

## Quad High Voltage Amplifier Array

### Features

- Four Independent High Voltage Amplifiers
- 219V Output Voltage Swing
- 11 V/ $\mu$ s Output Slew Rate
- 410  $\mu$ A Maximum Operating Current for High Voltage Supply
- Wide Operating Close Loop Gain Range: 50 to 100V/V
- 150 kHz, -3 dB Bandwidth with 15 pF Load
- AEC-Q100 Qualified
- TSSOP and TFBGA Packages

### Application

- Tunable Laser
- Micro-Electromechanical Systems (MEMS) Driver
- Test Equipment
- Piezoelectric Transducer Driver

### General Description

The HV56264 is an AEC-Q100 rated, Quad High Voltage Amplifier Array integrated circuit. The device operates on a 225V high voltage supply and a 5.0V low voltage supply. Amplifiers input voltage range from 0V to 3.3V and output swing ranges from 1.0V to VPP – 6V with a 3 mA sink/source current capability.

The HV56264 is designed for maximum performance with minimal high voltage current. The high voltage current for each amplifier is typically less than 75  $\mu$ A.

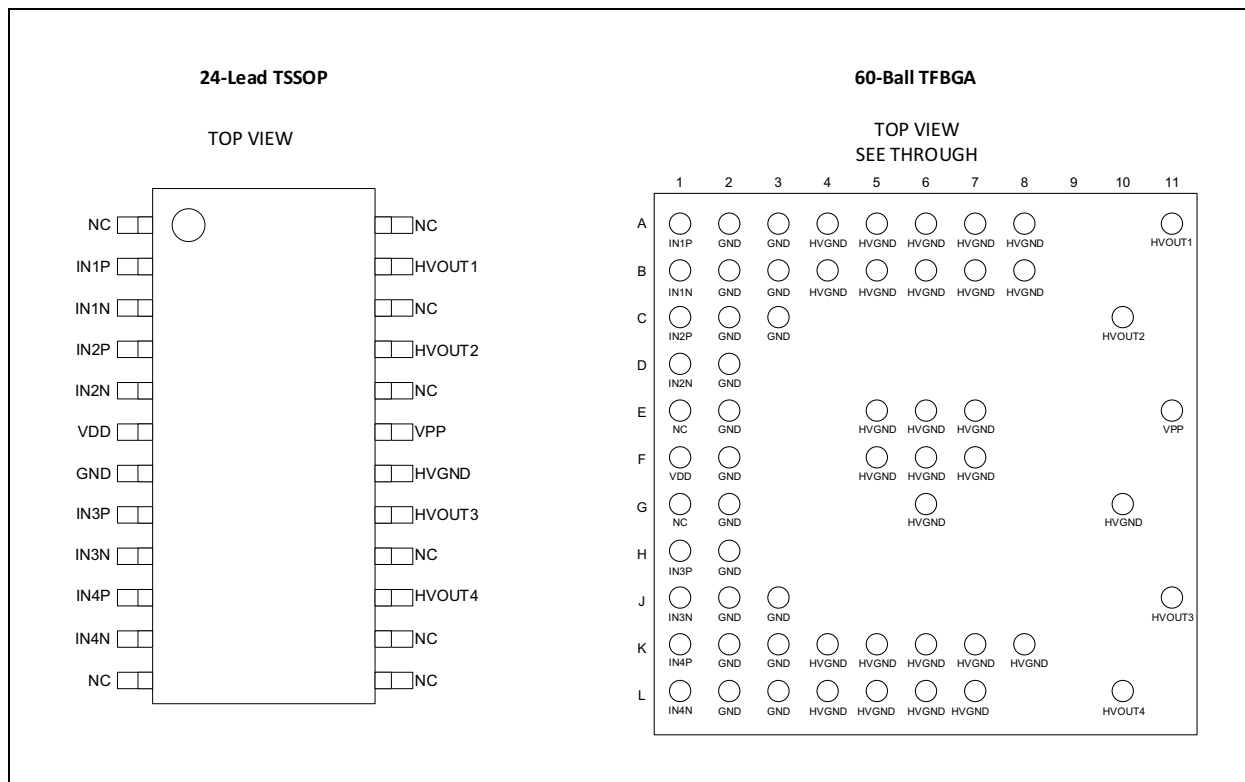
### Related Devices

HV264

### Packages

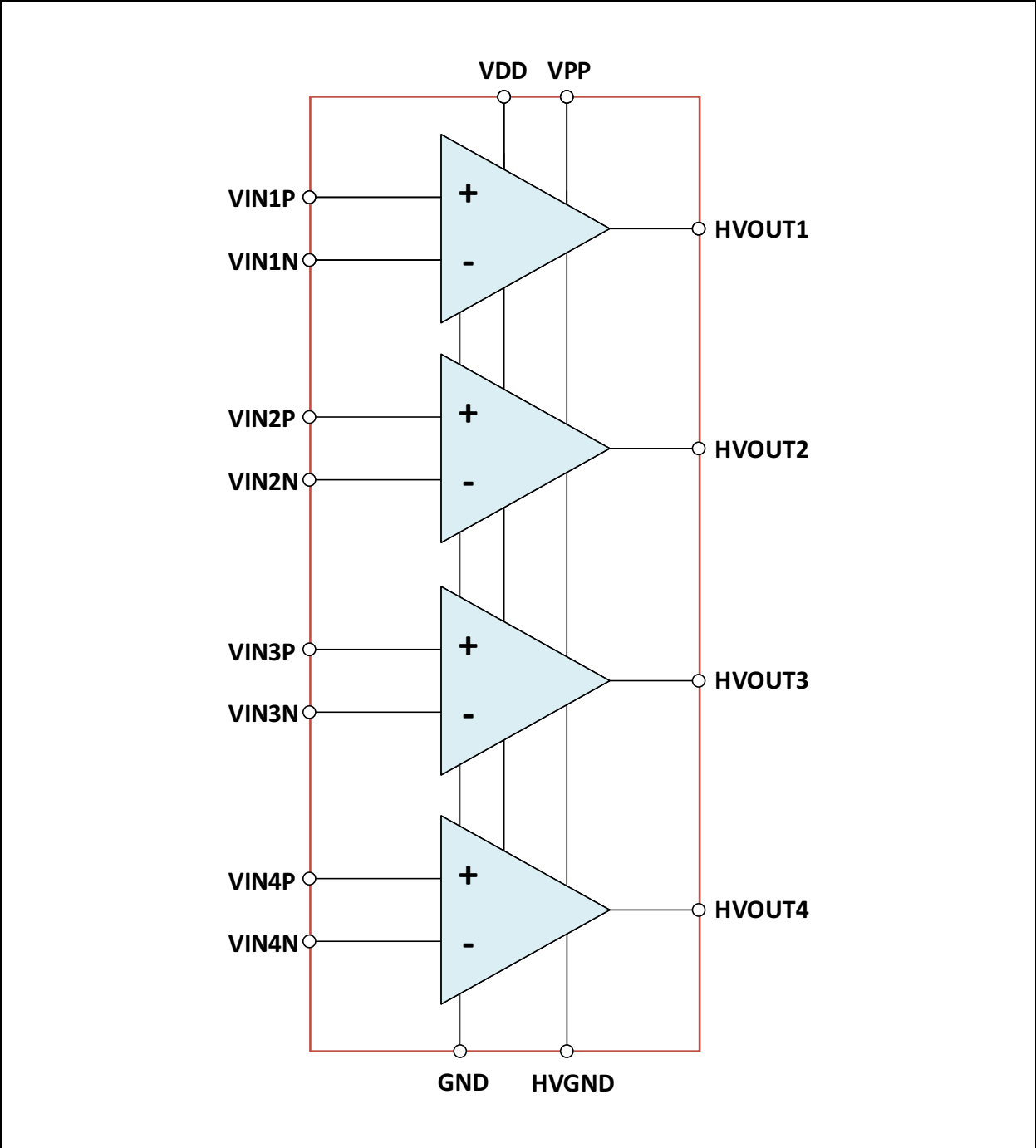
- TSSOP 24L
- TFBGA 60-Ball

### Package Types



# HV56264

Block Diagram



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

|                                                         |                 |
|---------------------------------------------------------|-----------------|
| VIN <sub>XP,N</sub> High Voltage Amplifiers Inputs..... | –0.3V to 5.5V   |
| V <sub>DD</sub> Low Output Voltage Supply.....          | –0.3V to 5.5V   |
| V <sub>PP</sub> High Voltage Supply for Op-Amps.....    | –0.5V to 250V   |
| Storage Temperature.....                                | –55°C to +150°C |
| Operating Junction Temperature.....                     | –40°C to +125°C |
| ESD Rating HBM High Voltage Pins.....                   | 1kV             |
| ESD Rating HBM Low Voltage Pins.....                    | 2kV             |
| ESD Rating CDM Corner Pins.....                         | 750V            |
| ESD Rating CDM all Other Pins.....                      | 500V            |

† **Notice:** Stresses above those listed under “Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

**TABLE 1-1: RECOMMENDED OPERATING RATINGS**

| Parameters            | Sym.                | Min. | Typ. | Max. | Units | Conditions |
|-----------------------|---------------------|------|------|------|-------|------------|
| High Voltage Supply   | V <sub>PP</sub>     | 50   | —    | 225  | V     |            |
| Low Voltage Supply    | V <sub>DD</sub>     | 4.5  | 5    | 5.5  | V     |            |
| Inputs for Amplifiers | VIN <sub>XP,N</sub> | 0    | —    | 3.3  | V     |            |

## POWER SEQUENCE

### Power-Up Sequence

1. Connect Ground
2. Apply VDD
3. Set all inputs to ground
4. Apply VPP

### Power-Down Sequence

Reverse order of Power-Up Sequence

## DC ELECTRICAL CHARACTERISTICS

| <b>Electrical Specifications:</b> Unless otherwise specified, $V_{DD} = 5.0V$ , $V_{PP} = 225V$ , $T_A = T_J = +25^{\circ}C$ .<br><b>Boldface</b> specifications apply over the full operating temperature range of $T_A = T_J = -40^{\circ}C$ to $125^{\circ}C$ . |                  |              |      |            |         |                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------|------|------------|---------|---------------------------------------------------------------------------------|
| Parameters                                                                                                                                                                                                                                                         | Sym.             | Min.         | Typ. | Max.       | Units   | Conditions                                                                      |
| $V_{PP}$ Supply Current                                                                                                                                                                                                                                            | $I_{PP}$         | —            | —    | 300        | $\mu A$ | All inputs at 0V,<br>RF = 5.36 M $\Omega$<br>R1 = 79.6 k $\Omega$<br>VDD = 5.5V |
|                                                                                                                                                                                                                                                                    |                  | —            | —    | <b>410</b> |         |                                                                                 |
| $V_{DD}$ Supply Current                                                                                                                                                                                                                                            | $I_{DD}$         | —            | —    | 6.6        | mA      | All inputs at 0V,<br>RF = 5.36 M $\Omega$<br>R1 = 79.6 k $\Omega$<br>VDD = 5.5V |
|                                                                                                                                                                                                                                                                    |                  | —            | —    | <b>8.3</b> |         |                                                                                 |
| HV <sub>OUT</sub> VOH1 Voltage Swing                                                                                                                                                                                                                               | VOH1             | <b>VPP-3</b> | —    | —          | V       | VIN = 3.3V<br>RF = 536 k $\Omega$<br>R1 = 7.97 k $\Omega$<br>(Note 1)           |
| HV <sub>OUT</sub> VOH2 Voltage Swing                                                                                                                                                                                                                               | VOH2             | <b>VPP-6</b> | —    | —          |         | VIN = 3.3V<br>RF = 5.36 M $\Omega$<br>R1 = 79.6 k $\Omega$                      |
| HV <sub>OUT</sub> VOL1 Voltage Swing                                                                                                                                                                                                                               | VOL1             | —            | —    | <b>1</b>   |         | VIN = 0V<br>RF = 536 k $\Omega$<br>R1 = 7.97 k $\Omega$<br>(Note 1)             |
| HV <sub>OUT</sub> VOL2 Voltage Swing                                                                                                                                                                                                                               | VOL2             | —            | —    | <b>1.7</b> |         | VIN = 0V<br>RF = 5.36 M $\Omega$<br>R1 = 79.6 k $\Omega$                        |
| Input Voltage Range                                                                                                                                                                                                                                                | $V_{INXP,N}$     | 0            |      | VDD-1.5    | V       | Note 2                                                                          |
| Input Current into $V_{INXP,N}$ pins                                                                                                                                                                                                                               | $I_{IN}$         | —            | —    | 50         | nA      | VIN = 1V<br>(Note 1)                                                            |
| High Voltage Output Offset Voltage                                                                                                                                                                                                                                 | HV <sub>OS</sub> | <b>-1.9</b>  | —    | <b>1.9</b> | V       |                                                                                 |

**Note 1:** Specification is obtained by characterization and is not 100% tested.

**2:** Design guidance only.

## AC ELECTRICAL CHARACTERISTICS

| <b>Electrical Specifications:</b> Unless otherwise specified, $V_{DD} = 5.0V$ , $V_{PP} = 225V$ , $T_A = T_J = +25^{\circ}C$ ,<br>RF = 5.36 M $\Omega$ , R1 = 79.6 k $\Omega$<br><b>Boldface</b> specifications apply over the full operating temperature range of $T_A = T_J = -40^{\circ}C$ to $125^{\circ}C$ . |      |      |      |      |            |                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|------------|-----------------------------------------------------------|
| Parameters                                                                                                                                                                                                                                                                                                        | Sym. | Min. | Typ. | Max. | Units      | Conditions                                                |
| HV <sub>OUT</sub> Slew Rate-Rising Edge                                                                                                                                                                                                                                                                           | SR   | 4    | 11   | 20   | V/ $\mu s$ | Load = 15 pF<br>10%-90%<br>VIN = 0 to 3.3V<br>Square Wave |
| HV <sub>OUT</sub> Slew Rate-Falling Edge                                                                                                                                                                                                                                                                          |      | 4    | 11   | 20   |            |                                                           |
| Total External Feedback Resistance                                                                                                                                                                                                                                                                                | FB   | 700k | —    | 7M   | $\Omega$   | External Resistor Network<br>RFB= RF+R1<br>(Note 2)       |
| Bandwidth (-3dB)                                                                                                                                                                                                                                                                                                  | BW   | 150  | —    | —    | kHz        | Load = 15pF<br>VIN= 1.5V DC + 150 mV AC<br>(Note 1)       |

**Note 1:** Specification is obtained by characterization and is not 100% tested.

**2:** Design guidance only.

**3:** Excluding package parasitic capacitance.

## AC ELECTRICAL CHARACTERISTICS (CONTINUED)

**Electrical Specifications:** Unless otherwise specified,  $V_{DD} = 5.0V$ ,  $V_{PP} = 225V$ ,  $T_A = T_J = +25^\circ C$ ,  $R_F = 5.36\text{ M}\Omega$ ,  $R_1 = 79.6\text{ k}\Omega$

**Boldface** specifications apply over the full operating temperature range of  $T_A = T_J = -40^\circ C$  to  $125^\circ C$ .

| Parameters                        | Sym.       | Min. | Typ. | Max. | Units             | Conditions                                                                                                              |
|-----------------------------------|------------|------|------|------|-------------------|-------------------------------------------------------------------------------------------------------------------------|
| Closed Loop Gain Range            | $A_V$      | 50   | —    | 100  | V/V               | External Resistor Network<br>( <a href="#">Note 2</a> )                                                                 |
| HV <sub>OUT</sub> Capacitive Load | $C_{LOAD}$ | 0    | —    | 15   | pF                | ( <a href="#">Note 2</a> )<br>( <a href="#">Note 3</a> )                                                                |
| Output Referred Noise             | $V_N$      | —    | —    | 10   | mV <sub>rms</sub> | Measured at HV <sub>OUT</sub> ,<br>$V_{IN} = 0.2V$<br>( <a href="#">Note 1</a> )                                        |
| VDD Power Supply Rejection Ratio  | PSRR1      | 40   | —    | —    | dB                | $V_{DD} = 4.5V$ to $5.5V$<br>$V_{PP} = 225V$ ,<br>$V_{IN} = 0.1V$ ,<br>DC Measurement<br>( <a href="#">Note 1</a> )     |
| VPP Power Supply Rejection Ratio  | PSRR2      | 60   | —    | —    | dB                | $V_{DD} = 5V$<br>$V_{PP} = 50$ to $225V$ ,<br>$V_{IN} = 0.1V$<br>DC Measurement<br>( <a href="#">Note 1</a> )           |
| Crosstalk                         | Xtalk      | —    | —    | -80  | dB                | Output Referred.<br>$V_{IN}$ 0 to 3.3V sine wave at<br>100 Hz<br>with $CL = 15\text{ pF}$<br>( <a href="#">Note 1</a> ) |

**Note 1:** Specification is obtained by characterization and is not 100% tested.

**2:** Design guidance only.

**3:** Excluding package parasitic capacitance.

## TEMPERATURE SPECIFICATIONS

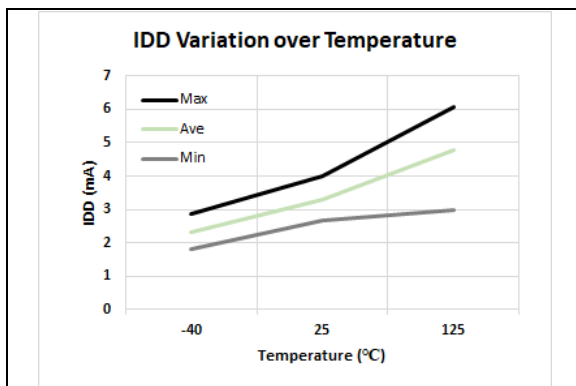
| Electrical Specifications: Unless otherwise specified, $V_{DD} = 5.0V$ , $V_{PP} = 225V$ |               |      |      |      |       |            |
|------------------------------------------------------------------------------------------|---------------|------|------|------|-------|------------|
| Parameters                                                                               | Sym.          | Min. | Typ. | Max. | Units | Conditions |
| Temperature Ranges                                                                       |               |      |      |      |       |            |
| Operating Junction Temperature                                                           | $T_J$         | -40  | —    | 125  | °C    |            |
| Storage Temperature                                                                      | $T_S$         | -55  | —    | 150  | °C    |            |
| Package Thermal Resistances                                                              |               |      |      |      |       |            |
| Thermal Resistance - TSSOP                                                               | $\theta_{JC}$ | —    | 11.8 | —    | °C/W  | Note 1     |
|                                                                                          | $\theta_{JA}$ | —    | 55   | —    | °C/W  |            |
| Thermal Resistance - TFBGA                                                               | $\theta_{JC}$ | —    | 12.4 | —    | °C/W  |            |
|                                                                                          | $\theta_{JA}$ | —    | 47   | —    | °C/W  |            |

**Note 1:** 4 Layers FR4 4"X4" PCB

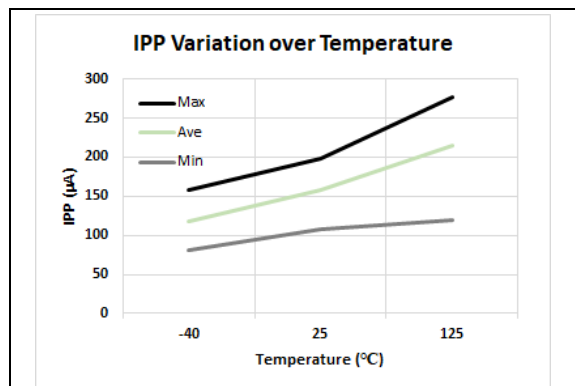
## 2.0 TYPICAL PERFORMANCE CURVES

**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

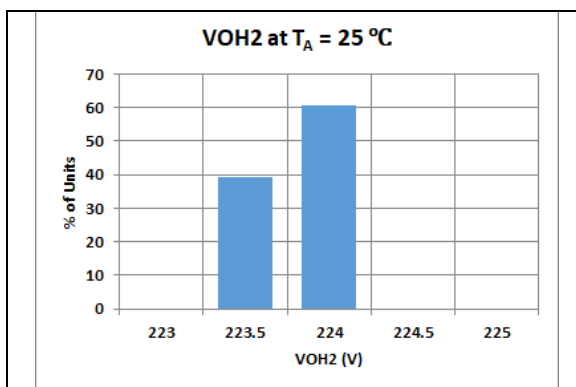
**Note:** Unless otherwise indicated: VDD = 5.0V, VPP = 225V, VIN = 0V, RF = 5.36 MΩ, RI = 79.6 kΩ, CLOAD = 15 pF.



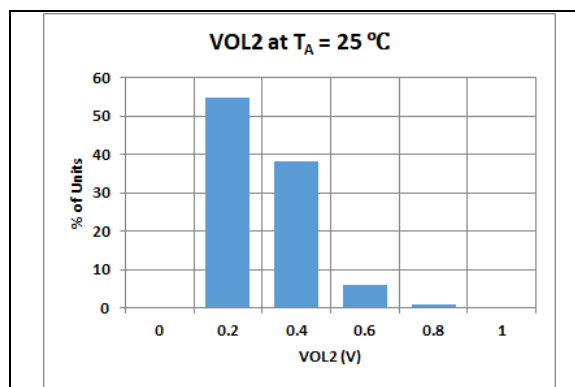
**FIGURE 2-1:**  $I_{DD}$  Variation Over Temperature.



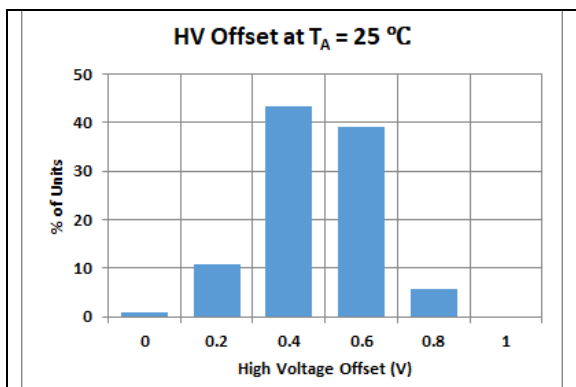
**FIGURE 2-4:**  $I_{PP}$  Variation Over Temperature.



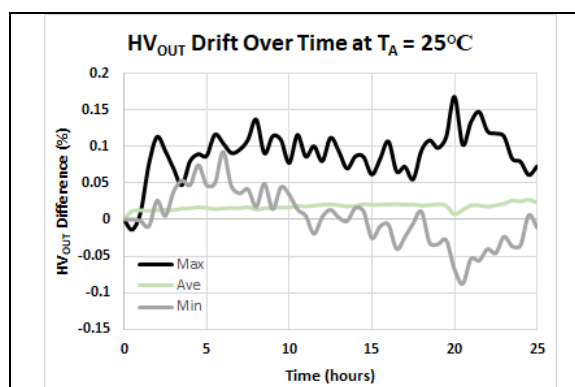
**FIGURE 2-2:**  $VOH_2$  Distribution at  $T_A = 25^\circ\text{C}$ .



**FIGURE 2-5:**  $VOL_2$  Distribution at  $T_A = 25^\circ\text{C}$ .



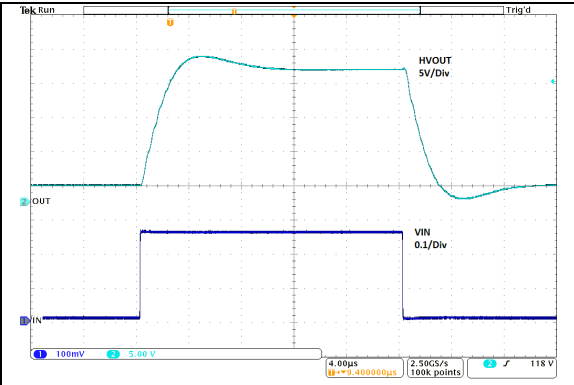
**FIGURE 2-3:**  $HV_{OS}$  Distribution at  $T_A = 25^\circ\text{C}$ .



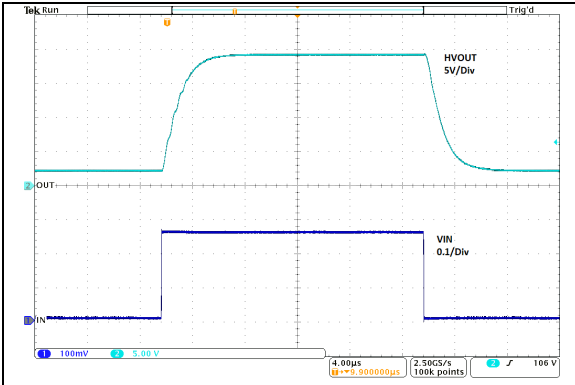
**FIGURE 2-6:**  $HV_{OUT}$  Drift Over Time at  $T_A = 25^\circ\text{C}$  ( $V_{IN} = 0.2\text{V}$ ).

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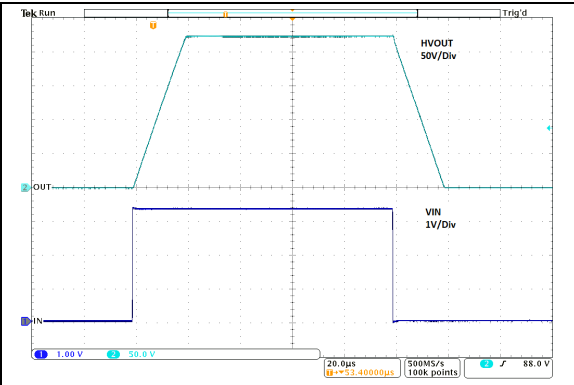
**Note:** Unless otherwise indicated: VDD = 5.0V, VPP = 225V, VIN = 0V, RF = 5.36 MΩ, RI = 79.6 kΩ, CLOAD = 15 pF.



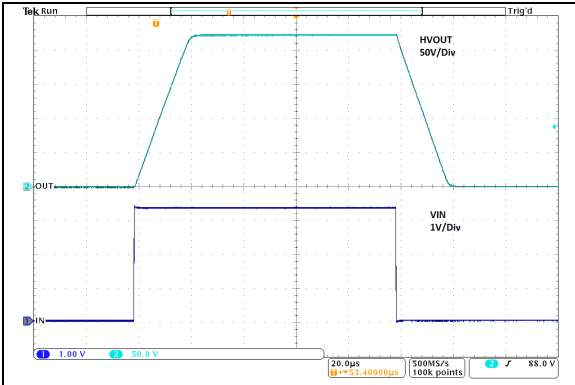
**FIGURE 2-7:** Typical Small Signal Pulse Response (VIN = 1.5V to 1.75V, RF = 5.36 MΩ, RI = 79.6 kΩ).



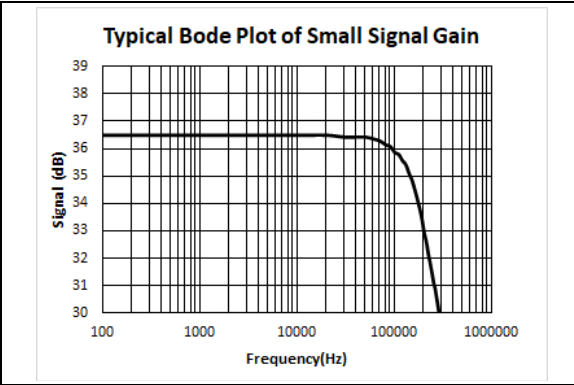
**FIGURE 2-10:** Typical Small Signal Pulse Response (VIN = 1.5V to 1.75V, RF = 536 kΩ, RI = 7.97 kΩ).



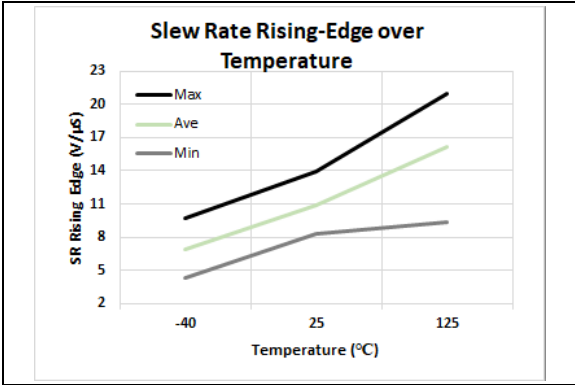
**FIGURE 2-8:** Typical Small Signal Pulse Response (VIN = 0V to 3.3V, RF = 5.36 MΩ, RI = 79.6 kΩ).



**FIGURE 2-11:** Typical Small Signal Pulse Response (VIN = 0V to 3.3V, RF = 536 kΩ, RI = 7.97 kΩ).



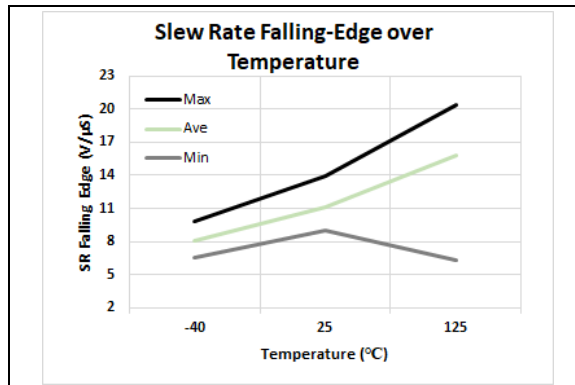
**FIGURE 2-9:** Typical Bode Plot of Small Signal Gain (VIN = 1.5V + 0.2AC).



**FIGURE 2-12:** Slew Rate Rising-Edge Variation Over Temperature.

**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

**Note:** Unless otherwise indicated: VDD = 5.0V, VPP = 225V, VIN = 0V, RF = 5.36 MΩ, RI = 79.6 kΩ, CLOAD = 15 pF.



**FIGURE 2-13:** Slew Rate Falling-Edge Variation Over Temperature.



**FIGURE 2-15:** PSRR1-VDD (VDD = 5.0V + 0.1 V AC).



**FIGURE 2-14:** PSRR2-VPP (VPP = 225V + 1V AC).

3.0 PACKAGE PIN CONFIGURATION AND DESCRIPTION

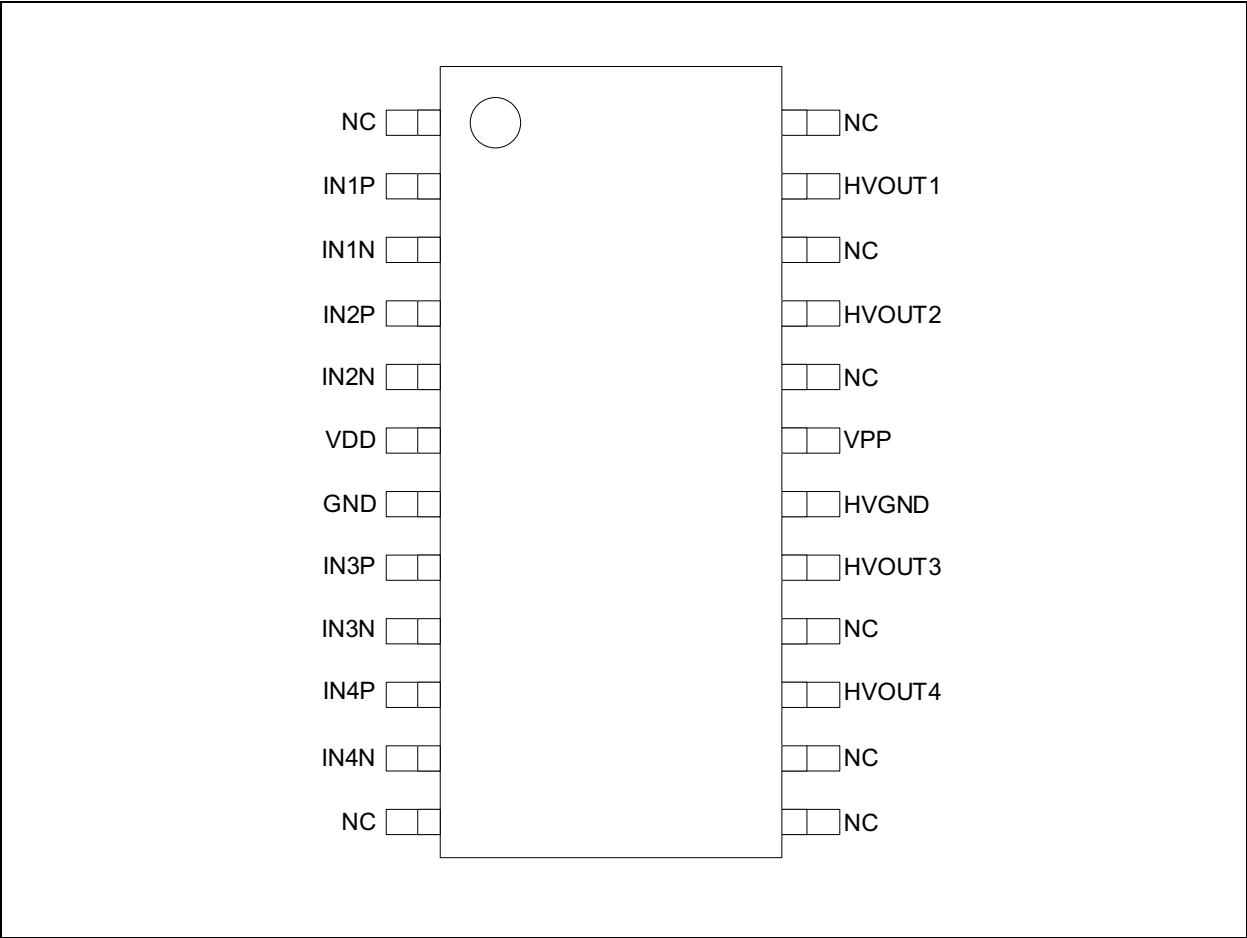
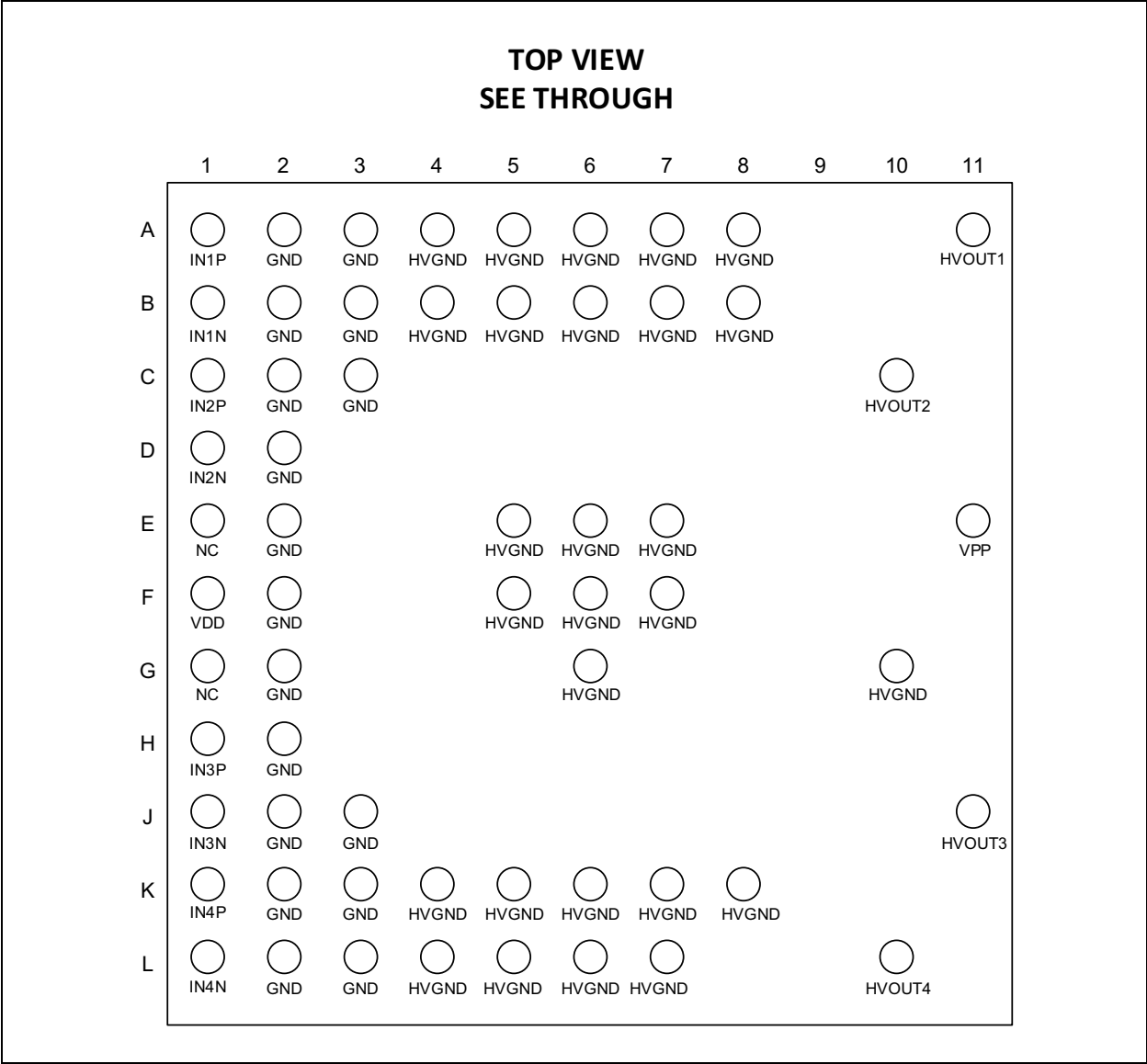


FIGURE 3-1: TSSOP Pinout.



**FIGURE 3-2:**      *TFBGA Pinout.*

**TABLE 3-1: PINOUT CONFIGURATION**

| TSSOP PIN #            | TFBGA PIN #                                                                               | NAME   | FUNCTION                        |
|------------------------|-------------------------------------------------------------------------------------------|--------|---------------------------------|
| 1,12,13,14,16,20,22,24 | E1,G1                                                                                     | NC     | No Connection                   |
| 2                      | A1                                                                                        | IN1P   | Amplifier 1 Non-inverting Input |
| 3                      | B1                                                                                        | IN1N   | Amplifier 1 Inverting Input     |
| 4                      | C1                                                                                        | IN2P   | Amplifier 2 Non-inverting Input |
| 5                      | D1                                                                                        | IN2N   | Amplifier 2 Inverting Input     |
| 6                      | F1                                                                                        | VDD    | Low Voltage Supply              |
| 7                      | A2,A3,B2,B3,C2,C3,D2,E2,<br>F2,G2,H2,J2,J3,K2,K3,L2,L3                                    | GND    | Ground                          |
| 8                      | H1                                                                                        | IN3P   | Amplifier 3 Non-inverting Input |
| 9                      | J1                                                                                        | IN3N   | Amplifier 3 Inverting Input     |
| 10                     | K1                                                                                        | IN4P   | Amplifier 4 Non-inverting Input |
| 11                     | L1                                                                                        | IN4N   | Amplifier 4 Inverting Input     |
| 15                     | L10                                                                                       | HVOUT4 | Amplifier 4 Output              |
| 17                     | J11                                                                                       | HVOUT3 | Amplifier 3 Output              |
| 18                     | A4,A5,A6,A7,A8,B4,B5,B6,B7,B8,<br>E5,E6,E7,F5,F6,F7,G6,G10,<br>K4,K5,K6,K7,K8,L4,L5,L6,L7 | HVGND  | High Voltage Ground             |
| 19                     | E11                                                                                       | VPP    | High Voltage Positive Supply    |
| 21                     | C10                                                                                       | HVOUT2 | Amplifier 2 Output              |
| 23                     | A11                                                                                       | HVOUT1 | Amplifier 1 Output              |

### 3.1 IN1P, IN1N, IN2P, IN2N, IN3P, IN3N, IN4P, IN4N Input pins

Input pins for the amplifiers.

### 3.2 Low Voltage Supply Input Pin (VDD)

Low voltage supply input pin for the amplifiers.

### 3.3 High Voltage Positive Supply Input Pin (VPP)

High voltage supply input pin for the amplifiers.

### 3.4 High Voltage Ground (HVGND)

Ground reference pins for the high voltage amplifiers.

### 3.5 High Voltage Amplifiers Outputs (HVOUT4, HVOUT3, HVOUT2, HVOUT1)

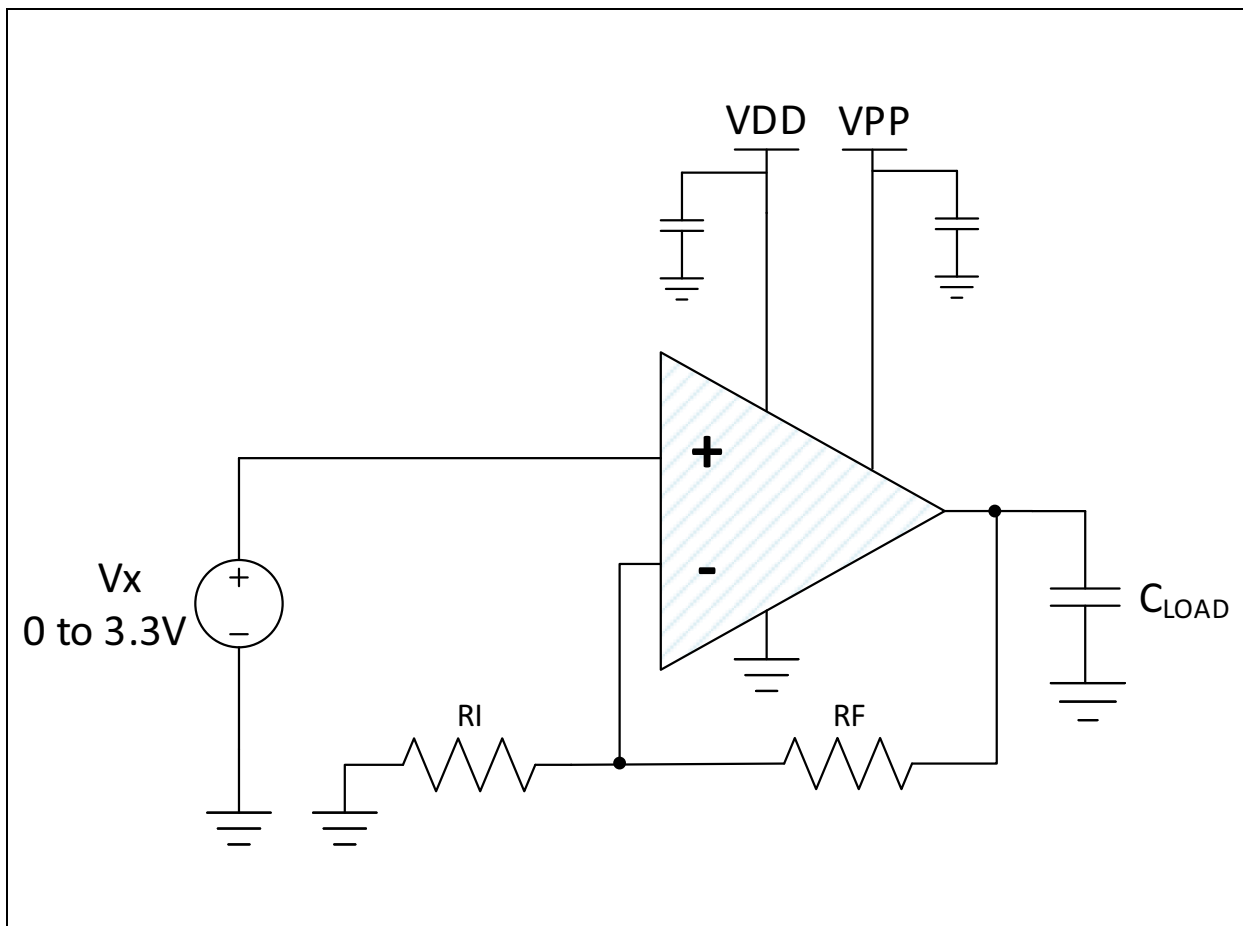
Amplifiers output pins.

### 3.6 Ground (GND)

Ground reference for input signals and low voltage supplies.

## 4.0 FUNCTIONAL DESCRIPTION

The HV56264 is a Quad High Voltage Amplifier Array that can operate up to 225V with a source/sink capability of 3 mA. Amplifiers are designed to deliver a 11 V/ $\mu$ s typical output slew rate and sustain a 150 kHz  $-3$  dB Bandwidth for a 15 pF capacitive load.

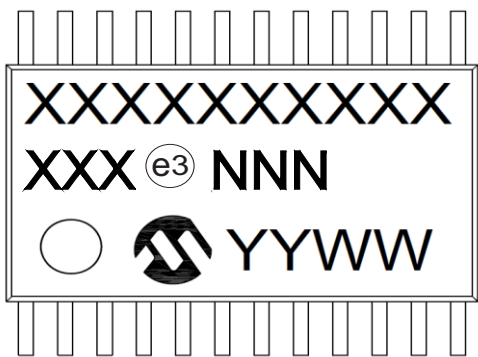


**FIGURE 4-1:** Functional Block Diagram.

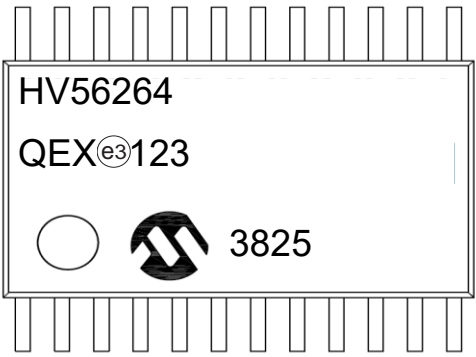
## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information

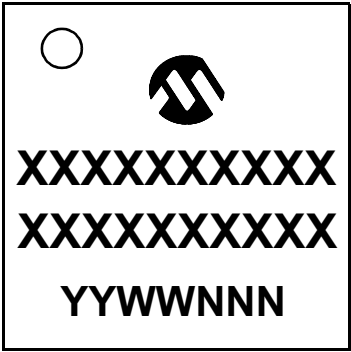
24-Lead TSSOP



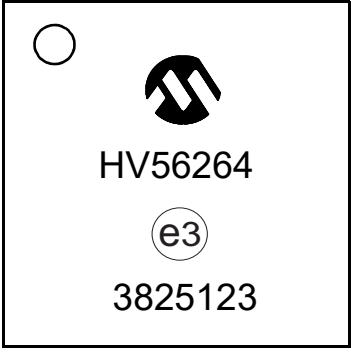
Example



60-Lead TFBGA (6 x 6 mm)



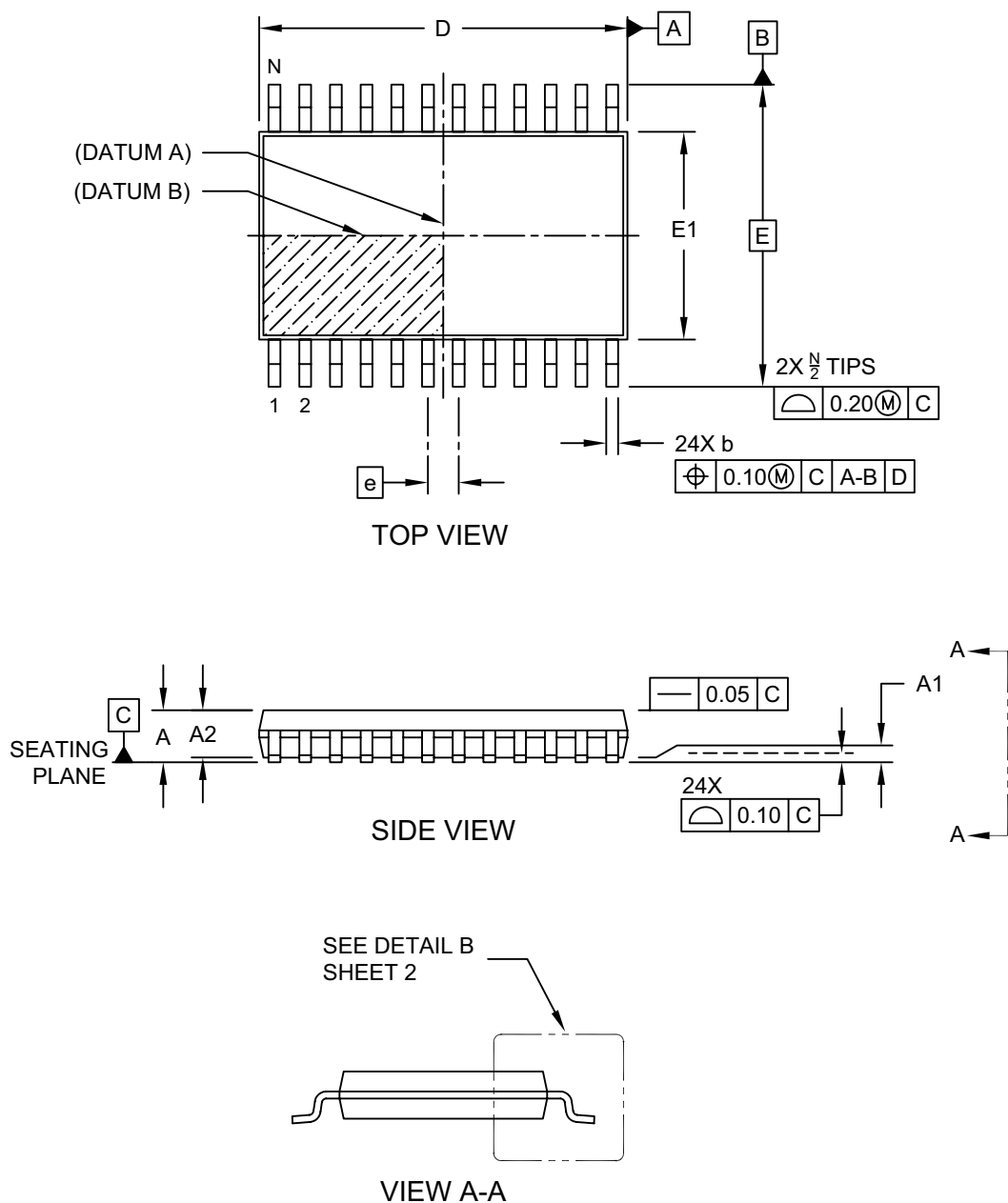
Example



|                |                                                                                                                                                                                                                                                            |                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Legend:</b> | XX...X                                                                                                                                                                                                                                                     | Product Code or Customer-specific information                                                                    |
|                | Y                                                                                                                                                                                                                                                          | Year code (last digit of calendar year)                                                                          |
|                | YY                                                                                                                                                                                                                                                         | Year code (last 2 digits of calendar year)                                                                       |
|                | WW                                                                                                                                                                                                                                                         | Week code (week of January 1 is week '01')                                                                       |
|                | NNN                                                                                                                                                                                                                                                        | Alphanumeric traceability code                                                                                   |
|                | (e3)                                                                                                                                                                                                                                                       | Pb-free JEDEC designator for Matte Tin (Sn)                                                                      |
|                | *                                                                                                                                                                                                                                                          | This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package. |
| <b>Note:</b>   | In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo. |                                                                                                                  |

## 24-Lead Thin Shrink Small Outline Package (QE) - 4.40 mm Body [TSSOP] Supertex Legacy & Micrel Legacy Package

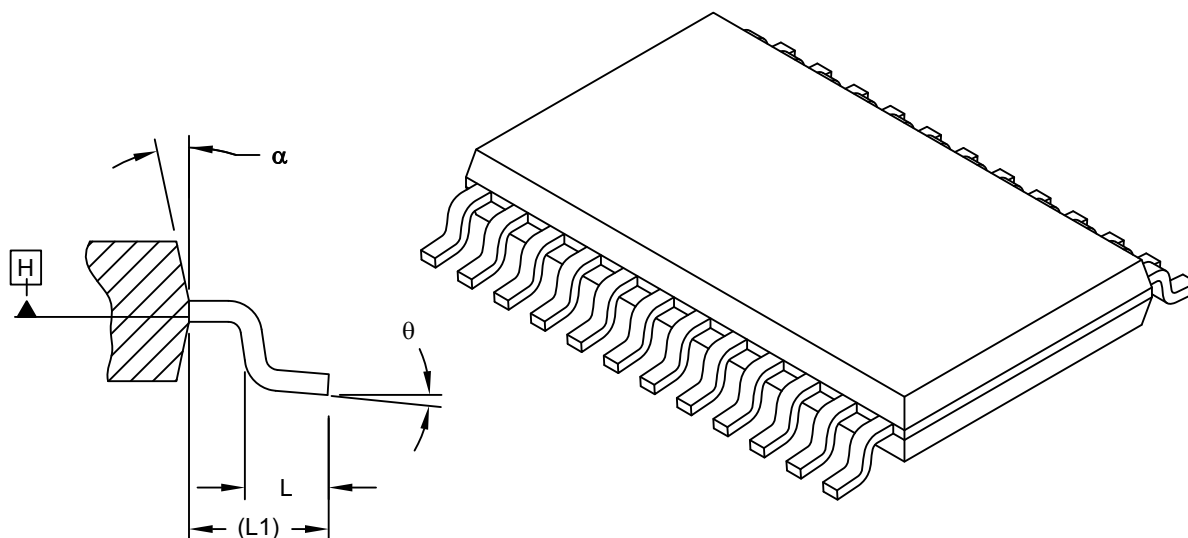
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-284A Sheet 1 of 2

## 24-Lead Thin Shrink Small Outline Package (QE) - 4.40 mm Body [TSSOP] Supertex Legacy & Micrel Legacy Package

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



DETAIL B

| Units                    |    | MILLIMETERS |      |      |
|--------------------------|----|-------------|------|------|
| Dimension Limits         |    | MIN         | NOM  | MAX  |
| Number of Leads          | N  | 24          |      |      |
| Lead Pitch               | e  | 0.65 BSC    |      |      |
| Overall Height           | A  | 0.85        | -    | 1.20 |
| Standoff                 | A1 | 0.05        | 0.10 | 0.15 |
| Molded Package Thickness | A2 | 0.80        | 1.00 | 1.15 |
| Foot Length              | L  | 0.45        | 0.60 | 0.75 |
| Footprint                | L1 | 1.00 REF    |      |      |
| Foot Angle               | θ  | 0°          | 4°   | 8°   |
| Overall Width            | E  | 6.40 BSC    |      |      |
| Overall Length           | D  | 7.70        | 7.80 | 7.90 |
| Molded Package Width     | E1 | 4.30        | 4.40 | 4.50 |
| Lead Width               | b  | 0.19        | -    | 0.30 |
| Mold Draft Angle Top     | α  | 12° REF     |      |      |

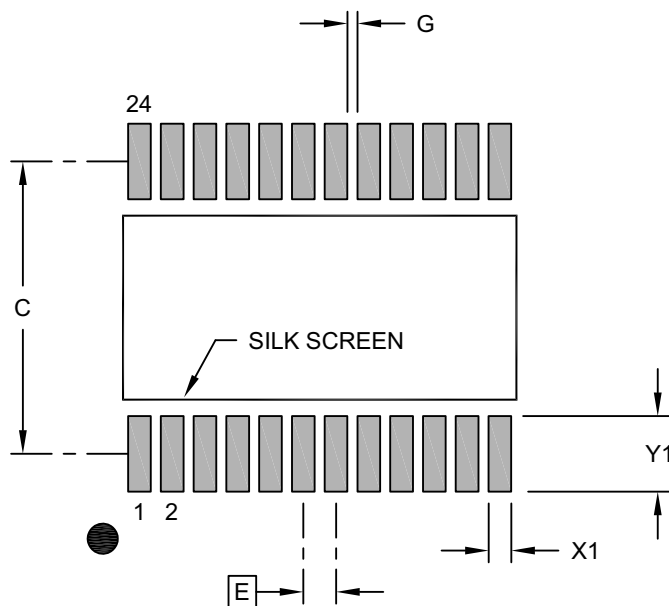
**Notes:**

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.  
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-284A Sheet 2 of 2

## 24-Lead Thin Shrink Small Outline Package (QE) - 4.40 mm Body [TSSOP] Supertex Legacy & Micrel Legacy Package

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



### RECOMMENDED LAND PATTERN

| Dimension Limits                | Units | MILLIMETERS |      |      |
|---------------------------------|-------|-------------|------|------|
|                                 |       | MIN         | NOM  | MAX  |
| Contact Pitch                   | E     | 0.65 BSC    |      |      |
| Contact Pad Spacing             | C     |             | 5.80 |      |
| Contact Pad Width (X24)         | X1    |             |      | 0.45 |
| Contact Pad Length (X24)        | Y1    |             |      | 1.50 |
| Contact Pad to Center Pad (X20) | G1    | 0.20        |      |      |

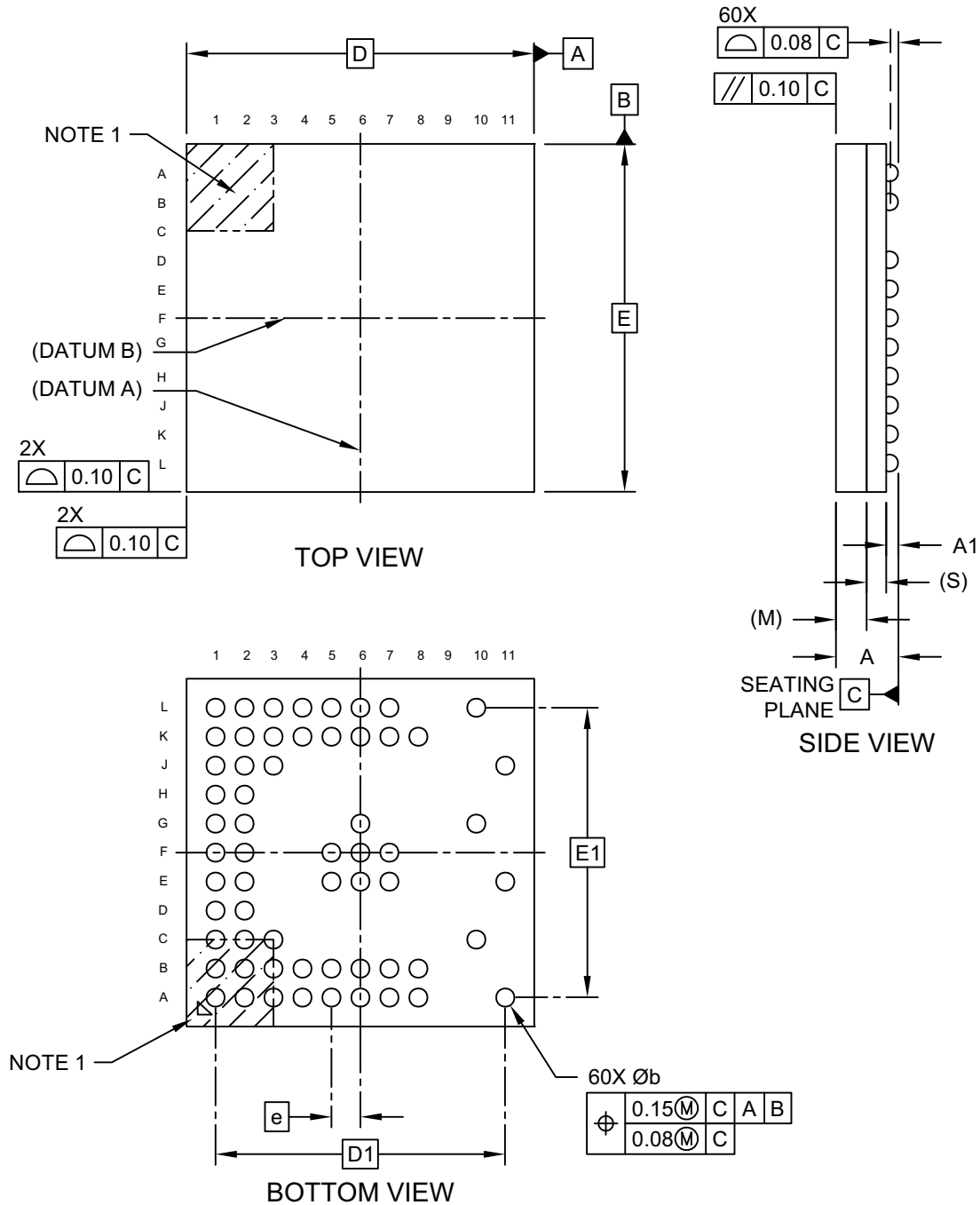
#### Notes:

- Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
- For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-2284A

## 60-Ball Thin Fine-Pitch Ball Grid Array (AKA) - 6x6x1.20 mm Body [TFBGA]

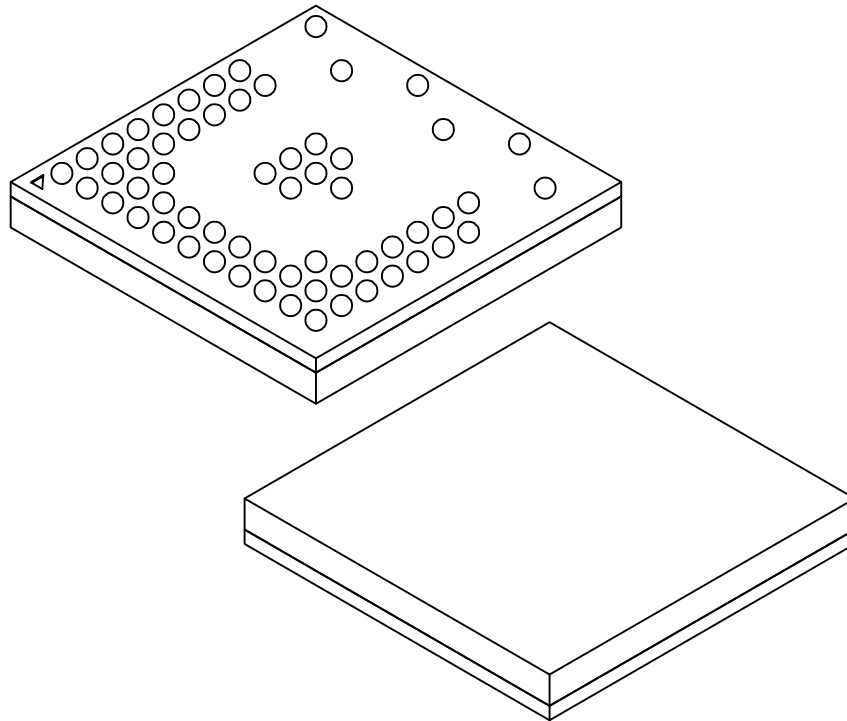
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-1277 Rev A Sheet 1 of 2

## 60-Ball Thin Fine-Pitch Ball Grid Array (AKA) - 6x6x1.20 mm Body [TFBGA]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



| Units               |    | MILLIMETERS |      |      |
|---------------------|----|-------------|------|------|
| Dimension Limits    |    | MIN         | NOM  | MAX  |
| Number of Terminals | N  | 60          |      |      |
| Pitch               | e  | 0.50 BSC    |      |      |
| Overall Height      | A  | –           | –    | 1.20 |
| Ball Height         | A1 | 0.16        | –    | 0.26 |
| Mold Thickness      | M  | 0.53 REF    |      |      |
| Substrate Thickness | S  | 0.248 REF   |      |      |
| Overall Length      | D  | 6.00 BSC    |      |      |
| Ball Array Length   | D1 | 5.00 BSC    |      |      |
| Overall Width       | E  | 6.00 BSC    |      |      |
| Ball Array Width    | E1 | 5.00 BSC    |      |      |
| Ball Width          | b  | 0.27        | 0.30 | 0.37 |

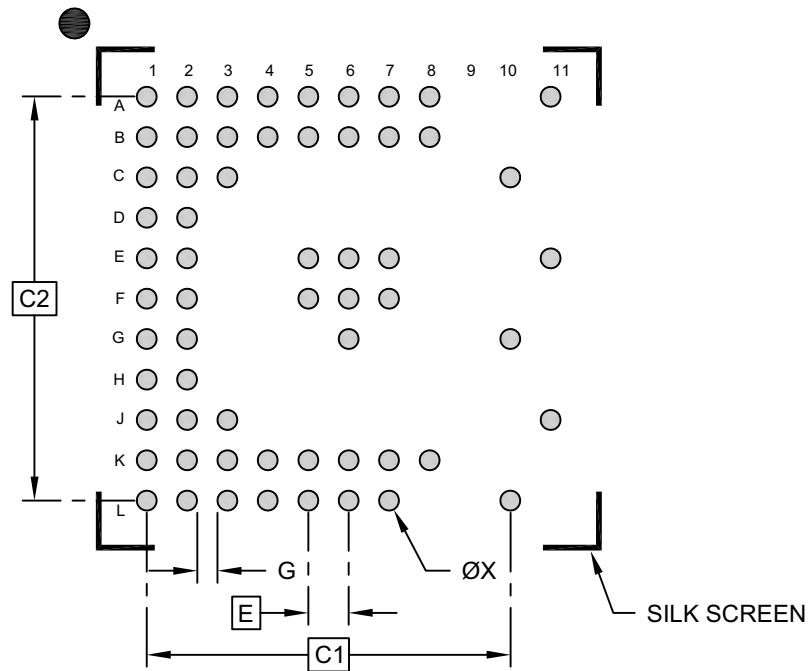
**Notes:**

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated
- Dimensioning and tolerancing per ASME Y14.5M
  - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
  - REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1277 Rev A Sheet 2 of 2

## 60-Ball Thin Fine-Pitch Ball Grid Array (AKA) - 6x6x1.20 mm Body [TFBGA]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



### RECOMMENDED LAND PATTERN

| Dimension Limits           | Units | MILLIMETERS |          |      |
|----------------------------|-------|-------------|----------|------|
|                            |       | MIN         | NOM      | MAX  |
| Contact Pitch              | E     |             | 0.50 BSC |      |
| Contact Pad Spacing        | C1    |             | 5.00 BSC |      |
| Contact Pad Spacing        | C2    |             | 5.00 BSC |      |
| Contact Pad Width (X60)    | X     |             |          | 0.25 |
| Space Between Contact Pads | G     | 0.25        |          |      |

#### Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-3277 Rev A

## APPENDIX A: REVISION HISTORY

### Revision B (January 2021)

The following is the list of modifications:

- Updated the [DC Electrical Characteristics](#) table.
- Minor typographical and layout edits.

### Revision A (December 2020)

- Initial Release of this Document.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| <u>PART NO.</u>                                                                                                                                                                                                                                                                                                                                                                                                                          | <u>X<sup>(1)</sup></u> | <u>-X</u>         | <u>/XXX</u> | <u>-XXX</u> | <b>Examples:</b>                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|-------------|-------------|------------------------------------------------------------------------------------------------------------------------|
| Device                                                                                                                                                                                                                                                                                                                                                                                                                                   | Tape and Reel Option   | Temperature Range | Package     | Option      | a) HV56264T-E/QEX-VAO: Quad High-Voltage Amplifier Array, Automotive Grade, 24-Lead TSSOP package, 2500 Reel           |
| <div><div>Device:</div><div>Media Type</div><div>Temperature Range:</div><div>Package:</div><div>Option</div></div> <div><div>HV56264: Quad High Voltage Amplifier Array</div><div>T = 2500/Reel for QEX Package<br/>= 3000/Reel for AKA Package</div><div>E = -40°C to +125°C (Extended)<br/>RoHS Compliant</div><div>QEX = 24LD TSSOP 6.4x4.4 mm<br/>AKA = 60-Ball Count TFBGA 6x6x1.2 mm</div><div>VAO = Automotive Grade</div></div> |                        |                   |             |             | b) HV56264T-E/AKA-VAO: Quad High-Voltage Amplifier Array, Automotive Grade, 60-Terminal Count TFBGA package, 3000/Reel |
| <b>Note 1:</b> Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.                                                                                                                                                      |                        |                   |             |             |                                                                                                                        |

NOTES:

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**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- Microchip is willing to work with any customer who is concerned about the integrity of its code.
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