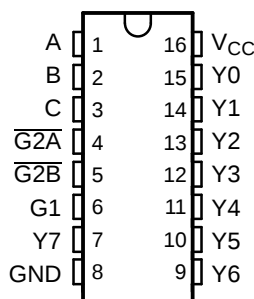


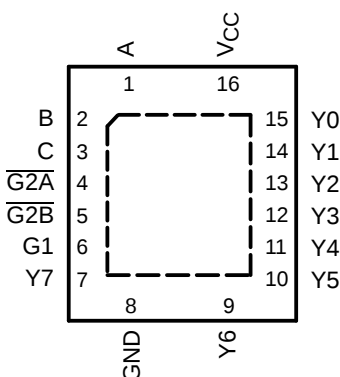
## FEATURES

- 2-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 9.5 ns at 5 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $>2.3$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Voltage Operation on All Ports
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

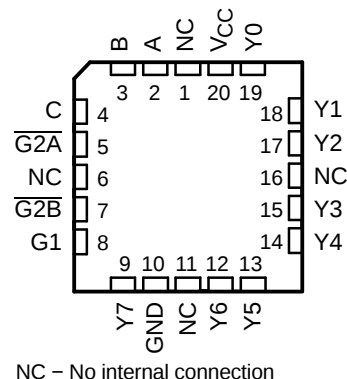
SN54LV138A . . . J OR W PACKAGE  
SN74LV138A . . . D, DB, DGV, NS  
OR PW PACKAGE  
(TOP VIEW)



SN74LV138A . . . RGY PACKAGE  
(TOP VIEW)



SN54LV138A . . . FK PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

The 'LV138A devices are 3-line to 8-line decoders/demultiplexers designed for 2-V to 5.5-V  $V_{CC}$  operation.

### ORDERING INFORMATION

| $T_A$          | PACKAGE <sup>(1)</sup> |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C  | QFN – RGY              | Reel of 1000 | SN74LV138ARGYR        | LV138A           |
|                | SOIC – D               | Tube of 40   | SN74LV138AD           | LV138A           |
|                |                        | Reel of 2500 | SN74LV138ADR          |                  |
|                | SOP – NS               | Reel of 2000 | SN74LV138ANSR         | 74LV138A         |
|                | SSOP – DB              | Reel of 2000 | SN74LV138ADBR         | LV138A           |
|                | TSSOP – PW             | Tube of 90   | SN74LV138APW          | LV138A           |
|                |                        | Reel of 2000 | SN74LV138APWR         |                  |
|                |                        | Reel of 250  | SN74LV138APWT         |                  |
|                | TVSOP – DGV            | Reel of 2000 | SN74LV138ADGVR        | LV138A           |
| –55°C to 125°C | CDIP – J               | Tube of 25   | SNJ54LV138AJ          | SNJ54LV138AJ     |
|                | CFP – W                | Tube of 150  | SNJ54LV138AW          | SNJ54LV138AW     |
|                | LCCC – FK              | Tube of 55   | SNJ54LV138AFK         | SNJ54LV138AFK    |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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.

## DESCRIPTION/ORDERING INFORMATION (CONTINUED)

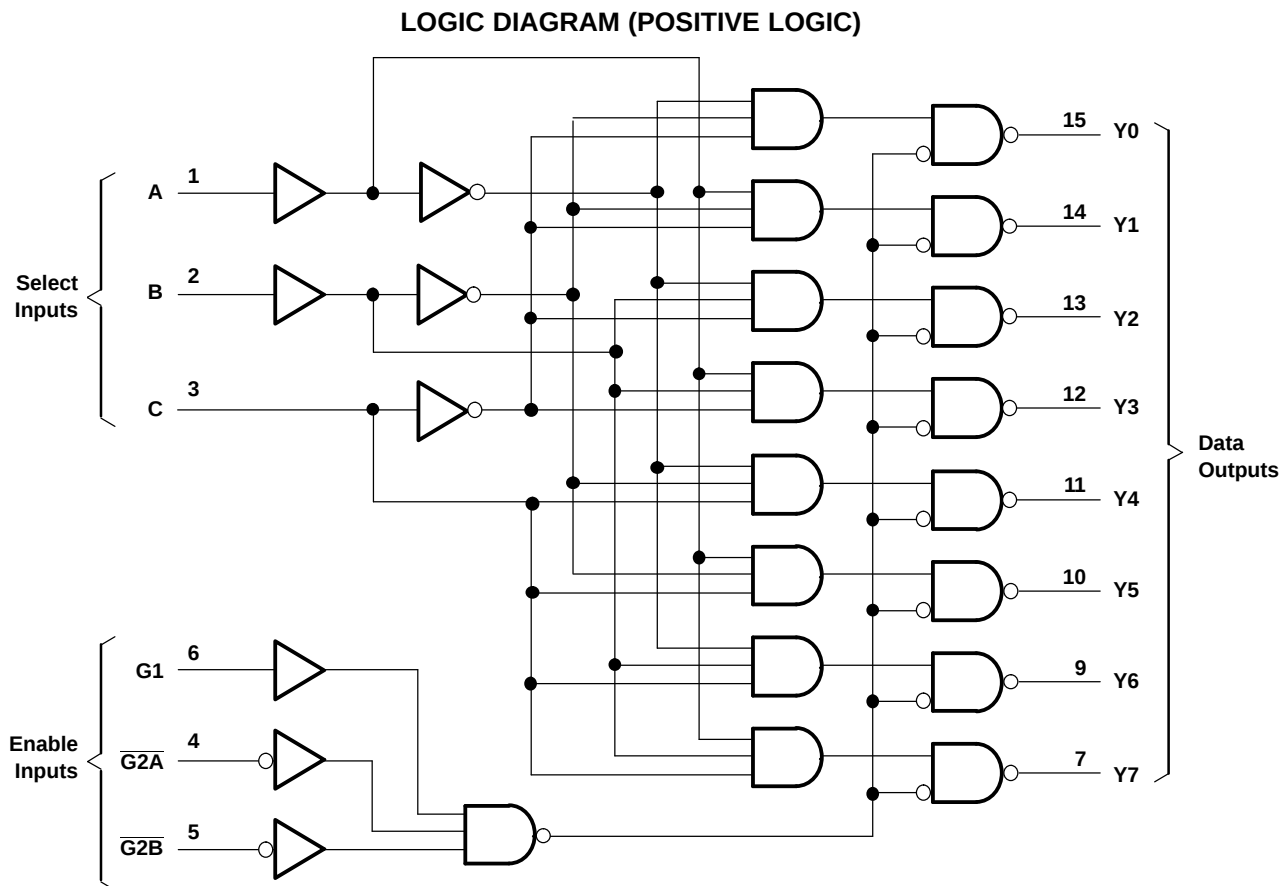
These devices are designed for high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, these decoders can be used to minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay times of these decoders and the enable time of the memory usually are less than the typical access time of the memory. This means that the effective system delay introduced by the decoder is negligible.

The conditions at the binary-select inputs (A, B, C) and the three enable inputs (G1,  $\overline{G2A}$ ,  $\overline{G2B}$ ) select one of eight output lines. The two active-low ( $\overline{G2A}$ ,  $\overline{G2B}$ ) and one active-high (G1) enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

**FUNCTION TABLE**

| ENABLE INPUTS |                  |                  | SELECT INPUTS |   |   | OUTPUTS |    |     |    |    |    |    |    |
|---------------|------------------|------------------|---------------|---|---|---------|----|-----|----|----|----|----|----|
| G1            | $\overline{G2A}$ | $\overline{G2B}$ | C             | B | A | Y0      | Y1 | Y20 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X             | H                | X                | X             | X | X | H       | H  | H   | H  | H  | H  | H  | H  |
| X             | X                | H                | X             | X | X | H       | H  | H   | H  | H  | H  | H  | H  |
| L             | X                | X                | X             | X | X | H       | H  | H   | H  | H  | H  | H  | H  |
| H             | L                | L                | L             | L | L | L       | H  | H   | H  | H  | H  | H  | H  |
| H             | L                | L                | L             | L | H | H       | L  | H   | H  | H  | H  | H  | H  |
| H             | L                | L                | L             | H | L | H       | H  | L   | H  | H  | H  | H  | H  |
| H             | L                | L                | L             | H | H | H       | H  | H   | L  | H  | H  | H  | H  |
| H             | L                | L                | H             | L | L | H       | H  | H   | H  | L  | H  | H  | H  |
| H             | L                | L                | H             | L | H | H       | H  | H   | H  | H  | L  | H  | H  |
| H             | L                | L                | H             | H | L | H       | H  | H   | H  | H  | H  | L  | H  |
| H             | L                | L                | H             | H | H | H       | H  | H   | H  | H  | H  | H  | L  |



Pin numbers shown are for the D, DB, DGV, J, NS, PW, RGY, and W packages.

# SN54LV138A, SN74LV138A

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

SCLS395L–APRIL 1998–REVISED AUGUST 2005

### Absolute Maximum Ratings<sup>(1)</sup>

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

|               |                                                                                             | MIN                        | MAX            | UNIT   |
|---------------|---------------------------------------------------------------------------------------------|----------------------------|----------------|--------|
| $V_{CC}$      | Supply voltage range                                                                        | –0.5                       | 7              | V      |
| $V_I$         | Input voltage range <sup>(2)</sup>                                                          | –0.5                       | 7              | V      |
| $V_O$         | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5                       | 7              | V      |
| $V_O$         | Output voltage range <sup>(2)(3)</sup>                                                      | –0.5                       | $V_{CC} + 0.5$ | V      |
| $I_{IK}$      | Input clamp current                                                                         | $V_I < 0$                  |                | –20 mA |
| $I_{OK}$      | Output clamp current                                                                        | $V_O < 0$                  |                | –50 mA |
| $I_O$         | Continuous output current                                                                   | $V_O = 0$ to $V_{CC}$      |                | ±25 mA |
|               | Continuous current through $V_{CC}$ or GND                                                  |                            |                | ±50 mA |
| $\theta_{JA}$ | Package thermal impedance                                                                   | D package <sup>(4)</sup>   |                | 73     |
|               |                                                                                             | DB package <sup>(4)</sup>  |                | 82     |
|               |                                                                                             | DGV package <sup>(4)</sup> |                | 120    |
|               |                                                                                             | NS package <sup>(4)</sup>  |                | 64     |
|               |                                                                                             | PW package <sup>(4)</sup>  |                | 108    |
|               |                                                                                             | RGY package <sup>(5)</sup> |                | 39     |
| $T_{stg}$     | Storage temperature range                                                                   | –65                        | 150            | °C     |

- (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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 5.5 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7
- (5) The package thermal impedance is calculated in accordance with JESD 51-5.

## Recommended Operating Conditions<sup>(1)</sup>

|                 |                                    |                                  | SN54LV138A <sup>(2)</sup> |                 | SN74LV138A            |                 | UNIT |
|-----------------|------------------------------------|----------------------------------|---------------------------|-----------------|-----------------------|-----------------|------|
|                 |                                    |                                  | MIN                       | MAX             | MIN                   | MAX             |      |
| V <sub>CC</sub> | Supply voltage                     |                                  | 2                         | 5.5             | 2                     | 5.5             | V    |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 2 V            | 1.5                       |                 | 1.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.7     |                 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.7     |                 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.7     |                 | V <sub>CC</sub> × 0.7 |                 |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 2 V            | 0.5                       |                 | 0.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.3     |                 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.3     |                 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.3     |                 | V <sub>CC</sub> × 0.3 |                 |      |
| V <sub>I</sub>  | Input voltage                      |                                  | 0                         | 5.5             | 0                     | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                     |                                  | 0                         | V <sub>CC</sub> | 0                     | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 2 V            | −50                       |                 | −50                   |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | −2                        |                 | −2                    |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | −6                        |                 | −6                    |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | −12                       |                 | −12                   |                 |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 2 V            | 50                        |                 | 50                    |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | 2                         |                 | 2                     |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | 6                         |                 | 6                     |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 12                        |                 | 12                    |                 |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 2.3 V to 2.7 V | 200                       |                 | 200                   |                 | ns/V |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | 100                       |                 | 100                   |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 20                        |                 | 20                    |                 |      |
| T <sub>A</sub>  | Operating free-air temperature     |                                  | −55                       | 125             | −40                   | 85              | °C   |

(1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

(2) Product Preview

## Electrical Characteristics

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

| PARAMETER        | TEST CONDITIONS                                             | V <sub>CC</sub> | SN54LV138A <sup>(1)</sup> |     |     | SN74LV138A            |     |     | UNIT |
|------------------|-------------------------------------------------------------|-----------------|---------------------------|-----|-----|-----------------------|-----|-----|------|
|                  |                                                             |                 | MIN                       | TYP | MAX | MIN                   | TYP | MAX |      |
| V <sub>OH</sub>  | I <sub>OH</sub> = –50 μA                                    | 2 V to 5.5 V    | V <sub>CC</sub> – 0.1     |     |     | V <sub>CC</sub> – 0.1 |     |     | V    |
|                  | I <sub>OH</sub> = –2 mA                                     | 2.3 V           | 2                         |     |     | 2                     |     |     |      |
|                  | I <sub>OH</sub> = –6 mA                                     | 3 V             | 2.48                      |     |     | 2.48                  |     |     |      |
|                  | I <sub>OH</sub> = –12 mA                                    | 4.5 V           | 3.8                       |     |     | 3.8                   |     |     |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 50 μA                                     | 2 V to 5.5 V    | 0.1                       |     |     | 0.1                   |     |     | V    |
|                  | I <sub>OL</sub> = 2 mA                                      | 2.3 V           | 0.4                       |     |     | 0.4                   |     |     |      |
|                  | I <sub>OL</sub> = 6 mA                                      | 3 V             | 0.44                      |     |     | 0.44                  |     |     |      |
|                  | I <sub>OL</sub> = 12 mA                                     | 4.5 V           | 0.55                      |     |     | 0.55                  |     |     |      |
| I <sub>I</sub>   | V <sub>I</sub> = 5.5 V or GND                               | 0 to 5.5 V      | ±1                        |     |     | ±1                    |     |     | μA   |
| I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 5.5 V           | 20                        |     |     | 20                    |     |     | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V               | 0               | 5                         |     |     | 5                     |     |     | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 3.3 V           | 2.1                       |     |     | 2.1                   |     |     | pF   |

(1) Product Preview

# SN54LV138A, SN74LV138A

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

SCLS395L–APRIL 1998–REVISED AUGUST 2005

### Switching Characteristics

over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see [Figure 1](#))

| PARAMETER | FROM<br>(INPUT)                      | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE  | $T_A = 25^\circ\text{C}$ |                     |                     | SN54LV138A <sup>(1)</sup> |                   | SN74LV138A |     | UNIT |
|-----------|--------------------------------------|----------------|----------------------|--------------------------|---------------------|---------------------|---------------------------|-------------------|------------|-----|------|
|           |                                      |                |                      | MIN                      | TYP                 | MAX                 | MIN                       | MAX               | MIN        | MAX |      |
| $t_{pd}$  | A, B, or C                           | Y              | $C_L = 15\text{ pF}$ |                          | 11.7 <sup>(2)</sup> | 17.6 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 21 <sup>(2)</sup> | 1          | 21  | ns   |
|           | G1                                   |                |                      |                          | 12.3 <sup>(2)</sup> | 19.2 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 22 <sup>(2)</sup> | 1          | 22  |      |
|           | $\overline{G2A}$ or $\overline{G2B}$ |                |                      |                          | 11.4 <sup>(2)</sup> | 18.2 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 21 <sup>(2)</sup> | 1          | 21  |      |
| $t_{pd}$  | A, B, or C                           | Y              | $C_L = 50\text{ pF}$ |                          | 14.9                | 21.4                | 1                         | 25                | 1          | 25  | ns   |
|           | G1                                   |                |                      |                          | 15.7                | 22.6                | 1                         | 26                | 1          | 26  |      |
|           | G2A or G2B                           |                |                      |                          | 14.8                | 22                  | 1                         | 25                | 1          | 25  |      |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### Switching Characteristics

over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see [Figure 1](#))

| PARAMETER | FROM<br>(INPUT)                      | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE  | $T_A = 25^\circ\text{C}$ |                    |                     | SN54LV138A <sup>(1)</sup> |                     | SN74LV138A |      | UNIT |
|-----------|--------------------------------------|----------------|----------------------|--------------------------|--------------------|---------------------|---------------------------|---------------------|------------|------|------|
|           |                                      |                |                      | MIN                      | TYP                | MAX                 | MIN                       | MAX                 | MIN        | MAX  |      |
| $t_{pd}$  | A, B, or C                           | Y              | $C_L = 15\text{ pF}$ |                          | 8.1 <sup>(2)</sup> | 11.4 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 13.5 <sup>(2)</sup> | 1          | 13.5 | ns   |
|           | G1                                   |                |                      |                          | 8.4 <sup>(2)</sup> | 12.8 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 15 <sup>(2)</sup>   | 1          | 15   |      |
|           | $\overline{G2A}$ or $\overline{G2B}$ |                |                      |                          | 7.8 <sup>(2)</sup> | 11.4 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 13.5 <sup>(2)</sup> | 1          | 13.5 |      |
| $t_{pd}$  | A, B, or C                           | Y              | $C_L = 50\text{ pF}$ |                          | 10.3               | 15.8                | 1                         | 18                  | 1          | 18   | ns   |
|           | G1                                   |                |                      |                          | 10.6               | 16.3                | 1                         | 18.5                | 1          | 18.5 |      |
|           | G2A or G2B                           |                |                      |                          | 10                 | 14.9                | 1                         | 17                  | 1          | 17   |      |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### Switching Characteristics

over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Figure 1](#))

| PARAMETER | FROM<br>(INPUT)                      | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE  | $T_A = 25^\circ\text{C}$ |                    |                    | SN54LV138A <sup>(1)</sup> |                    | SN74LV138A |      | UNIT |
|-----------|--------------------------------------|----------------|----------------------|--------------------------|--------------------|--------------------|---------------------------|--------------------|------------|------|------|
|           |                                      |                |                      | MIN                      | TYP                | MAX                | MIN                       | MAX                | MIN        | MAX  |      |
| $t_{pd}$  | A, B, or C                           | Y              | $C_L = 15\text{ pF}$ |                          | 5.6 <sup>(2)</sup> | 8.1 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 9.5 <sup>(2)</sup> | 1          | 9.5  | ns   |
|           | G1                                   |                |                      |                          | 5.7 <sup>(2)</sup> | 8.1 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 9.5 <sup>(2)</sup> | 1          | 9.5  |      |
|           | $\overline{G2A}$ or $\overline{G2B}$ |                |                      |                          | 5.4 <sup>(2)</sup> | 8.1 <sup>(2)</sup> | 1 <sup>(2)</sup>          | 9.5 <sup>(2)</sup> | 1          | 9.5  |      |
| $t_{pd}$  | A, B, or C                           | Y              | $C_L = 50\text{ pF}$ |                          | 7                  | 10.1               | 1                         | 11.5               | 1          | 11.5 | ns   |
|           | G1                                   |                |                      |                          | 7.1                | 10.1               | 1                         | 11.5               | 1          | 11.5 |      |
|           | G2A or G2B                           |                |                      |                          | 6.8                | 10.1               | 1                         | 11.5               | 1          | 11.5 |      |

(1) Product Preview

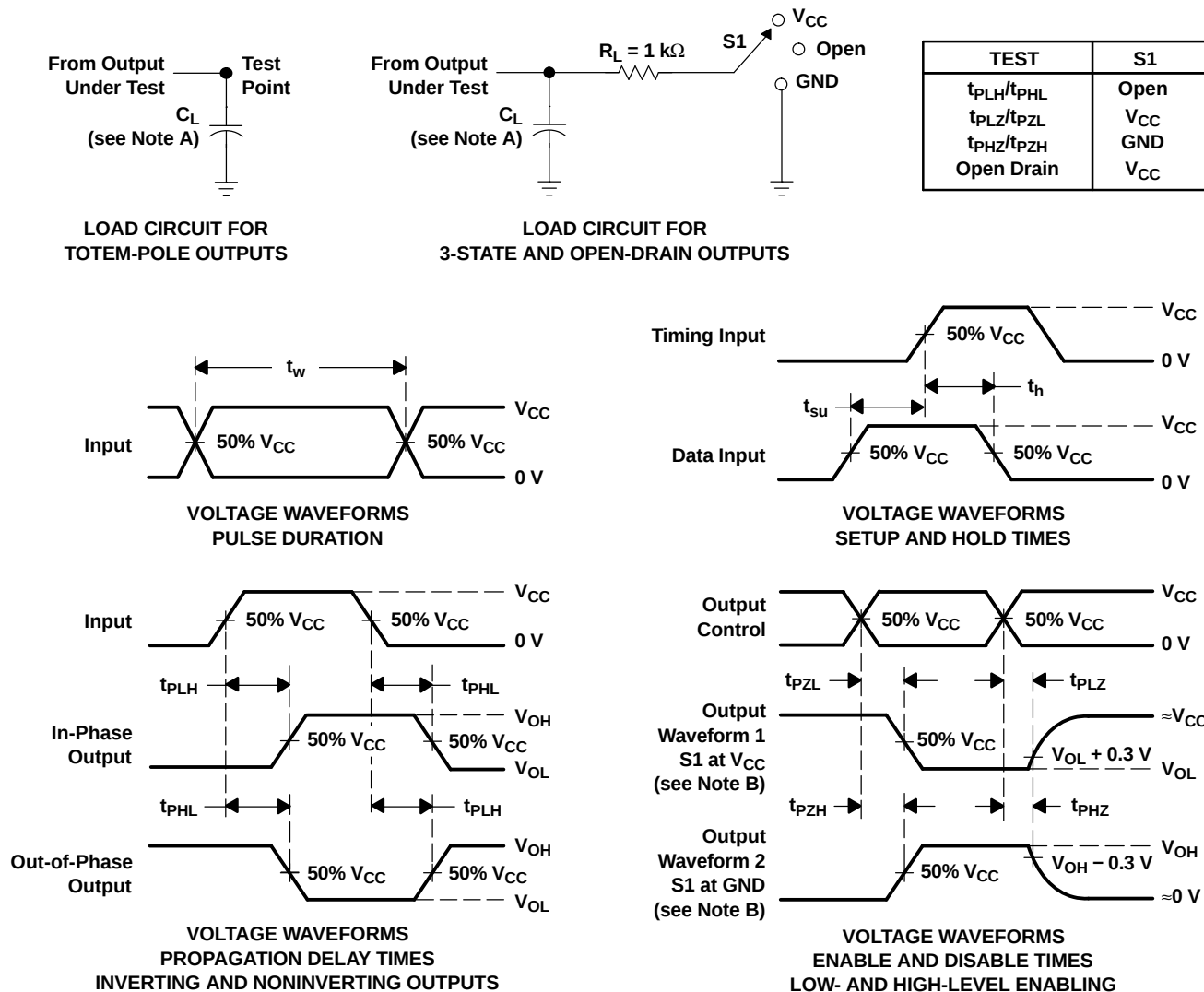
(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### Operating Characteristics

$T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS                            | $V_{CC}$ | TYP  | UNIT |
|-----------|-------------------------------|--------------------------------------------|----------|------|------|
| $C_{pd}$  | Power dissipation capacitance | $C_L = 50\text{ pF}$ , $f = 10\text{ MHz}$ | 3.3 V    | 16.8 | pF   |
|           |                               |                                            | 5 V      | 19.1 |      |

## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
  - The outputs are measured one at a time, with one input transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuits and Voltage Waveforms

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74LV138AD      | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138ADBR    | ACTIVE        | SSOP         | DB                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138ADGVR   | ACTIVE        | TVSOP        | DGV                | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138ADR     | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138ANSR    | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | 74LV138A                | <a href="#">Samples</a> |
| SN74LV138APW     | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138APWG4   | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138APWR    | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138APWRG4  | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138APWT    | ACTIVE        | TSSOP        | PW                 | 16   | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | LV138A                  | <a href="#">Samples</a> |
| SN74LV138ARGYR   | ACTIVE        | VQFN         | RGY                | 16   | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | LV138A                  | <a href="#">Samples</a> |

(1) 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.

(2) **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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish 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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LV138ADGVR  | TVSOP        | DGV             | 16   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138ADR    | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LV138ANSR   | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LV138APWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138APWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138APWRG4 | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138APWT   | TSSOP        | PW              | 16   | 250  | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138ARGYR  | VQFN         | RGY             | 16   | 3000 | 330.0              | 12.4               | 3.8     | 4.3     | 1.5     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LV138ADGVR  | TVSOP        | DGV             | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74LV138ADR    | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74LV138ANSR   | SO           | NS              | 16   | 2000 | 367.0       | 367.0      | 38.0        |
| SN74LV138APWR   | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74LV138APWR   | TSSOP        | PW              | 16   | 2000 | 364.0       | 364.0      | 27.0        |
| SN74LV138APWRG4 | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74LV138APWT   | TSSOP        | PW              | 16   | 250  | 367.0       | 367.0      | 35.0        |
| SN74LV138ARGYR  | VQFN         | RGY             | 16   | 3000 | 367.0       | 367.0      | 35.0        |

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

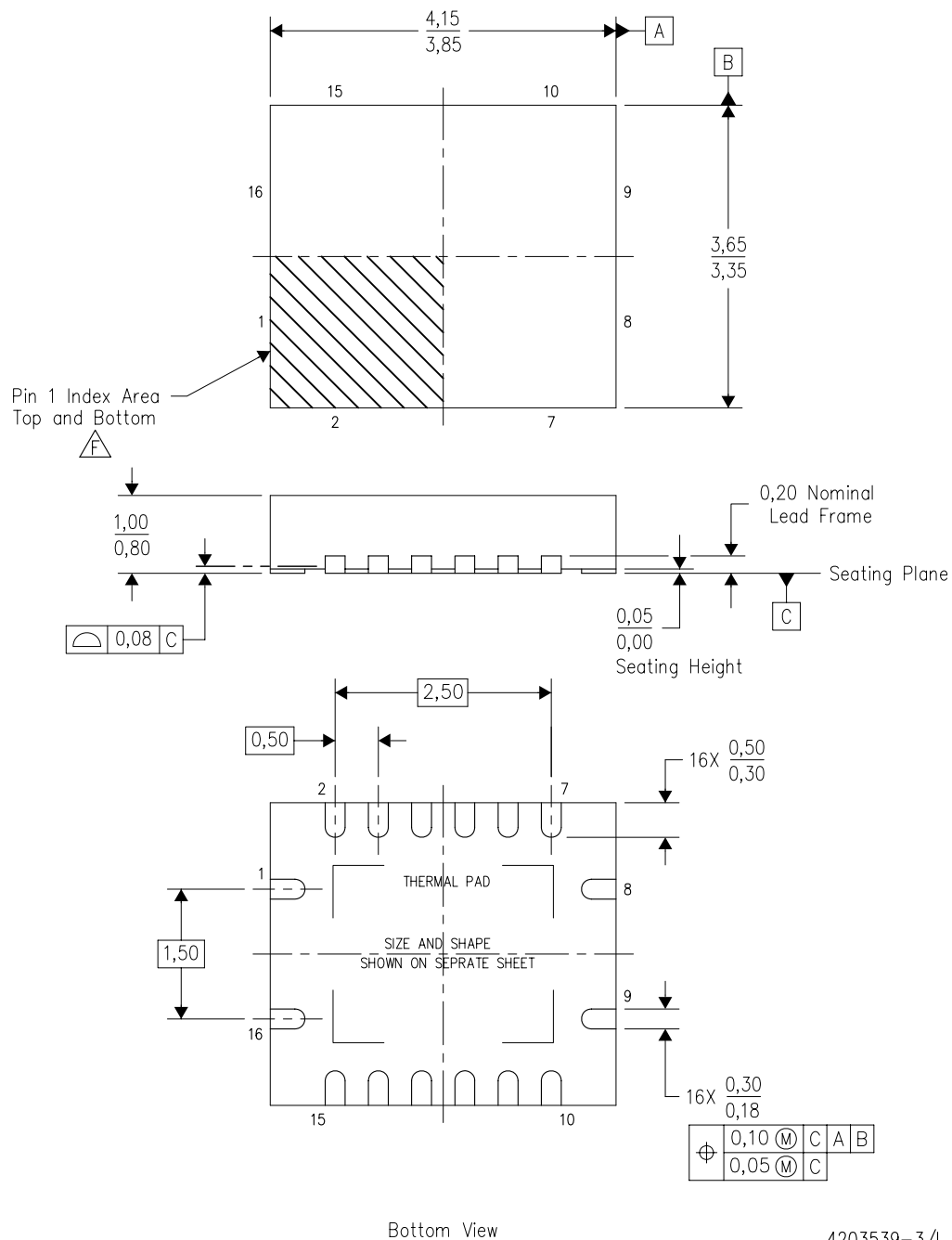
28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
- F** Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
- Package complies to JEDEC MO-241 variation BA.

RGY (R-PVQFN-N16)

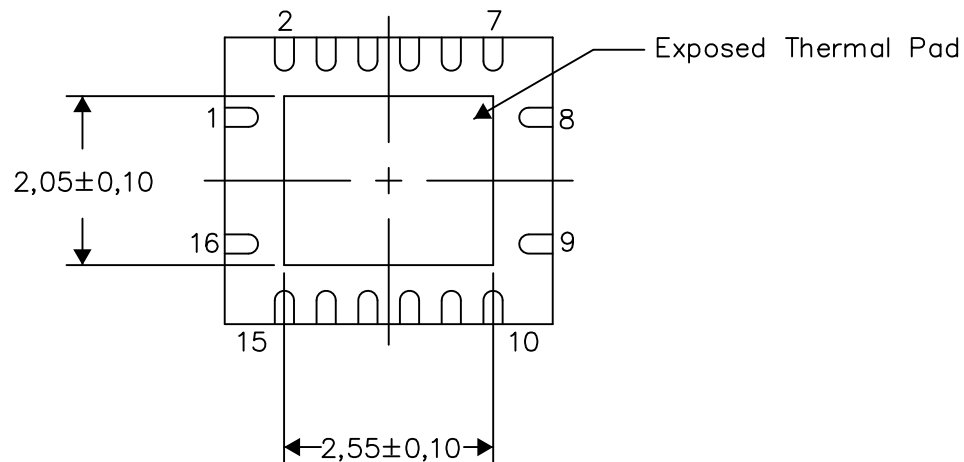
PLASTIC QUAD FLATPACK NO-LEAD

## THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.

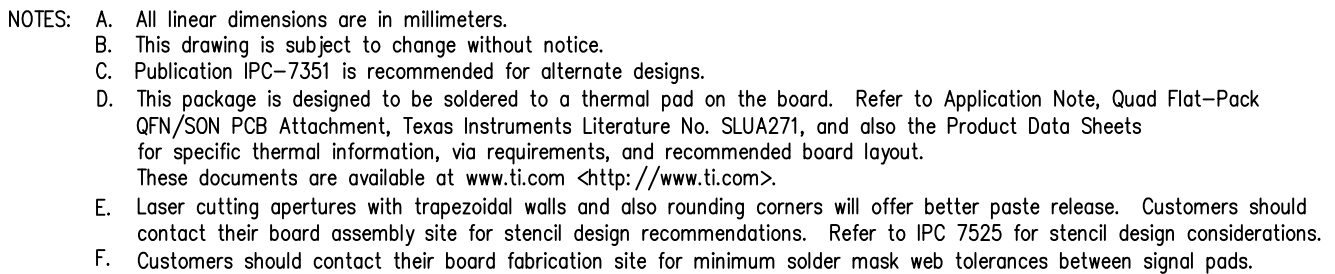


Bottom View

Exposed Thermal Pad Dimensions

4206353-3/P 03/14

NOTE: All linear dimensions are in millimeters



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



## NOTES:

- A. All linear dimensions are in inches (millimeters).
- 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 0.006 (0,15) each side.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

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.



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## NOTES:

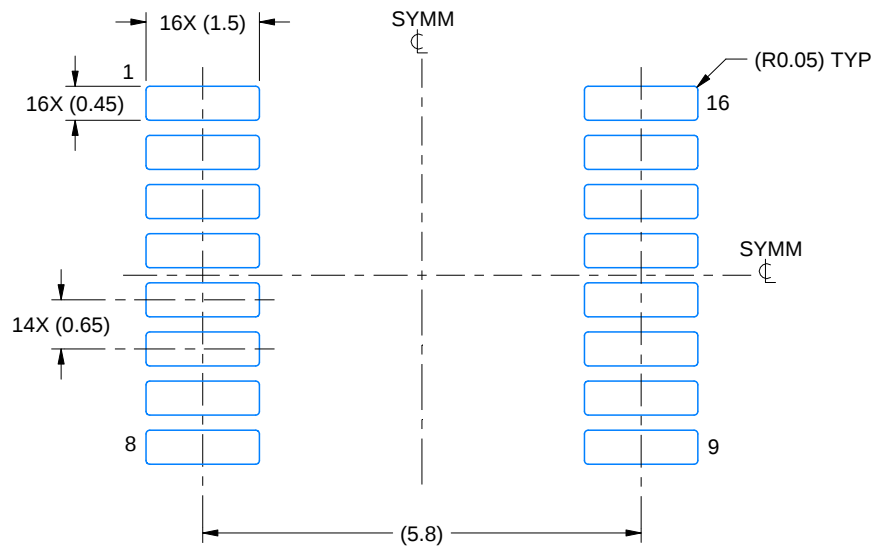
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

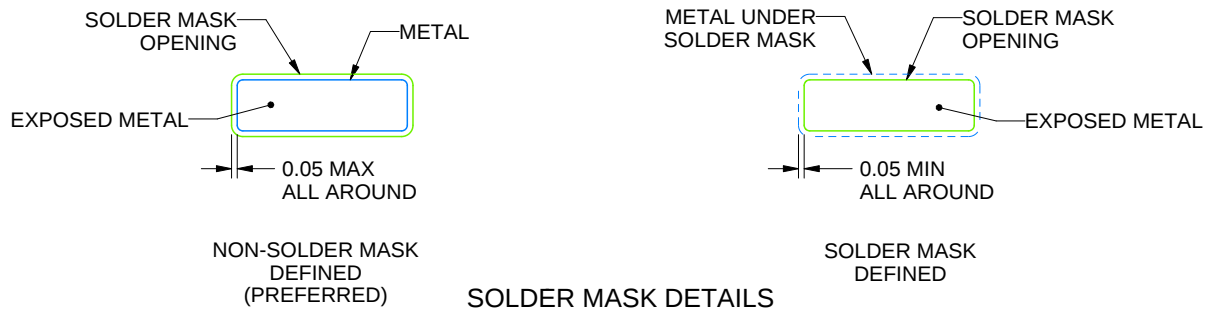
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

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