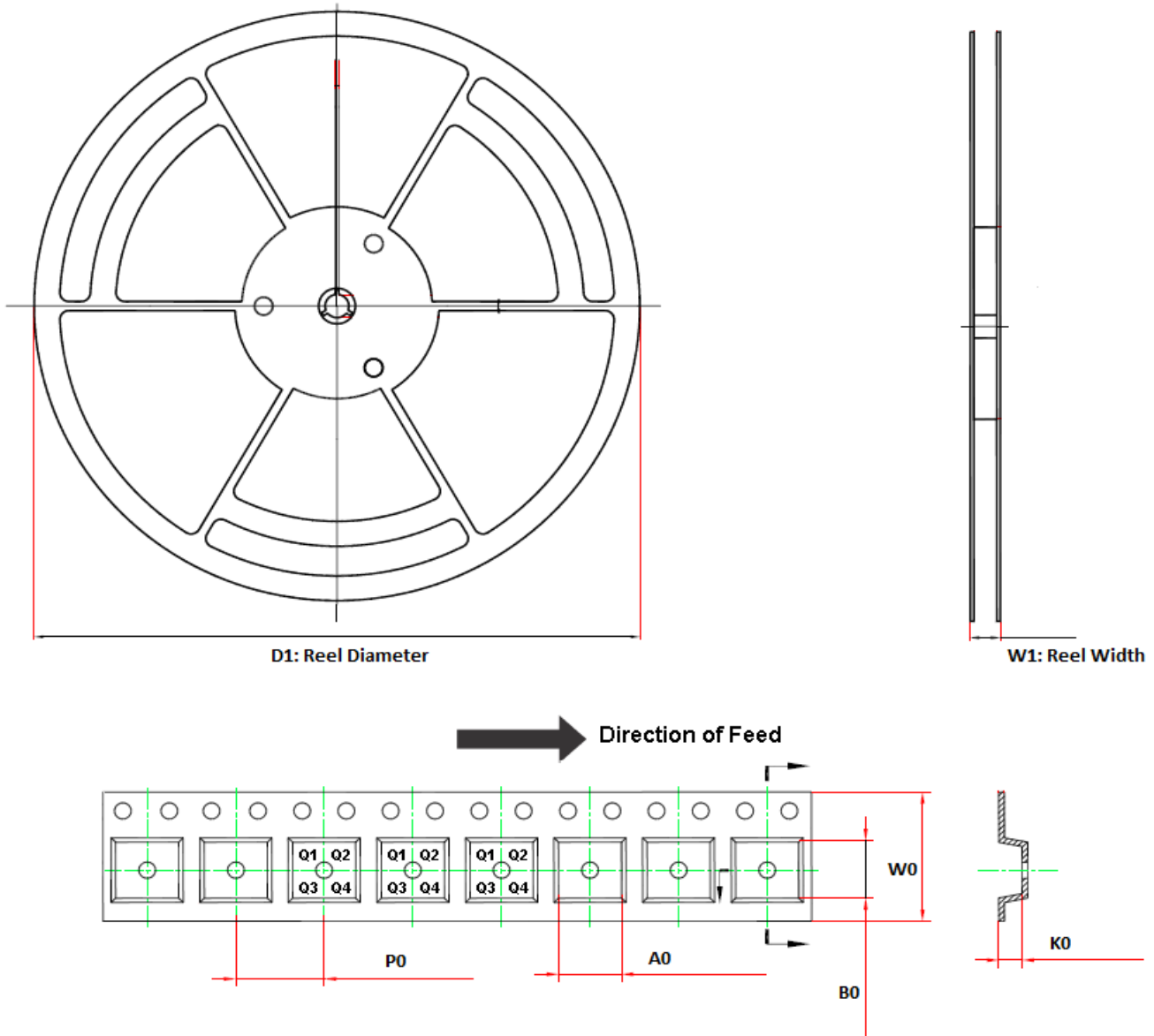


Figure 14. Negative Overload Recovery,
 $V_S = 3.3\text{V}$, $V_{CM} = 1.65\text{V}$, $G = 11$

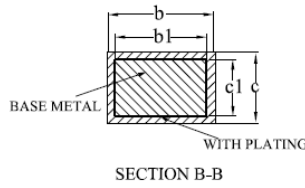
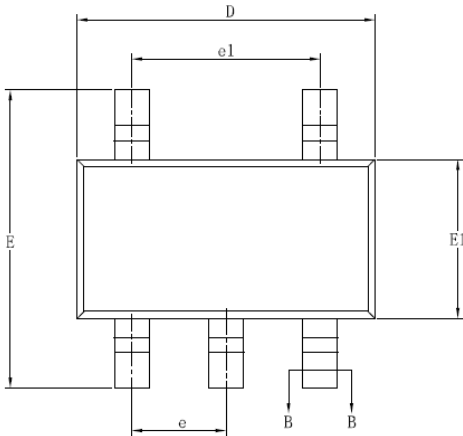
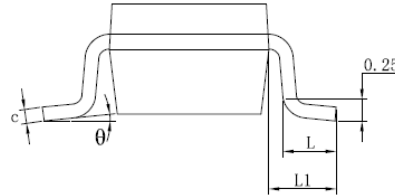
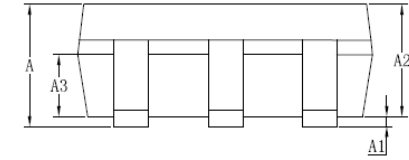
Tape and Reel Information



| Order Number | Package | D1 | W1 | A0 | B0 | K0 | P0 | W0 | Pin1 Quadrant |
|--------------|--------------|-------|------|-----|-----|-----|-----|------|---------------|
| TP2581-TR | 5-Pin SOT23 | 180.0 | 13.1 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TP2581-SR | 8-Pin SOIC | 330.0 | 17.6 | 6.4 | 5.4 | 2.1 | 8.0 | 12.0 | Q1 |
| TP2582-SR | 8-Pin SOIC | 330.0 | 17.6 | 6.4 | 5.4 | 2.1 | 8.0 | 12.0 | Q1 |
| TP2582-VR | 8-Pin MSOP | 330.0 | 17.6 | 5.2 | 3.3 | 1.5 | 8.0 | 12.0 | Q1 |
| TP2582-TSR | 8-Pin TSSOP | 330.0 | 17.6 | 6.8 | 3.3 | 1.2 | 8.0 | 12.0 | Q1 |
| TP2584-SR | 14-Pin SOIC | 330.0 | 21.6 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| TP2584-TR | 14-Pin TSSOP | 330.0 | 17.6 | 6.8 | 5.4 | 1.2 | 8.0 | 12.0 | Q1 |

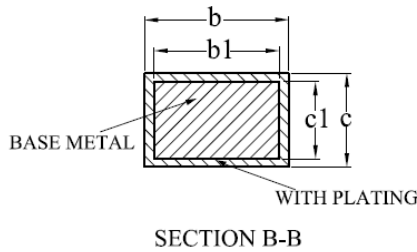
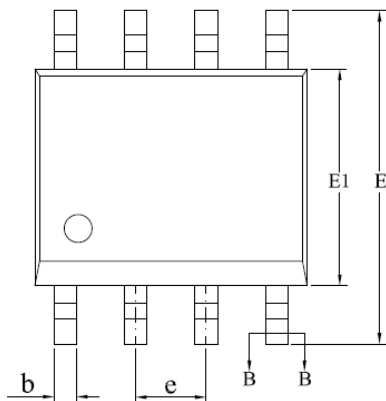
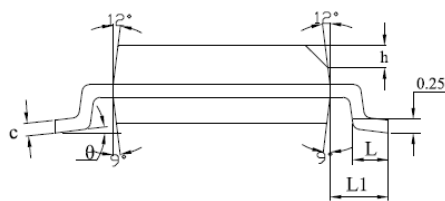
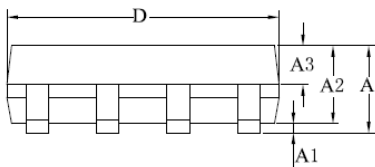
Package Outline Dimensions

SOT23-5



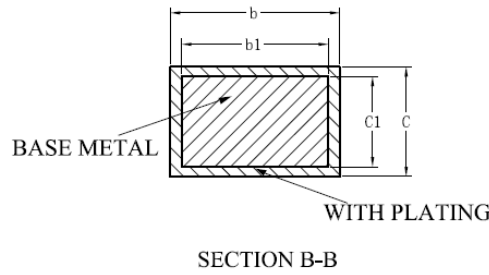
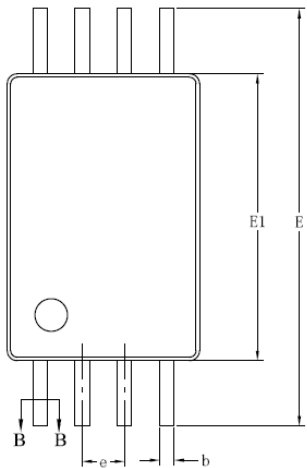
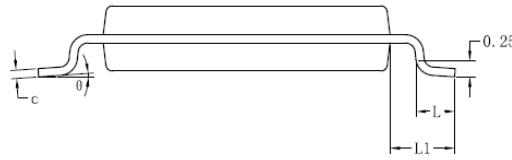
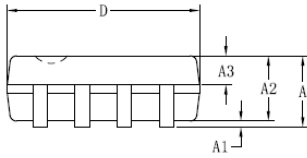
| SYMBOL | MILLIMETER | | |
|--------|------------|------|------|
| | MIN | NOM | MAX |
| A | — | — | 1.25 |
| A1 | 0.04 | — | 0.10 |
| A2 | 1.00 | 1.10 | 1.20 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.33 | — | 0.41 |
| b1 | 0.32 | 0.35 | 0.38 |
| c | 0.15 | — | 0.19 |
| c1 | 0.14 | 0.15 | 0.16 |
| D | 2.82 | 2.92 | 3.02 |
| E | 2.60 | 2.80 | 3.00 |
| E1 | 1.50 | 1.60 | 1.70 |
| e | 0.95BSC | | |
| e1 | 1.90BSC | | |
| L | 0.30 | — | 0.60 |
| L1 | 0.60REF | | |
| θ | 0 | — | 8° |

SOIC-8



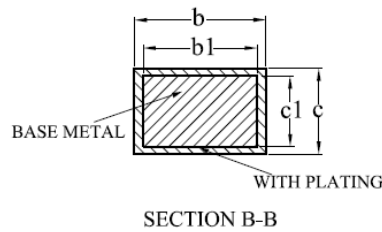
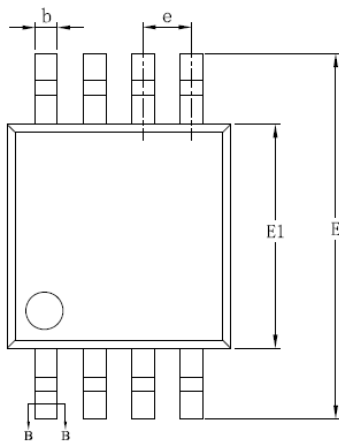
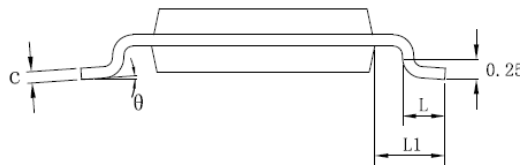
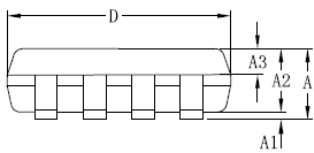
| SYMBOL | MILLIMETER | | |
|--------|------------|------|-------|
| | MIN | NOM | MAX |
| A | — | — | 1.75 |
| A1 | 0.10 | — | 0.225 |
| A2 | 1.30 | 1.40 | 1.50 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.39 | — | 0.47 |
| b1 | 0.38 | 0.41 | 0.44 |
| c | 0.20 | — | 0.24 |
| c1 | 0.19 | 0.20 | 0.21 |
| D | 4.80 | 4.90 | 5.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.27BSC | | |
| h | 0.25 | — | 0.50 |
| L | 0.50 | — | 0.80 |
| L1 | 1.05REF | | |
| θ | 0 | — | 8° |

TSSOP-8



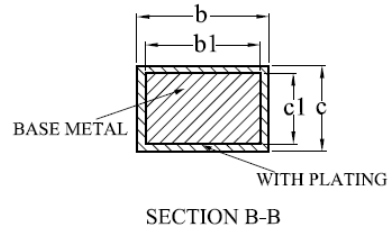
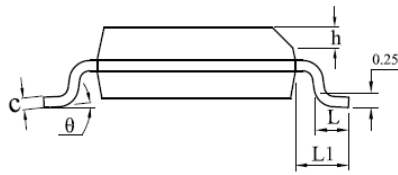
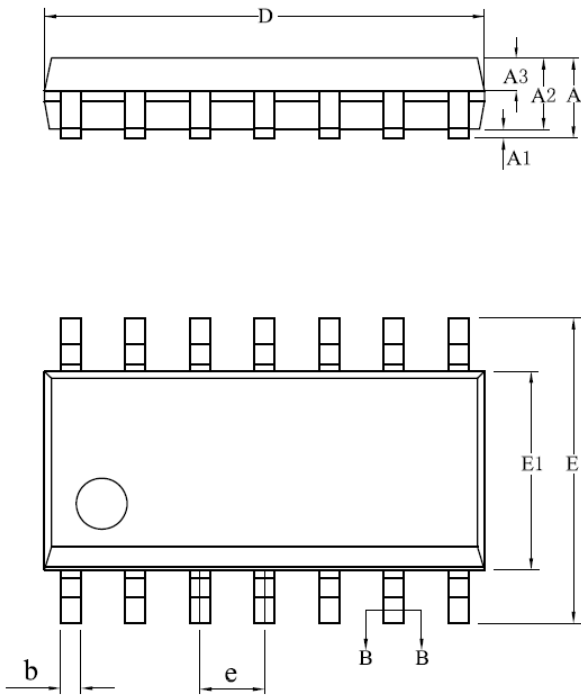
| SYMBOL | MILLIMETER | | |
|--------|------------|------|------|
| | MIN | NOM | MAX |
| A | — | — | 1.20 |
| A1 | 0.05 | — | 0.15 |
| A2 | 0.90 | 1.00 | 1.05 |
| A3 | 0.39 | 0.44 | 0.49 |
| b | 0.20 | — | 0.28 |
| b1 | 0.19 | 0.22 | 0.25 |
| c | 0.13 | — | 0.17 |
| c1 | 0.12 | 0.13 | 0.14 |
| D | 2.90 | 3.00 | 3.10 |
| E1 | 4.30 | 4.40 | 4.50 |
| E | 6.20 | 6.40 | 6.60 |
| e | 0.65BSC | | |
| L | 0.45 | — | 0.75 |
| L1 | 1.00REF | | |
| θ | 0 | — | 8° |

MSOP-8



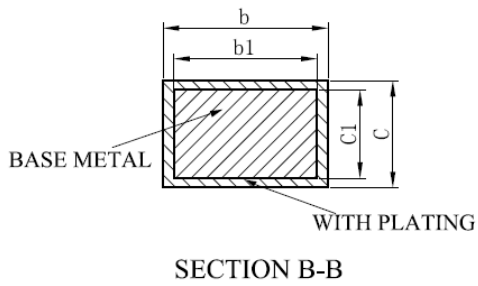
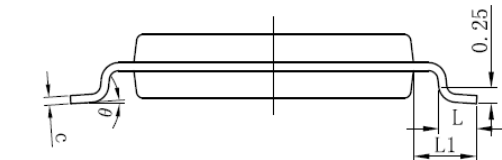
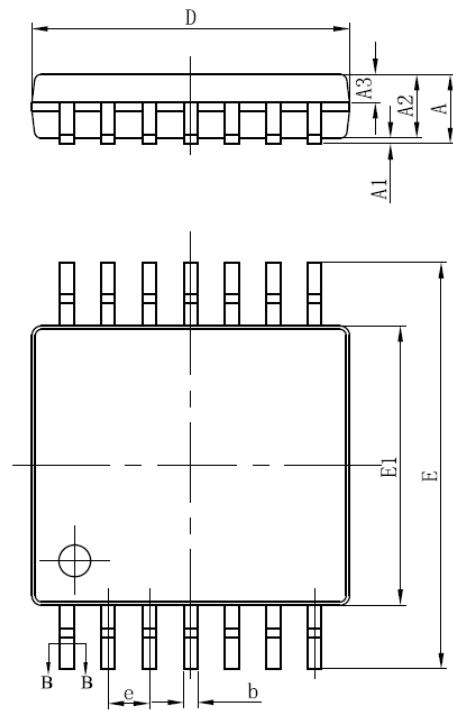
| SYMBOL | MILLIMETER | | |
|--------|------------|------|------|
| | MIN | NOM | MAX |
| A | — | — | 1.10 |
| A1 | 0.05 | — | 0.15 |
| A2 | 0.75 | 0.85 | 0.95 |
| A3 | 0.30 | 0.35 | 0.40 |
| b | 0.28 | — | 0.36 |
| b1 | 0.27 | 0.30 | 0.33 |
| c | 0.15 | — | 0.19 |
| c1 | 0.14 | 0.15 | 0.16 |
| D | 2.90 | 3.00 | 3.10 |
| E | 4.70 | 4.90 | 5.10 |
| E1 | 2.90 | 3.00 | 3.10 |
| e | 0.65BSC | | |
| L | 0.40 | — | 0.70 |
| L1 | 0.95REF | | |
| θ | 0 | — | 8° |

SOIC-14



| SYMBOL | MILLIMETER | | |
|--------|------------|------|-------|
| | MIN | NOM | MAX |
| A | — | — | 1.75 |
| A1 | 0.05 | — | 0.225 |
| A2 | 1.30 | 1.40 | 1.50 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.39 | — | 0.47 |
| b1 | 0.38 | 0.41 | 0.44 |
| c | 0.20 | — | 0.24 |
| c1 | 0.19 | 0.20 | 0.21 |
| D | 8.55 | 8.65 | 8.75 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.27BSC | | |
| h | 0.25 | — | 0.50 |
| L | 0.50 | — | 0.80 |
| L1 | 1.05REF | | |
| θ | 0 | — | 8° |

TSSOP-14



| SYMBOL | MILLIMETER | | |
|--------|------------|------|------|
| | MIN | NOM | MAX |
| A | — | — | 1.20 |
| A1 | 0.05 | — | 0.15 |
| A2 | 0.90 | 1.00 | 1.05 |
| A3 | 0.39 | 0.44 | 0.49 |
| b | 0.20 | — | 0.28 |
| b1 | 0.19 | 0.22 | 0.25 |
| c | 0.13 | — | 0.17 |
| c1 | 0.12 | 0.13 | 0.14 |
| D | 4.90 | 5.00 | 5.10 |
| E1 | 4.30 | 4.40 | 4.50 |
| E | 6.20 | 6.40 | 6.60 |
| e | 0.65BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| L1 | 1.00BSC | | |
| θ | 0 | — | 8° |

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