

## 具有可编程固定增益的 2Vrms DirectPath™ 线路驱动器

查询样品: [DRV612](#)

### 特性

- **DirectPath™**
  - 消除了噼啪声/喀哒声
  - 免除了输出隔直流电容器
  - **3V 至 3.6V** 电源电压
- 低噪声及THD
  - **SNR > 105dB** (在 **–1x** 增益条件下)
  - 典型 **V<sub>n</sub> < 12μVrms** (在 **20Hz** 至 **20kHz** 频率范围内和 **–1x** 增益条件下)
  - **THD + N < 0.003%** (在 **10kΩ** 负载和 **–1x** 增益条件下)
- 可为 **600Ω** 负载提供 **2Vrms** 输出电压
- 单端输入和输出
- 可编程增益选择减少了组件的数量
  - **13x** 增益值
- 具有大于 **80 dB** 衰减的有源静音
- 具短路和热保护功能
- **±8 kV HBM ESD** 保护输出

### 应用

- **PDP / LCD TV**
- **DVD** 播放机
- 迷你型/微型组合音响系统
- 声卡

### 说明

DRV612 是一款单端、2Vrms 立体声线路驱动器，专为缩减组件数量、板级空间和成本而设计。对于那些将尺寸和成本作为关键设计参数的单电源电子产品而言，该器件是理想的选择。

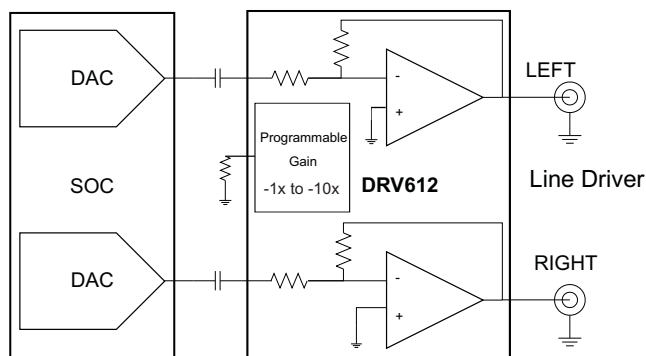
DRV612 既不需要采用一个高于 3.3V 的电源来产生其 5.6V<sub>pp</sub> 输出，也不需要一个分离轨电源。

DRV612 的设计运用了 TI 的 DirectPath 专利技术，集成了一个充电泵以产生一个负电源轨，可提供干净、无噼啪声的接地偏置输出。DRV612 能够向一个 600Ω 负载输送 2Vrms 驱动电压。另外，DirectPath 技术还允许去除昂贵的输出隔直流电容器。

该器件具有固定增益单端输入和一个增益选择引脚。通过在该引脚上使用单个电阻器，设计人员就能够从 13 种内部可编程增益设定值中进行选择，以使线路驱动器与编解码器输出电平相匹配。另外，它还削减了组件数量和板级空间。

线路输出具有 ±8 kV HBM ESD 保护等级，从而实现了简单的 ESD 保护电路。DRV612 内置了具有大于 80 dB 衰减的有源静音控制功能电路，用于实现无噼啪声的静音接通/关断控制。

DRV612 采用 14 引脚 TSSOP 封装和 16 引脚 QFN 封装。如需一款具有兼容焊脚的立体声头戴式耳机驱动器，请查阅 TPA6139A2 的文档资料 ([SLOS700](#))。



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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English Data Sheet: [SLOS690B](#)

# DRV612

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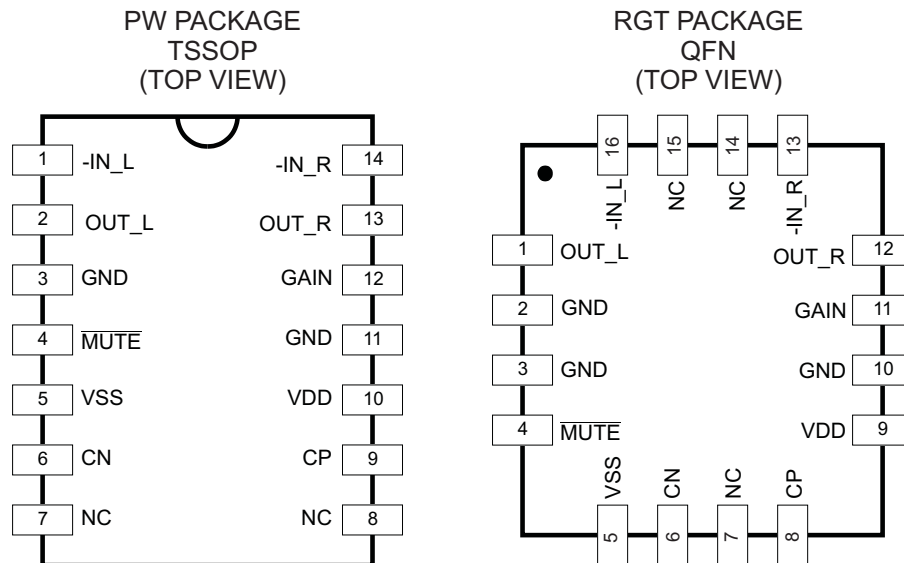
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

## GENERAL INFORMATION

### TERMINAL ASSIGNMENT

The DRV612 is available in package:

- 14-pin TSSOP package (PW) or 16-pin QFN package (RGT)

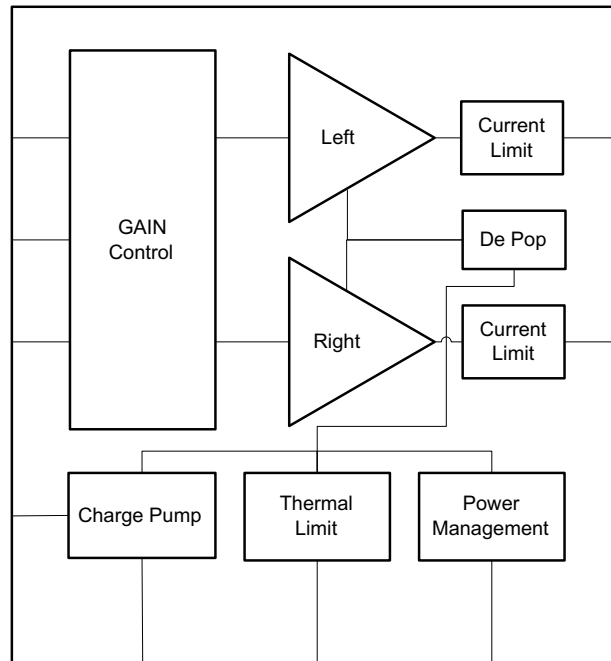


### PIN FUNCTIONS

| PIN         |        |             | FUNCTION <sup>(1)</sup> | DESCRIPTION                                                                                     |
|-------------|--------|-------------|-------------------------|-------------------------------------------------------------------------------------------------|
| NAME        | PW NO. | RGT NO.     |                         |                                                                                                 |
| -IN_L       | 1      | 16          | I                       | Negative input, left channel                                                                    |
| OUT_L       | 2      | 1           | O                       | Output, left channel                                                                            |
| GND         | 3, 11  | 2, 3, 10    | P                       | Ground                                                                                          |
| MUTE        | 4      | 4           | I                       | MUTE, active low                                                                                |
| VSS         | 5      | 5           | O                       | Change Pump negative supply voltage                                                             |
| CN          | 6      | 6           | I/O                     | Charge Pump flying capacitor negative connection                                                |
| NC          | 7, 8   | 7, 14, 15   |                         | No internal connection                                                                          |
| CP          | 9      | 8           | I/O                     | Charge Pump flying capacitor positive connection                                                |
| VDD         | 10     | 9           | P                       | Supply voltage, connect to positive supply                                                      |
| GAIN        | 12     | 11          | I                       | Gain set programming pin; connect a resistor to ground. See 表 1 for recommended resistor values |
| OUT_R       | 13     | 12          | O                       | Output, right channel                                                                           |
| -IN_R       | 14     | 13          | I                       | Negative input, right channel                                                                   |
| Thermal Pad | n/a    | Thermal Pad | P                       | Connect to ground                                                                               |

(1) I = input, O = output, P = power

## SYSTEM BLOCK DIAGRAM



## ORDERING INFORMATION<sup>(1)</sup>

| T <sub>A</sub> | PACKAGE   | DESCRIPTION  |
|----------------|-----------|--------------|
| –40°C to 85°C  | DRV612PW  | 14-pin TSSOP |
|                | DRV612RGT | 16-pin QFN   |

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI Web site at [www.ti.com](http://www.ti.com).

## THERMAL INFORMATION

| THERMAL METRIC <sup>(1)</sup> |                                              | DRV612<br>RGT (16-Pin) | DRV612<br>PW (14-Pin) | UNITS |
|-------------------------------|----------------------------------------------|------------------------|-----------------------|-------|
|                               |                                              |                        |                       |       |
| $\theta_{JA}$                 | Junction-to-ambient thermal resistance       | 52                     | 130                   | °C/W  |
| $\theta_{JCTop}$              | Junction-to-case (top) thermal resistance    | 71                     | 49                    |       |
| $\theta_{JB}$                 | Junction-to-board thermal resistance         | 26                     | 63                    |       |
| $\Psi_{JT}$                   | Junction-to-top characterization parameter   | 3.0                    | 3.6                   |       |
| $\Psi_{JB}$                   | Junction-to-board characterization parameter | 26                     | 62                    |       |
| $\theta_{JCbott}$             | Junction-to-case (bottom) thermal resistance | n/a                    | n/a                   |       |

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](http://www.ti.com/lit/an/spra953).

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### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

|                                                             |                                                              | VALUE          |           | UNIT |
|-------------------------------------------------------------|--------------------------------------------------------------|----------------|-----------|------|
|                                                             |                                                              | MIN            | MAX       |      |
| Voltage range                                               | VDD to GND                                                   | −0.3           | 4         | V    |
|                                                             | V <sub>I</sub> , Input voltage                               | VSS − 0.3      | VDD + 0.3 |      |
|                                                             | MUTE to GND                                                  | −0.3           | VDD + 0.3 |      |
| Temperature                                                 | Maximum operating junction temperature range, T <sub>J</sub> | −40            | 150       | °C   |
|                                                             | Storage temperature                                          | −65            | 150       |      |
| Electrostatic discharge (HBM) QSS<br>009-105 (JESD22-A114A) |                                                              | OUT_L, OUT_R   | 8         | kV   |
|                                                             |                                                              | All other pins | 2         |      |

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

### RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range unless otherwise noted

|                 |                          |                   | MIN | NOM | MAX | UNIT |
|-----------------|--------------------------|-------------------|-----|-----|-----|------|
| VDD             | Supply voltage           | DC supply voltage | 3.0 | 3.3 | 3.6 | V    |
| R <sub>L</sub>  |                          |                   | 600 | 10k |     | Ω    |
| V <sub>IL</sub> | Low-level input voltage  | MUTE              | 38  | 40  | 43  | %VDD |
| V <sub>IH</sub> | High-level input voltage | MUTE              | 57  | 60  | 66  | %VDD |
| T <sub>A</sub>  | Free-air temperature     |                   | −0  | 25  | 85  | °C   |

## ELECTRICAL CHARACTERISTICS

VDD = 3.3V, R<sub>LD</sub> = 5 kΩ, T<sub>A</sub> = 25°C, Charge pump: C<sub>CP</sub> = 1 μF, unless otherwise noted.

| PARAMETER                   | TEST CONDITIONS                                    | MIN | TYP | MAX   | UNIT |
|-----------------------------|----------------------------------------------------|-----|-----|-------|------|
| V <sub>OS</sub>             | Output offset voltage                              |     | 0.5 | 1     | mV   |
| PSRR                        | Power-supply rejection ratio                       | 70  | 80  |       | dB   |
| V <sub>OH</sub>             | High-level output voltage                          | 3.1 |     |       | V    |
| V <sub>OL</sub>             | Low-level output voltage                           |     |     | –3.05 | V    |
| V <sub>uvp_on</sub>         | VDD, undervoltage detection                        |     |     | 2.8   | V    |
| V <sub>uvp_hysteresis</sub> | VDD, undervoltage detection, hysteresis            |     | 200 |       | mV   |
| F <sub>CP</sub>             | Charge-pump switching frequency                    |     | 350 |       | kHz  |
| I <sub>IH</sub>             | High-level input current, $\overline{\text{MUTE}}$ |     |     | 1     | μA   |
| I <sub>IL</sub>             | Low-level input current, $\overline{\text{MUTE}}$  |     |     | 1     | μA   |
| I <sub>(VDD)</sub>          | Supply current, no load                            |     | 18  |       | mA   |
|                             | Supply current, MUTED                              |     | 18  |       | mA   |
| T <sub>SD</sub>             | Thermal shutdown                                   |     | 150 |       | °C   |
|                             | Thermal shutdown hysteresis                        |     | 15  |       | °C   |

## ELECTRICAL CHARACTERISTICS, LINE DRIVER

VDD = 3.3 V, R<sub>LOAD</sub> = 10 kΩ, T<sub>A</sub> = 25°C, Charge pump: C<sub>CP</sub> = 1 μF, 1× gain select (unless otherwise noted)

| PARAMETER          | TEST CONDITIONS                        | MIN | TYP    | MAX | UNIT             |
|--------------------|----------------------------------------|-----|--------|-----|------------------|
| V <sub>O</sub>     | Output voltage, outputs in phase       |     | 2.2    |     | V <sub>rms</sub> |
| THD+N              | Total harmonic distortion plus noise   |     | 0.007% |     |                  |
| SNR                | Signal-to-noise ratio                  |     | 105    |     | dB               |
| DNR                | Dynamic range                          |     | 105    |     | dB               |
| V <sub>n</sub>     | Noise voltage                          |     | 12     |     | μV               |
| Z <sub>o</sub>     | Output impedance when muted            |     | 0.07   | 1   | Ω                |
|                    | Input-to-output attenuation when muted |     | 80     |     | dB               |
|                    | Slew rate                              |     | 4.5    |     | V/μs             |
| G <sub>BW</sub>    | Unity-gain bandwidth                   |     | 8      |     | MHz              |
|                    | Crosstalk – Line L-R and R-L           |     | –91    |     | dB               |
| I <sub>limit</sub> | Current limit                          |     | 25     |     | mA               |

## DRV612

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### PROGRAMMABLE GAIN SETTINGS<sup>(1)(2)</sup>

VDD = 3.3 V, R<sub>load</sub> = 10 kΩ, T<sub>A</sub> = 25°C, Charge pump: C<sub>CP</sub> = 1 μF, 1× gain select, unless otherwise noted

| PARAMETER       | TEST CONDITIONS                     | MIN | TYP  | MAX | UNIT |
|-----------------|-------------------------------------|-----|------|-----|------|
| R_Tol           | Gain programming resistor tolerance |     |      | 2%  |      |
| ΔA <sub>V</sub> | Gain matching                       |     | 0.25 |     | dB   |
|                 | Gain step tolerance                 |     | 0.1  |     | dB   |
| Gain steps      | Gain resistor 2% tolerance          |     |      |     | V/V  |
|                 | 249k or higher                      |     | –2   |     |      |
|                 | 82k5                                |     | –1   |     |      |
|                 | 51k1                                |     | –1.5 |     |      |
|                 | 34k8                                |     | –2.3 |     |      |
|                 | 27k4                                |     | –2.5 |     |      |
|                 | 20k5                                |     | –3   |     |      |
|                 | 15k4                                |     | –3.5 |     |      |
|                 | 11k5                                |     | –4   |     |      |
|                 | 9k09                                |     | –5   |     |      |
|                 | 7k50                                |     | –5.6 |     |      |
|                 | 6k19                                |     | –6.4 |     |      |
|                 | 5k11                                |     | –8.3 |     |      |
|                 | 4k22                                |     | –10  |     |      |
| Input impedance | Gain resistor 2% tolerance          |     |      |     | kΩ   |
|                 | 249k or higher                      |     | 37   |     |      |
|                 | 82k5                                |     | 55   |     |      |
|                 | 51k1                                |     | 44   |     |      |
|                 | 34k8                                |     | 33   |     |      |
|                 | 27k4                                |     | 31   |     |      |
|                 | 20k5                                |     | 28   |     |      |
|                 | 15k4                                |     | 24   |     |      |
|                 | 11k5                                |     | 22   |     |      |
|                 | 9k09                                |     | 18   |     |      |
|                 | 7k50                                |     | 17   |     |      |
|                 | 6k19                                |     | 15   |     |      |
|                 | 5k11                                |     | 12   |     |      |
|                 | 4k22                                |     | 10   |     |      |

- (1) If the GAIN pin is left floating, an internal pullup sets the gain to –2×.
- (2) Gain setting is latched during power up.

## TYPICAL CHARACTERISTICS, LINE DRIVER

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $R_L = 2.5\text{ k}\Omega$ ,  $C_{PUMP} = C_{VSS} = 1\text{ }\mu\text{F}$ , Gain =  $-2\text{ V/V}$  (unless otherwise noted)

THD+N vs OUTPUT VOLTAGE  
3.3 V, 10 k $\Omega$ , 1 kHz

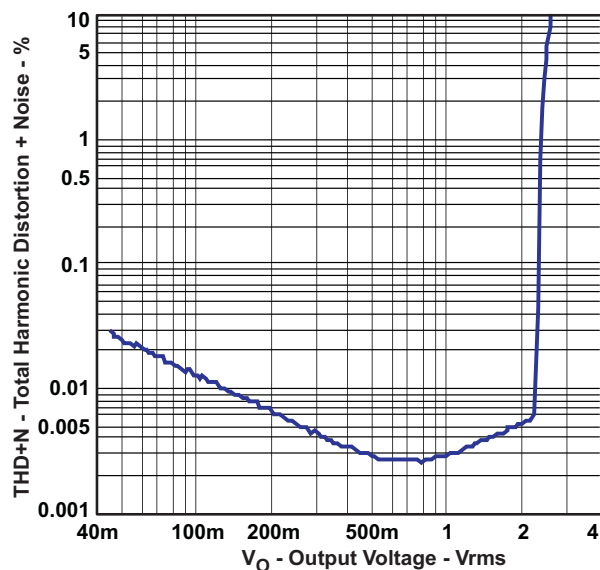


图 1.

THD+N vs OUTPUT VOLTAGE  
3.3 V, 600  $\Omega$  load, 1 kHz

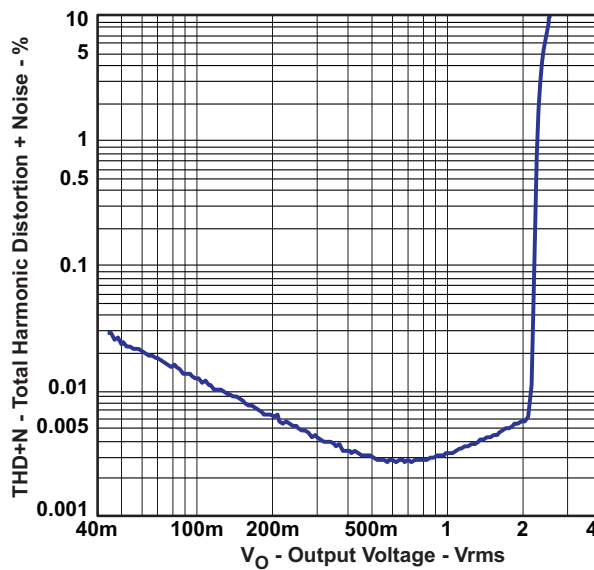
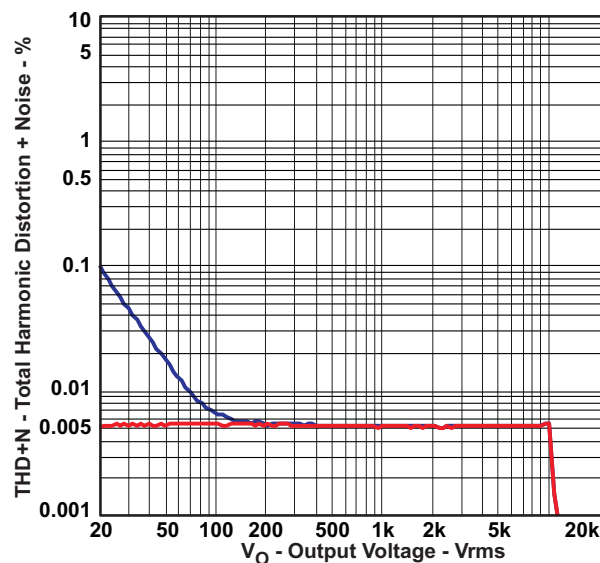


图 2.

THD+N vs FREQUENCY  
3.3 V, 10 k $\Omega$  load, 2 Vrms



Blue: 10- $\mu\text{F}$  ceramic ac-coupling capacitor.  
Red: 10- $\mu\text{F}$  electrolytic ac-coupling capacitor

图 3.

CHANNEL SEPARATION  
3.3 V, 5 k $\Omega$  load, 2 Vrms, Blue L to R, Red R to L

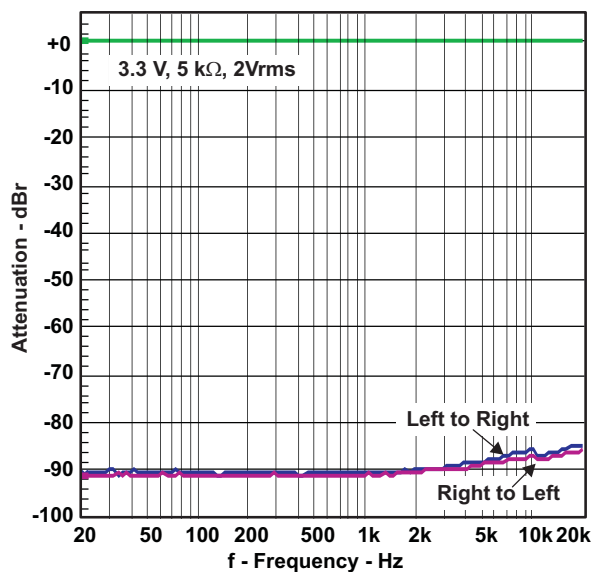


图 4.

## TYPICAL CHARACTERISTICS, LINE DRIVER (接下页)

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $R_L = 2.5\text{ k}\Omega$ ,  $C_{PUMP} = C_{VSS} = 1\text{ }\mu\text{F}$ , Gain = -2V/V (unless otherwise noted)

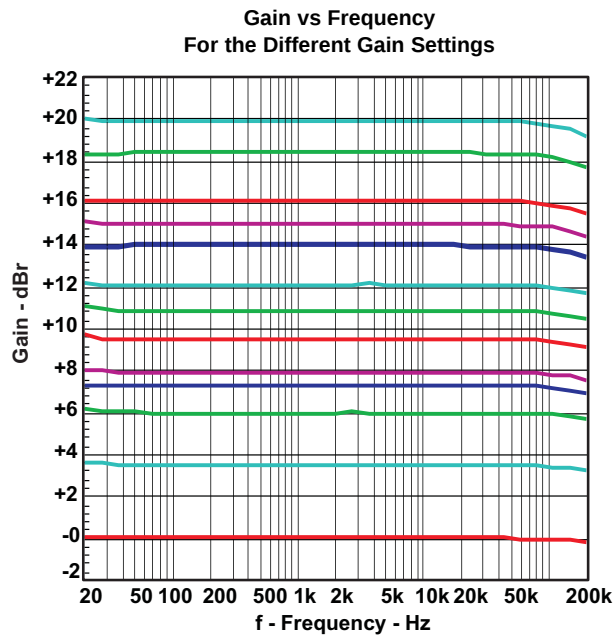


图 5.

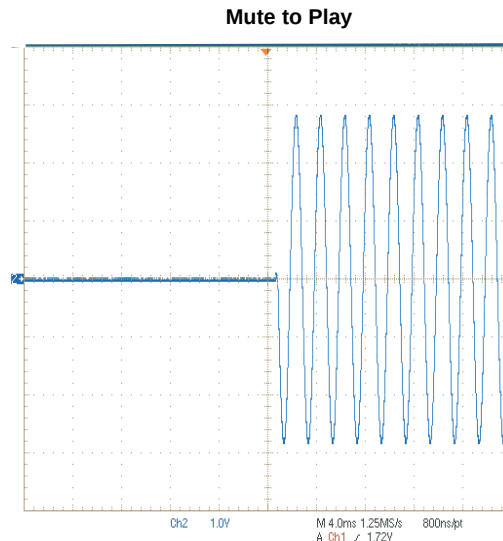


图 6.

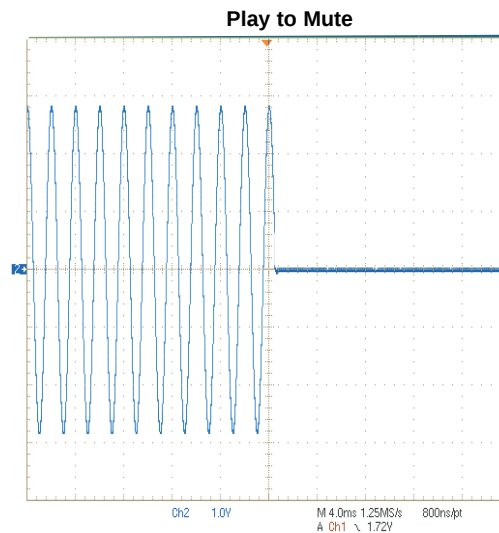


图 7.

## APPLICATION INFORMATION

### LINE DRIVER AMPLIFIERS

Single-supply line-driver amplifiers typically require dc-blocking capacitors. The top drawing in 图 8 illustrates the conventional line-driver amplifier connection to the load and output signal.

DC blocking capacitors are often large in value, and a mute circuit is needed during power up to minimize click and pop. The output capacitor and mute circuit consume PCB area and increase cost of assembly, and can reduce the fidelity of the audio output signal.

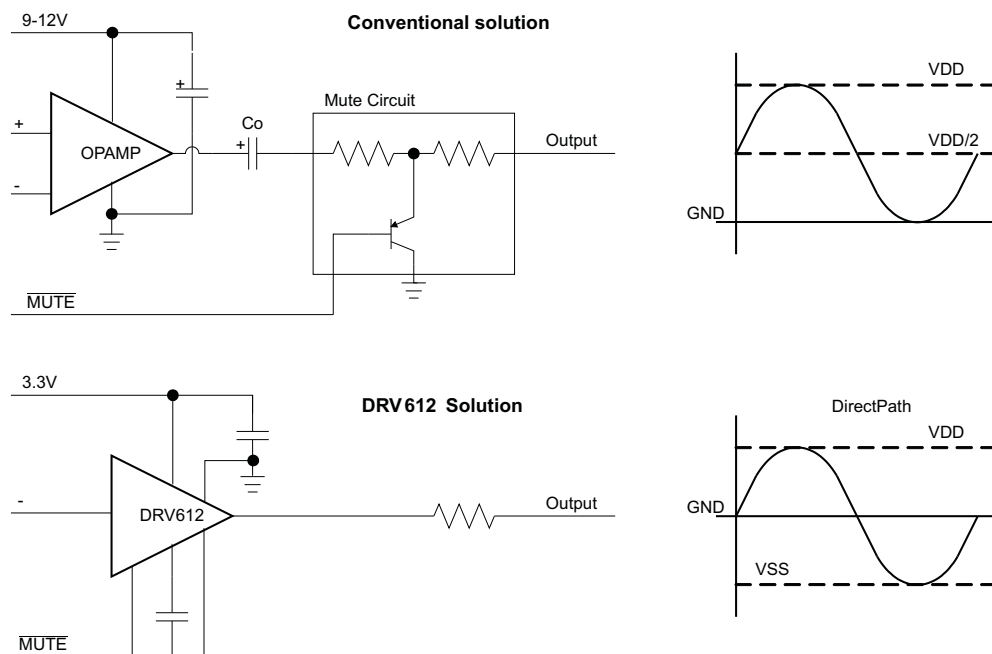


图 8. Conventional and DirectPath Line Driver

The DirectPath amplifier architecture operates from a single supply but makes use of an internal charge pump to provide a negative voltage rail.

Combining the user-provided positive rail and the negative rail generated by the IC, the device operates in what is effectively a split supply mode.

The output voltages are now centered at zero volts with the capability to swing to the positive rail or negative rail. Combining this with the built-in click- and pop-reduction circuit, the DirectPath amplifier requires no output dc-blocking capacitors.

The bottom block diagram and waveform of 图 8 illustrate the ground-referenced line-driver architecture. This is the architecture of the DRV612.

# DRV612

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## COMPONENT SELECTION

### Charge Pump Flying Capacitor and VSS Capacitor

The charge-pump flying capacitor serves to transfer charge during the generation of the negative supply voltage. The VSS capacitor must be at least equal to the charge pump capacitor in order to allow maximum charge transfer. Low-ESR capacitors are an ideal selection, and a value of 1  $\mu\text{F}$  is typical.

### Decoupling Capacitors

The DRV612 is a DirectPath line-driver amplifier that requires adequate power-supply decoupling to ensure that the noise and total harmonic distortion (THD) are low. A good low equivalent-series-resistance (ESR) ceramic capacitor, typically 1  $\mu\text{F}$ , placed as close as possible to the device VDD lead works best. Placing this decoupling capacitor close to the DRV612 is important for the performance of the amplifier. For filtering lower-frequency noise signals, a 10- $\mu\text{F}$  or greater capacitor placed near the audio power amplifier also helps, but it is not required in most applications because of the high PSRR of this device.

### Gain-Setting

The gain setting is programmed with the GAIN pin. Gain setting is latched during power on. 表 1 lists the gain settings.

NOTE: If gain pin is left unconnected (open) default gain of  $-2\times$  is selected.

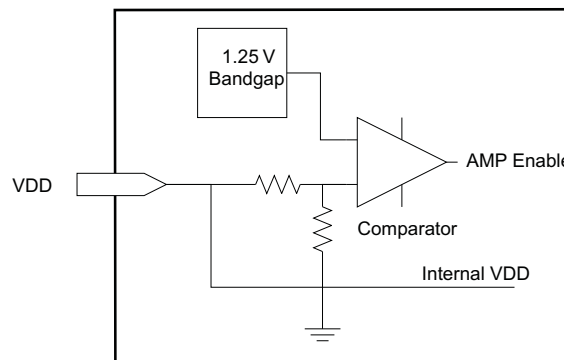
表 1. Gain Settings

| Gain_set RESISTOR             | GAIN         | GAIN (dB) | INPUT RESISTANCE |
|-------------------------------|--------------|-----------|------------------|
| 249 k $\Omega$ <sup>(1)</sup> | $-2\times$   | 6         | 37 k $\Omega$    |
| 82k5                          | $-1\times$   | 0.0       | 55 k $\Omega$    |
| 51k1                          | $-1.5\times$ | 3.5       | 44 k $\Omega$    |
| 34k8                          | $-2.3\times$ | 7.2       | 33 k $\Omega$    |
| 27k4                          | $-2.5\times$ | 8         | 31 k $\Omega$    |
| 20k5                          | $-3\times$   | 9.5       | 28 k $\Omega$    |
| 15k4                          | $-3.5\times$ | 10.9      | 24 k $\Omega$    |
| 11k5                          | $-4.0\times$ | 12        | 22 k $\Omega$    |
| 9k09                          | $-5\times$   | 14        | 18 k $\Omega$    |
| 7k5                           | $-5.6\times$ | 15        | 17 k $\Omega$    |
| 6k19                          | $-6.4\times$ | 16.1      | 15 k $\Omega$    |
| 5k11                          | $-8.3\times$ | 18.4      | 12 k $\Omega$    |
| 4k22                          | $-10\times$  | 20        | 10 k $\Omega$    |

(1) or higher

### Internal Undervoltage Detection

The DRV612 contains an internal precision band-gap reference voltage and a comparator used to monitor the supply voltage, VDD. The internal VDD monitor is set at 2.8 V with 200-mV hysteresis.



## Input-Blocking Capacitors

DC input-blocking capacitors are required to be added in series with the audio signal into the input pins of the DRV612. These capacitors block the dc portion of the audio source and allow the DRV612 inputs to be properly biased to provide maximum performance. The input blocking capacitors also limit the dc gain to 1, limiting the dc-offset voltage at the output.

These capacitors form a high-pass filter with the input resistor,  $R_{IN}$ . The cutoff frequency is calculated using 公式 1. For this calculation, the capacitance used is the input-blocking capacitor and the resistance is the input resistor chosen from 表 2. Then the frequency and/or capacitance can be determined when one of the two values is given.

$$f_{C_{IN}} = \frac{1}{2\pi R_{IN} C_{IN}} \quad \text{or} \quad C_{IN} = \frac{1}{2\pi f_{C_{IN}} R_{IN}} \quad (1)$$

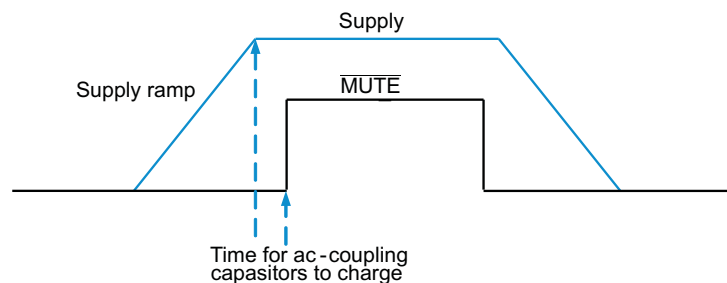
For a fixed cutoff frequency of 2 Hz, the size of the input capacitance is shown in 表 2 with the capacitors rounded up to nearest E6 values. For 20-Hz cutoff, simply divide the capacitor values with 10; e.g., for 1× gain, 150 nF is needed.

**表 2. Input Capacitor for Different Gain and Cutoff**

| Gain_set<br>RESISTOR | GAIN  | Gain<br>(dB) | INPUT<br>RESISTANCE | 2 Hz<br>Cutoff |
|----------------------|-------|--------------|---------------------|----------------|
| 249 kΩ               | –2 ×  | 6            | 37 kΩ               | 2.2 μF         |
| 82k5                 | –1 ×  | 0.0          | 55 kΩ               | 1.5 μF         |
| 51k1                 | –1.5× | 3.5          | 44 kΩ               | 2.2 μF         |
| 34k8                 | –2.3× | 7.2          | 33 kΩ               | 3.3 μF         |
| 27k4                 | –2.5× | 8            | 31 kΩ               | 3.3 μF         |
| 20k5                 | –3×   | 9.5          | 28 kΩ               | 3.3 μF         |
| 15k4                 | –3.5× | 10.9         | 24 kΩ               | 3.3 μF         |
| 11k5                 | –4×   | 12           | 22 kΩ               | 4.7 μF         |
| 9k09                 | –5×   | 14           | 18 kΩ               | 4.7 μF         |
| 7k5                  | –5.6× | 15           | 17 kΩ               | 4.7 μF         |
| 6k19                 | –6.4× | 16.1         | 15 kΩ               | 6.8 μF         |
| 5k11                 | –8.3× | 18.4         | 12 kΩ               | 6.8 μF         |
| 4k22                 | –10×  | 20           | 10 kΩ               | 10 μF          |

## Pop-Free Power Up

Pop-free power up is ensured by keeping the  $\overline{\text{MUTE}}$  pin low during power-supply ramp-up and -down. The pins should be kept low until the input ac-coupling capacitors are fully charged before asserting the  $\overline{\text{MUTE}}$  pin high, this way proper pre-charge of the ac-coupling is performed and pop-less power up is achieved. 图 9 illustrates the preferred sequence.



**图 9. Power-Up/Down Sequence**

## DRV612

ZHCS317B –DECEMBER 2010–REVISED APRIL 2011

[www.ti.com.cn](http://www.ti.com.cn)

### CAPACITIVE LOAD

The DRV612 has the ability to drive a high capacitive load up to 220 pF directly. Higher capacitive loads can be accepted by adding a series resistor of 47  $\Omega$  or larger for the line driver output.

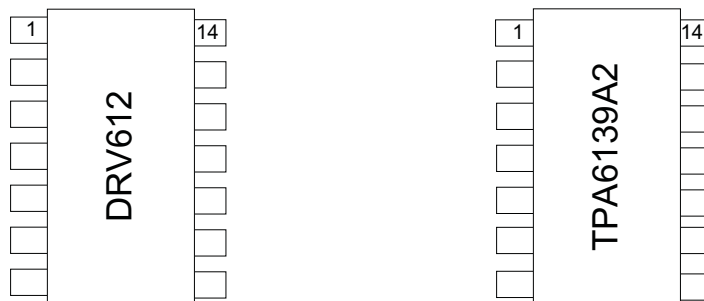
### LAYOUT RECOMMENDATIONS

A proposed layout for the DRV612 can be seen in the DRV612EVM User's Guide ([SLOU248](#)), and the Gerber files can be downloaded from <http://focus.ti.com/docs/toolsw/folders/print/DRV612evm.html>. To access this information, open the DRV612 product folder and look in the Tools and Software folder.

Ground traces are recommended to be routed as a star ground to minimize hum interference. VDD, VSS decoupling capacitors and the charge-pump capacitors should be connected with short traces.

## FOOTPRINT COMPATIBLE WITH TPA6139A2

The DRV612 stereo line driver is pin compatible with the headphone amplifier TPA6139A2. Therefore, a single PCB layout can be used with stuffing options for different board configurations.



## APPLICATION CIRCUIT

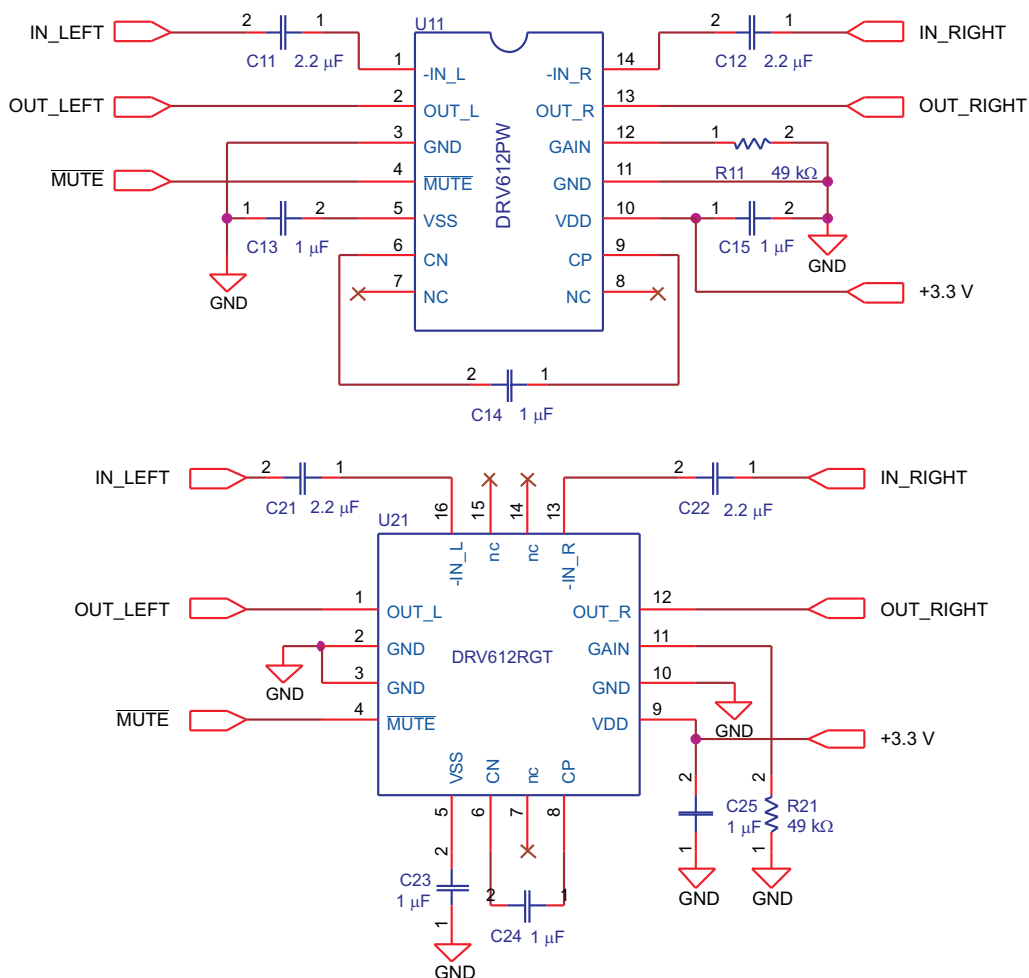


图 10. Single-Ended Input and Output, Gain Set to  $-1.5\times$

## REVISION HISTORY

| Changes from Original (December 2010) to Revision A                                                                                         | Page |
|---------------------------------------------------------------------------------------------------------------------------------------------|------|
| • Added the QFN pinout drawing .....                                                                                                        | 2    |
| • Added the QFN device To the PIN FUNCTIONS table .....                                                                                     | 2    |
| • Changed the Abs Max Storage Temp From: MIN = -40 To: MIN = -65 .....                                                                      | 4    |
| • Changed the Gain resistor 2% tolerance values in the Programmable Gain Settings table For Gain Steps and Input Impedance .....            | 6    |
| • Changed Note 1 of the PROGRAMMABLE GAIN SETTINGS table From: If pin 12, GAIN, is left floating To: If the GAIN pin is left floating ..... | 6    |
| • Changed From: $C_{PUMP} = C_{(VSS)} = 10 \mu F$ To: $C_{PUMP} = C_{(VSS)} = 1 \mu F$ in the Typical Characteristics condition text .....  | 7    |
| • Changed the Gain_set RESISTOR values in 表 1 .....                                                                                         | 10   |
| • Changed the Gain_set RESISTOR values in 表 2 .....                                                                                         | 11   |
| • Removed references to DRV614 from the FOOTPRINT COMPATIBLE WITH TPA6139A2 secton .....                                                    | 13   |
| Changes from Revision A (February 2011) to Revision B                                                                                       | Page |
| • Deleted the Product Preview note from the RGT package .....                                                                               | 3    |
| • Changed $R_{IN} = 10 \text{ k}\Omega$ , $R_{fb} = 20 \text{ k}\Omega$ To Gain = -2V/V in the Typical Characteristics condition text ..... | 7    |

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| DRV612PW         | ACTIVE        | TSSOP        | PW                 | 14   | 90             | RoHS & Green    | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 85    | DRV612                  | <a href="#">Samples</a> |
| DRV612PWR        | ACTIVE        | TSSOP        | PW                 | 14   | 2000           | RoHS & Green    | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 85    | DRV612                  | <a href="#">Samples</a> |
| DRV612RGTR       | ACTIVE        | VQFN         | RGT                | 16   | 3000           | RoHS & Green    | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 85    | D612                    | <a href="#">Samples</a> |
| DRV612RGTT       | ACTIVE        | VQFN         | RGT                | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 85    | D612                    | <a href="#">Samples</a> |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

<sup>(3)</sup> MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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## TAPE AND REEL INFORMATION



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| DRV612PWR  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| DRV612RGTR | VQFN         | RGT             | 16   | 3000 | 330.0              | 12.4               | 3.3     | 3.3     | 1.1     | 8.0     | 12.0   | Q2            |
| DRV612RGTT | VQFN         | RGT             | 16   | 250  | 180.0              | 12.4               | 3.3     | 3.3     | 1.1     | 8.0     | 12.0   | Q2            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| DRV612PWR  | TSSOP        | PW              | 14   | 2000 | 350.0       | 350.0      | 43.0        |
| DRV612RGTR | VQFN         | RGT             | 16   | 3000 | 346.0       | 346.0      | 33.0        |
| DRV612RGTT | VQFN         | RGT             | 16   | 250  | 210.0       | 185.0      | 35.0        |

## TUBE

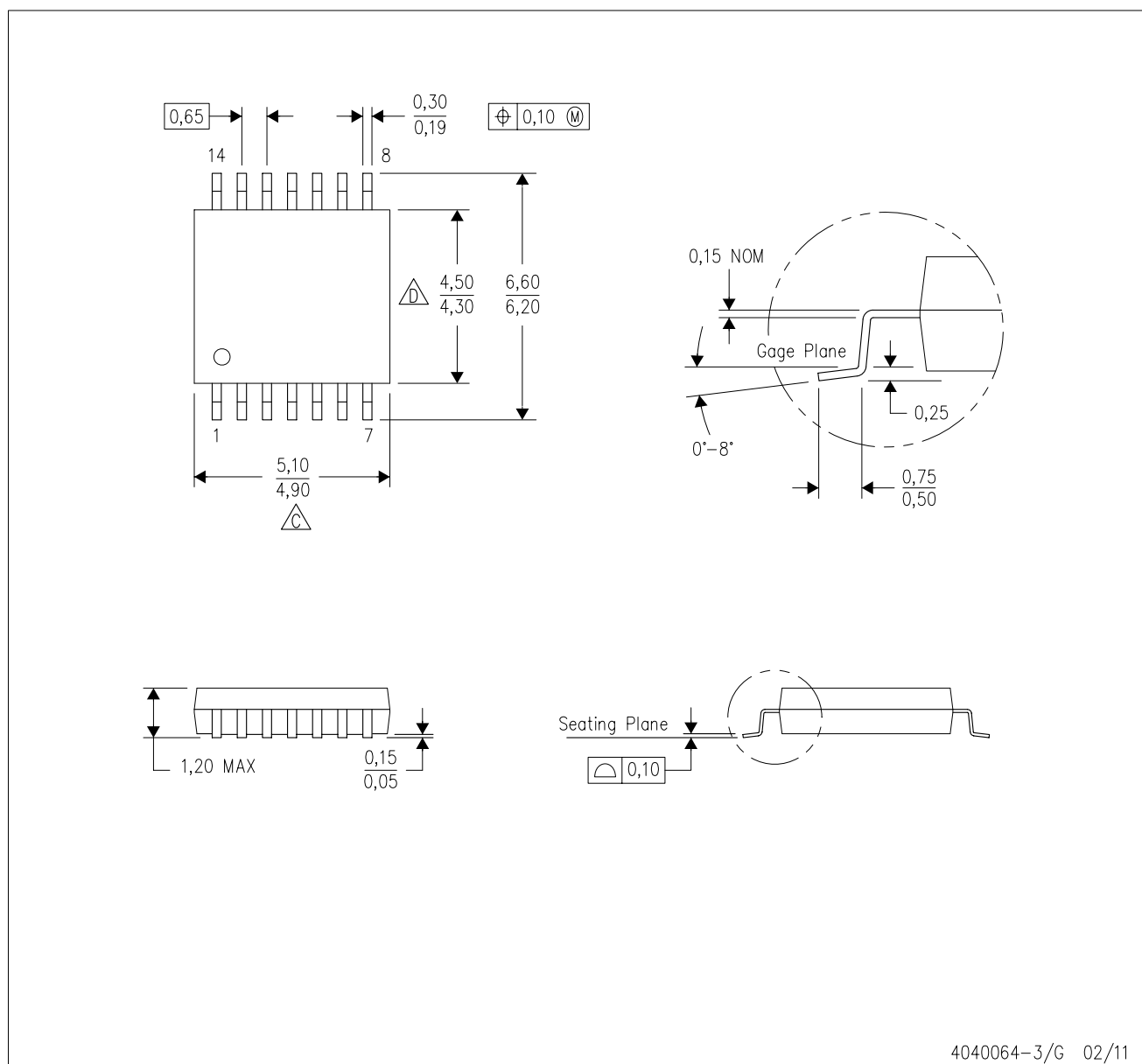


\*All dimensions are nominal

| Device   | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------|--------------|--------------|------|-----|--------|--------|--------|--------|
| DRV612PW | PW           | TSSOP        | 14   | 90  | 530    | 10.2   | 3600   | 3.5    |

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



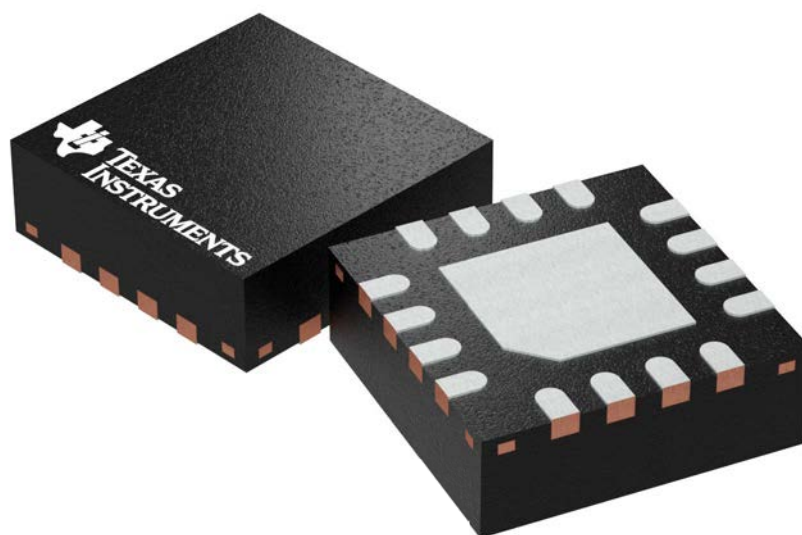
- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

**RGT 16**

**GENERIC PACKAGE VIEW**

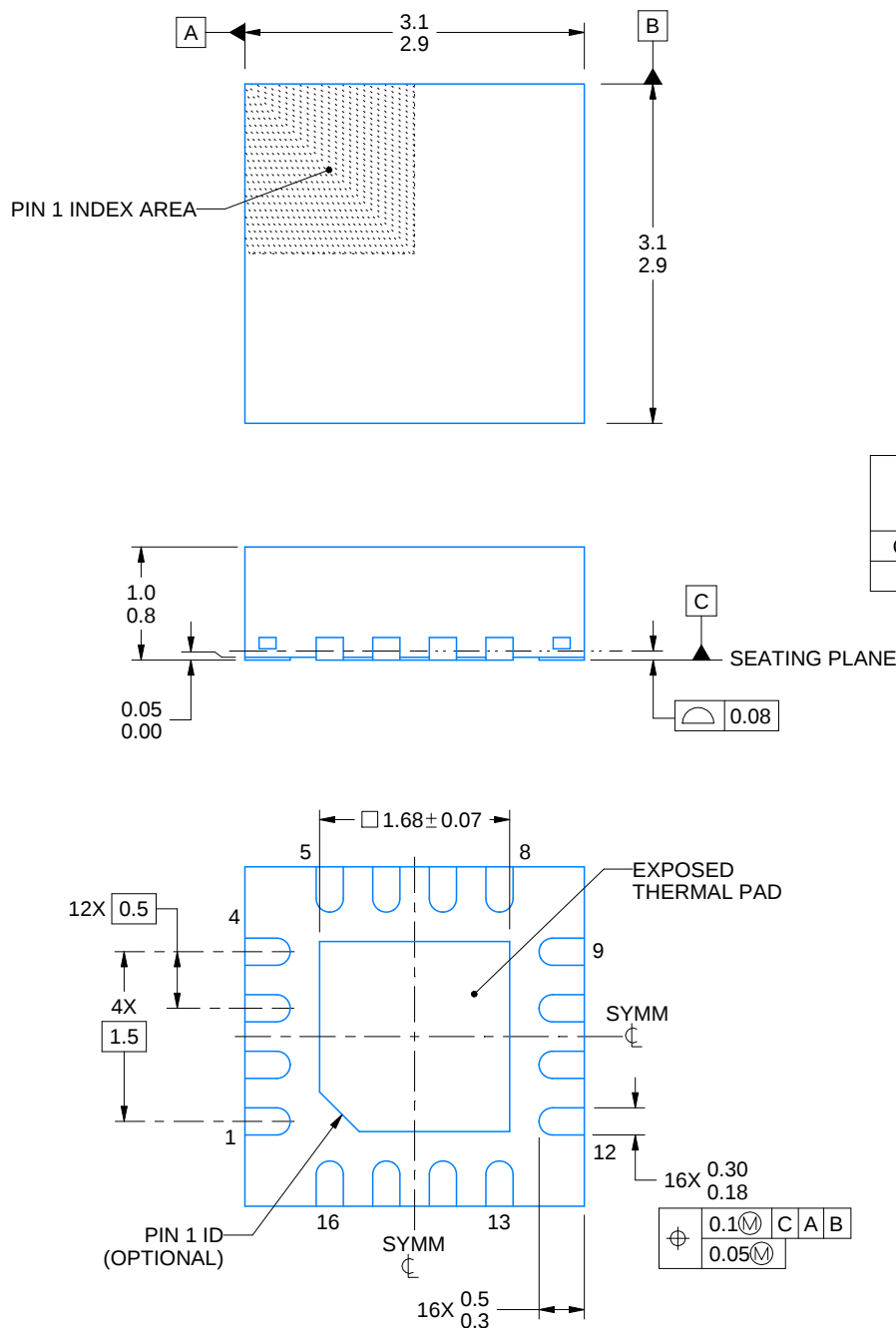
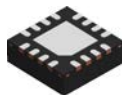
**VQFN - 1 mm max height**

PLASTIC QUAD FLATPACK - NO LEAD



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4203495/1



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## NOTES:

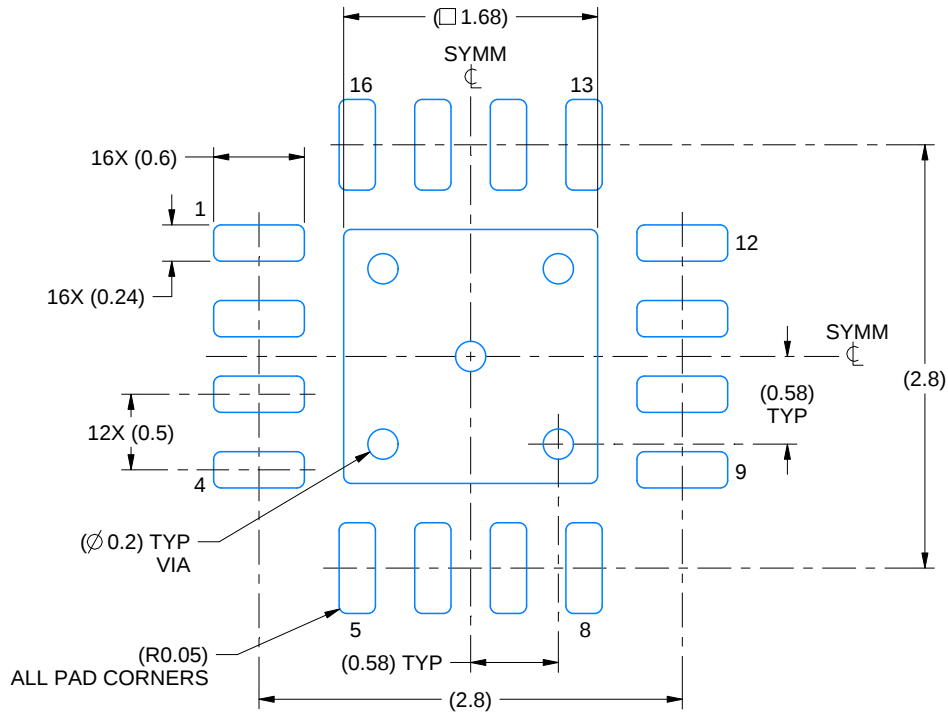
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

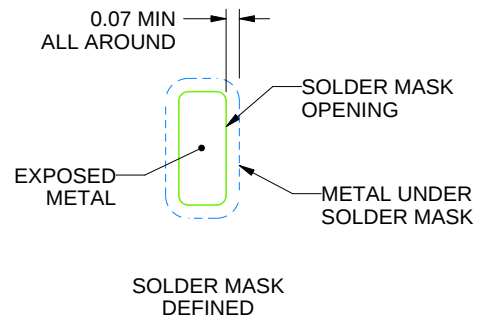
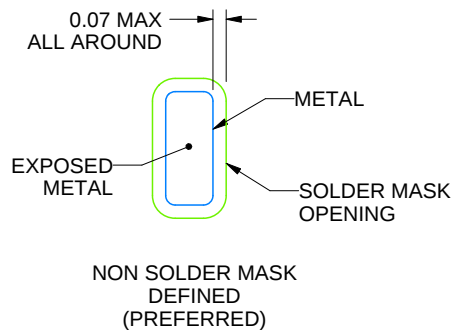
RGT0016C

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:20X



SOLDER MASK DETAILS

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NOTES: (continued)

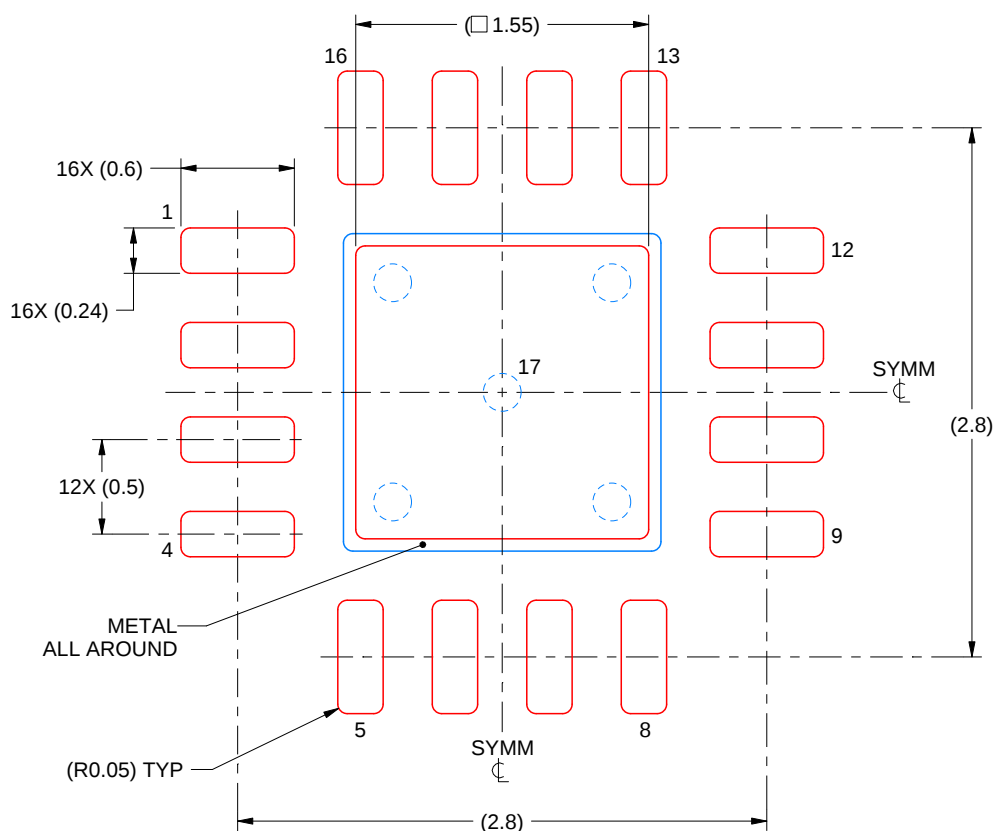
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

# EXAMPLE STENCIL DESIGN

RGT0016C

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



**SOLDER PASTE EXAMPLE**  
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD 17:  
 85% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
 SCALE:25X

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NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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