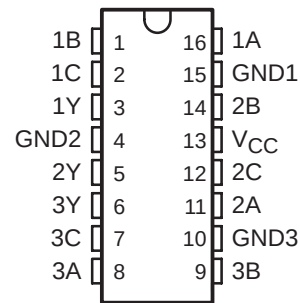


# TL52055

## WIDE-BANDWIDTH, 2-INPUT, 1-OUTPUT 3-CIRCUIT VIDEO SWITCH

SCDS169A – MAY 2004 – REVISED APRIL 2005

- Functionally Similar to M52055, NJM2283, MM1231, and BA7602
- $V_{CC}$  Operating Range From 4.5 V to 9 V
- Wide Frequency Range (0 dB at 40 MHz,  $V_{CC} = 5$  V)
- Crosstalk (–75 dB at 4.43 MHz)
- BiCMOS Technology
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Performance Tested Per JESD 22
  - 2000-V Human-Body Model (A114-B, Class II)
  - 1000-V Charged-Device Model (C101)
- Applications
  - Digital TV, LCD TV, PDP TV, and CRT TV
  - VCR, Projector, and DVD Player

D OR PW PACKAGE  
(TOP VIEW)

### description/ordering information

The TL52055 is a wide-bandwidth, 2-input, 1-output, 3-circuit video switch. All inputs are bias types. The select (1C, 2C, 3C) inputs control the signal path of A port and B port. The device can be used for switching separate video signals and component-video signals and is suitable for DTV, LCD, PDP, and other high-quality AV systems. The device provides no loss (0 dB) up to 40 MHz and has a very low crosstalk.

### ORDERING INFORMATION

| $T_A$         | PACKAGE <sup>†</sup> |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|----------------------|---------------|-----------------------|------------------|
| –40°C to 85°C | SOIC – D             | Tube          | TL52055D              | TL52055          |
|               |                      | Tape and reel | TL52055DR             |                  |
|               | TSSOP – PW           | Tape and reel | TL52055PWR            | ZA055            |

<sup>†</sup> 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).

### FUNCTION TABLE

| INPUT C | ON CHANNEL       |
|---------|------------------|
| L       | A port to Y port |
| H       | B port to Y port |
| OPEN    | A port to Y port |



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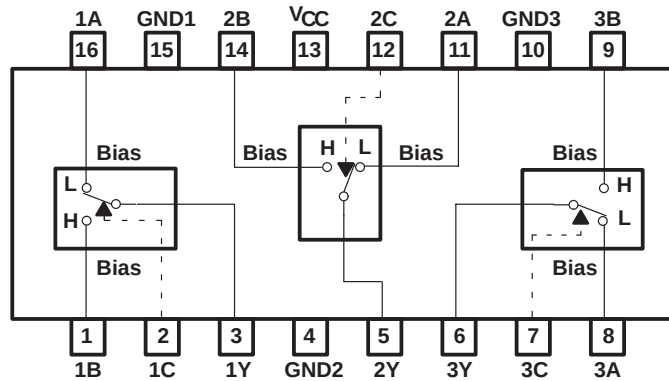
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**TL52055****WIDE-BANDWIDTH, 2-INPUT, 1-OUTPUT  
3-CIRCUIT VIDEO SWITCH**

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**block diagram****absolute maximum ratings over operating free-air temperature (unless otherwise noted)<sup>†</sup>**Supply voltage range,  $V_{CC}$  ..... -0.3 V to 12 VPackage thermal impedance,  $\theta_{JA}$  (see Note 1): D package ..... 73°C/W

PW package ..... 108°C/W

Storage temperature range,  $T_{stg}$  ..... -65°C to 150°C

<sup>†</sup> 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.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions**

|                                      | MIN | MAX | UNIT |
|--------------------------------------|-----|-----|------|
| $V_{CC}$ Supply voltage              | 4.5 | 9   | V    |
| $T_A$ Operating free-air temperature | -40 | 85  | °C   |

# TL52055

## WIDE-BANDWIDTH, 2-INPUT, 1-OUTPUT 3-CIRCUIT VIDEO SWITCH

SCDS169A – MAY 2004 – REVISED APRIL 2005

electrical characteristics  $V_{CC} = 5\text{ V}/9\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Note 2)

| PARAMETER                                            | TEST CONDITION                                                      | MIN  | TYP  | MAX      | UNIT       |
|------------------------------------------------------|---------------------------------------------------------------------|------|------|----------|------------|
| $I_{CC1}$ Operating current 1                        | $V_{CC} = 9\text{ V}$ , No signal                                   |      | 10.3 | 14       | mA         |
| $I_{CC2}$ Operating current 2                        | $V_{CC} = 5\text{ V}$ , No signal                                   |      | 9.4  | 12       | mA         |
| $f_f$ Frequency bandwidth                            | $V_{CC} = 5\text{ V}$ , $V_{IN} = 1\text{ V}_{P-P}$                 |      | 40   |          | MHz        |
| $G_V$ Voltage gain                                   | $F_{IN} = 1, 10\text{ MHz}$ , $V_{IN} = 1\text{ V}_{P-P}$           | -0.6 | -0.1 | 0.4      | dB         |
| $G_F^\ddagger$ Flatness of voltage gain              | $F_{IN} = 30\text{ MHz}/1\text{ MHz}$ , $V_{IN} = 1\text{ V}_{P-P}$ |      | 0    |          | dB         |
| $CT_{SW}^\S$ Switch crosstalk                        | $F_{IN} = 4.43\text{ MHz}$ , $V_{IN} = 1\text{ V}_{P-P}$            | -75  |      | -60      | dB         |
| $CT_{CH}^\P$ Channel crosstalk                       | $F_{IN} = 4.43\text{ MHz}$ , $V_{IN} = 1\text{ V}_{P-P}$            | -75  |      | -60      | dB         |
| $D_G$ Differential gain                              | $V_{IN} = 1\text{ V}_{P-P}$ , 10-step video signal                  |      | 0.3  |          | %          |
| $D_P$ Differential phase                             | $V_{IN} = 1\text{ V}_{P-P}$ , 10-step video signal                  |      | 0.3  |          | deg        |
| $V_{OS}$ Output offset voltage                       |                                                                     | -10  | 0    | 10       | mV         |
| $Z_I$ Input impedance                                |                                                                     |      | 20   |          | k $\Omega$ |
| $V_{IH}$ High-level control input voltage (C inputs) | $V_{CC} = 5\text{ V}$ and $9\text{ V}$                              | 2    |      | $V_{CC}$ | V          |
| $V_{IL}$ Low-level control input voltage (C inputs)  | $V_{CC} = 5\text{ V}$ and $9\text{ V}$                              | 0    |      | 0.8      | V          |

<sup>†</sup> Frequency bandwidth is defined as the maximum frequency, with 0-dB gain.<sup>‡</sup>  $G_F$  is the difference of  $G_V$  at 30 MHz and at 1 MHz.<sup>§</sup> Switch crosstalk is defined as the crosstalk from an ON-channel to an OFF-channel (xA to xB).<sup>¶</sup> Channel crosstalk is defined as the crosstalk between two ON-channels (1Y to 2Y, 2Y to 3Y).

NOTE 2: All unused inputs of the device must be open or connected to GND through a capacitor to ensure proper device operation.

# TL52055

## WIDE-BANDWIDTH, 2-INPUT, 1-OUTPUT

### 3-CIRCUIT VIDEO SWITCH

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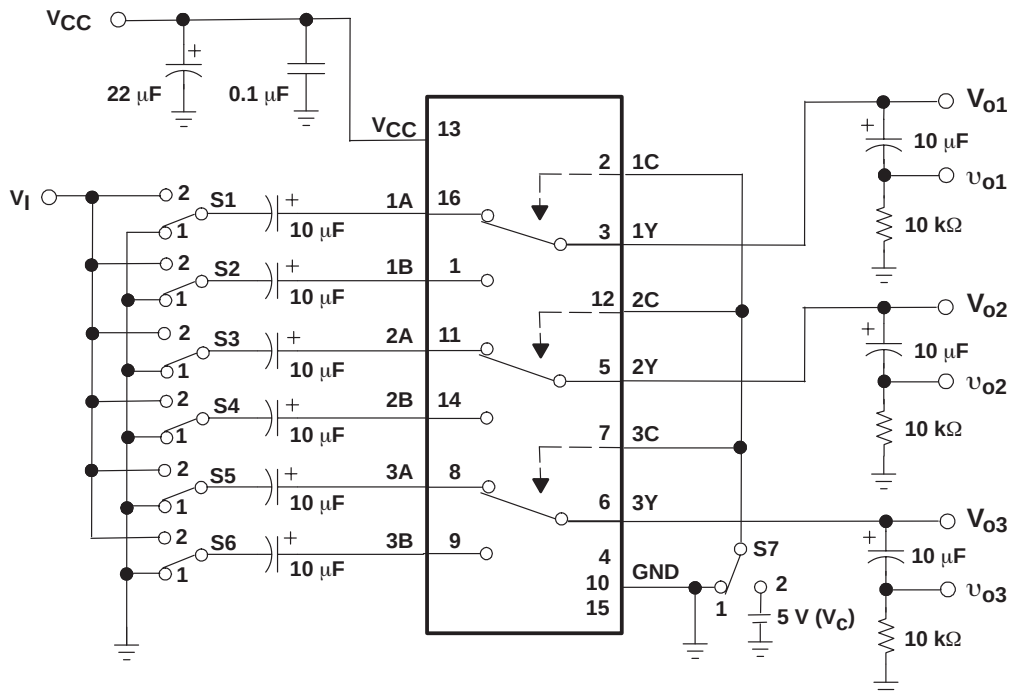
equivalent circuit,  $V_{CC} = 5\text{ V}$  (9 V)<sup>†</sup>

| PIN NO.                       | PIN NAME                         | INSIDE EQUIVALENT CIRCUIT | VOLTAGE                       | NOTE    |
|-------------------------------|----------------------------------|---------------------------|-------------------------------|---------|
| 16<br>1<br>11<br>14<br>8<br>9 | 1A<br>1B<br>2A<br>2B<br>3A<br>3B |                           | 2.9 V<br>(5.2 V) <sup>†</sup> | Input   |
| 3<br>5<br>6                   | 1Y<br>2Y<br>3Y                   |                           | 2.1 V<br>(4.4 V) <sup>†</sup> | Output  |
| 2<br>12<br>7                  | 1C<br>2C<br>3C                   |                           |                               | Control |
| 13                            | $V_{CC}$                         |                           |                               |         |
| 15<br>4<br>10                 | GND1<br>GND2<br>GND3             |                           |                               |         |

<sup>†</sup> Voltages in parentheses are associated with  $V_{CC} = 9\text{ V}$ .

<sup>‡</sup>  $V_{BIAS}$  is an internal voltage source.

## PARAMETER MEASUREMENT INFORMATION



| SYMBOL                           | S1  | S2  | S3 | S4 | S5 | S6 | S7             | MEASUREMENT POINT                                   |
|----------------------------------|-----|-----|----|----|----|----|----------------|-----------------------------------------------------|
| I <sub>CC1</sub>                 | 1   | 1   | 1  | 1  | 1  | 1  | 1              | V <sub>CC</sub>                                     |
| I <sub>CC2</sub>                 | 1   | 1   | 1  | 1  | 1  | 1  | 1              |                                                     |
| G <sub>F</sub>                   | 2   | 1   | 1  | 1  | 1  | 1  | 1              | v <sub>01</sub> , v <sub>02</sub> , v <sub>03</sub> |
| G <sub>V</sub>                   | 2   | 1   | 1  | 1  | 1  | 1  | 1              |                                                     |
| D <sub>G</sub> /D <sub>p</sub>   | 2   | 1   | 1  | 1  | 1  | 1  | 1              |                                                     |
| CT <sub>SW1</sub>                | 2   | 1   | 1  | 1  | 1  | 1  | 2              | v <sub>01</sub>                                     |
| CT <sub>SW2</sub>                | 1   | 2   | 1  | 1  | 1  | 1  | 1              |                                                     |
| CT <sub>SW3</sub>                | 1   | 1   | 2  | 1  | 1  | 1  | 2              | v <sub>02</sub>                                     |
| CT <sub>SW4</sub>                | 1   | 1   | 1  | 2  | 1  | 1  | 1              |                                                     |
| CT <sub>SW5</sub>                | 1   | 1   | 1  | 1  | 2  | 1  | 2              | v <sub>03</sub>                                     |
| CT <sub>SW6</sub>                | 1   | 1   | 1  | 1  | 1  | 2  | 1              |                                                     |
| CT <sub>CH1</sub>                | 2   | 1   | 1  | 1  | 1  | 1  | 1              | v <sub>02</sub> , v <sub>03</sub>                   |
|                                  | 1   | 2   | 1  | 1  | 1  | 1  | 2              |                                                     |
| CT <sub>CH2</sub>                | 1   | 1   | 2  | 1  | 1  | 1  | 1              | v <sub>01</sub> , v <sub>03</sub>                   |
|                                  | 1   | 1   | 1  | 2  | 1  | 1  | 2              |                                                     |
| CT <sub>CH3</sub>                | 1   | 1   | 1  | 1  | 2  | 1  | 1              | v <sub>01</sub> , v <sub>02</sub>                   |
|                                  | 1   | 1   | 1  | 1  | 1  | 2  | 2              |                                                     |
| V <sub>OS</sub>                  | 1   | 1   | 1  | 1  | 1  | 1  | 1/2            | V <sub>01</sub> , V <sub>02</sub> , V <sub>03</sub> |
| V <sub>IH</sub> /V <sub>IL</sub> | 1/2 | 1/2 | 1  | 1  | 1  | 1  | V <sub>C</sub> | V <sub>C</sub>                                      |

Figure 1. Load Circuit and Test Conditions

# TYPICAL CHARACTERISTICS

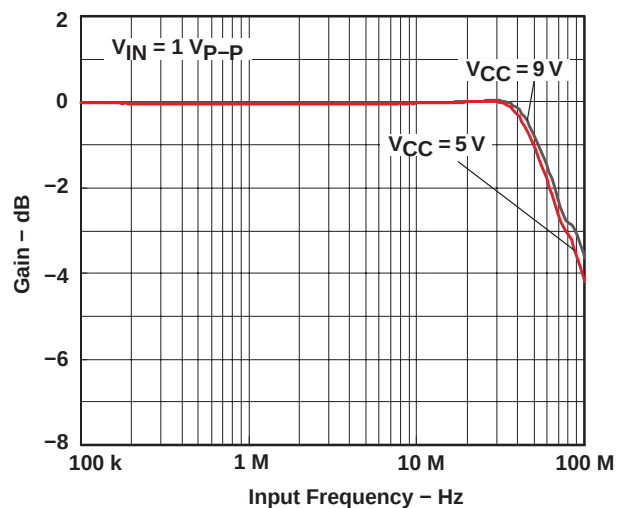


Figure 2. Gain vs Frequency

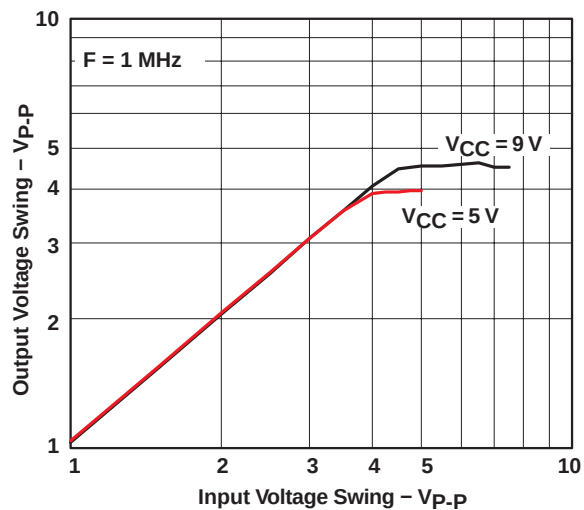


Figure 3. Output Voltage Swing vs Input Voltage Swing

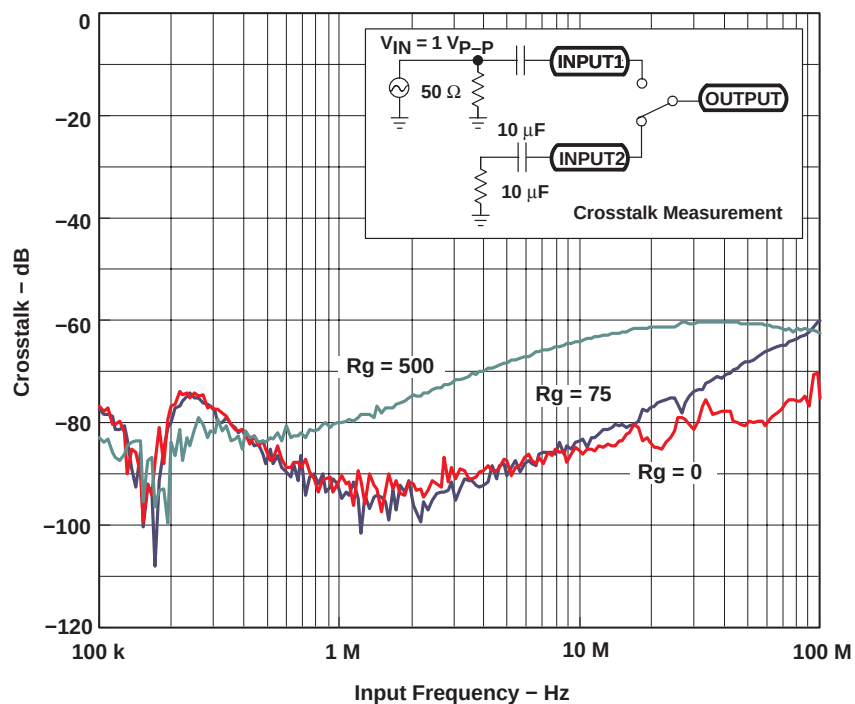


Figure 4. Crosstalk vs Frequency

## APPLICATION INFORMATION

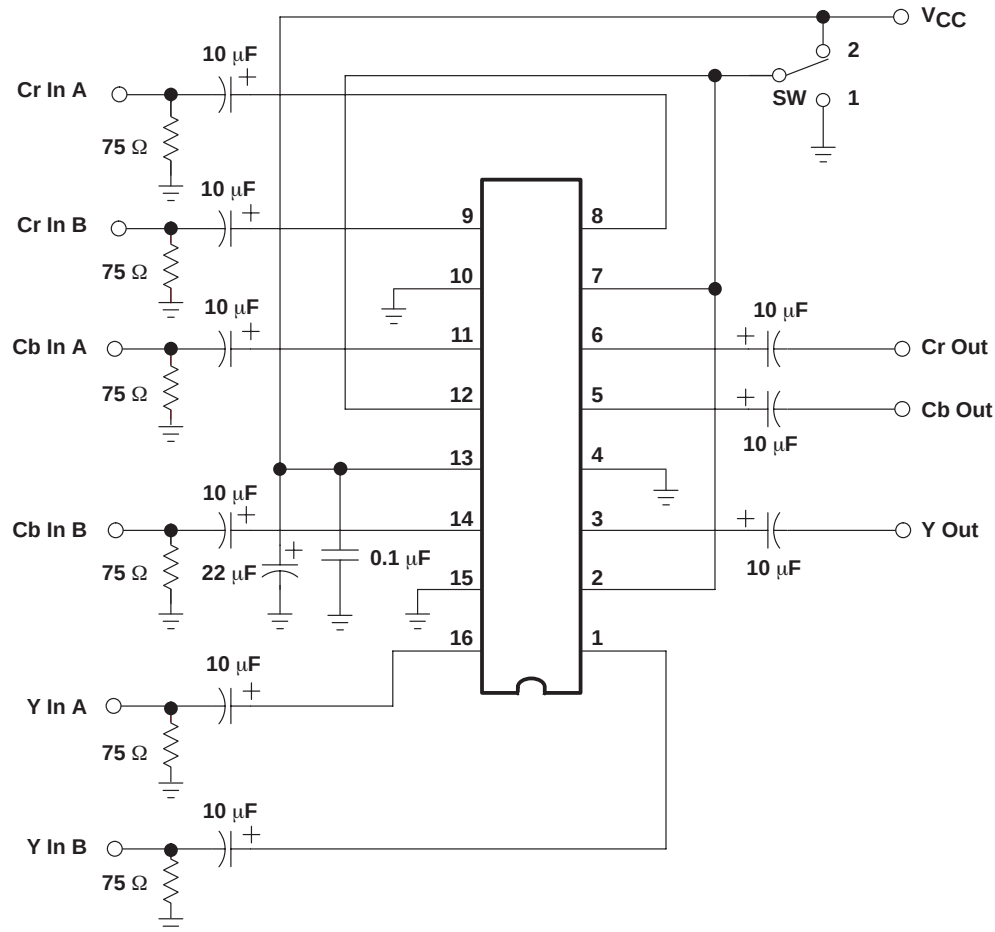


Figure 5. Application of TL52055

Figure 5 shows a typical application of the TL52055 in component-video signaling. Typically, the peak-to-peak amplitude of a component-video signal is less than 1 V. If the frequency of operation is less than 40 MHz, the switch does not cause any loss of signal. Also, due to low crosstalk, there is no degradation of the video switch.

## USAGE NOTES

1. When using this device, the output drive current should be 5 mA or less.
2. Voltage applied to the control pins (2, 7, and 12) should be less than the power supply voltage ( $V_{CC}$ ) and greater than the ground voltage (GND).
3. The types of output pins for this device are emitter follower. The drive current list below is applied inside the device. If the drive performance is insufficient, apply external drive current within the range in step 1.

| Power-Supply Voltage ( $V_{CC}$ ) | Drive Current in the Device (standard value) |
|-----------------------------------|----------------------------------------------|
| 5 V                               | 1 mA                                         |
| 9 V                               | 1 mA                                         |

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2) | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples |
|------------------|---------------|--------------|--------------------|------|-------------|-----------------|------------------|----------------------|--------------|--------------------------|---------|
| TL52055DR        | OBSOLETE      | SOIC         | D                  | 16   |             | TBD             | Call TI          | Call TI              | -40 to 85    | TL52055                  |         |
| TL52055DRE4      | OBSOLETE      | SOIC         | D                  | 16   |             | TBD             | Call TI          | Call TI              | -40 to 85    |                          |         |
| TL52055DRG4      | OBSOLETE      | SOIC         | D                  | 16   |             | TBD             | Call TI          | Call TI              | -40 to 85    |                          |         |
| TL52055PWR       | OBSOLETE      | TSSOP        | PW                 | 16   |             | TBD             | Call TI          | Call TI              | -40 to 85    | ZA055                    |         |
| TL52055PWRE4     | OBSOLETE      | TSSOP        | PW                 | 16   |             | TBD             | Call TI          | Call TI              | -40 to 85    |                          |         |
| TL52055PWRG4     | OBSOLETE      | TSSOP        | PW                 | 16   |             | TBD             | Call TI          | Call TI              | -40 to 85    |                          |         |

(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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

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**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) Only one of markings shown within the brackets will appear on the physical device.

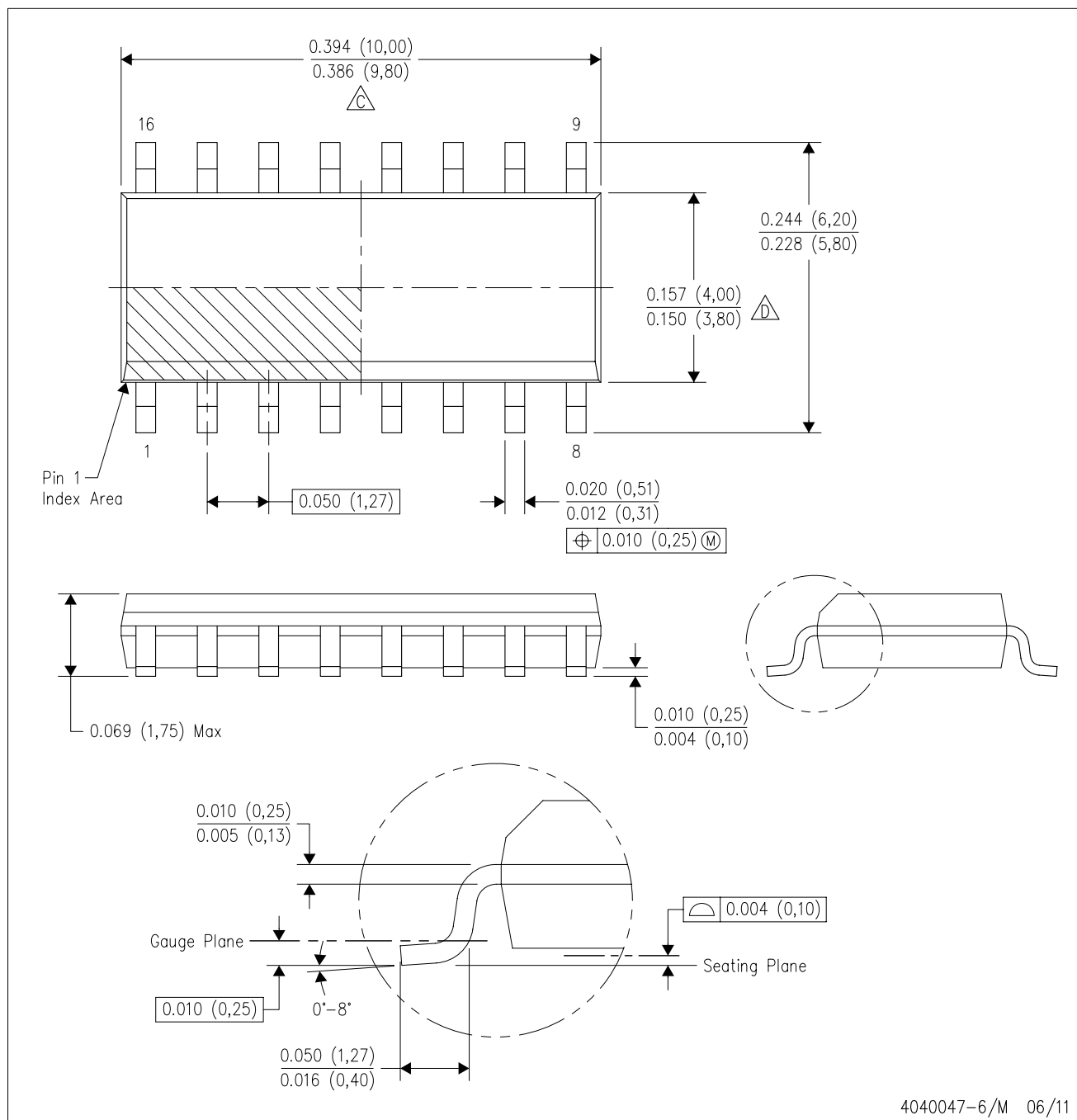
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D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



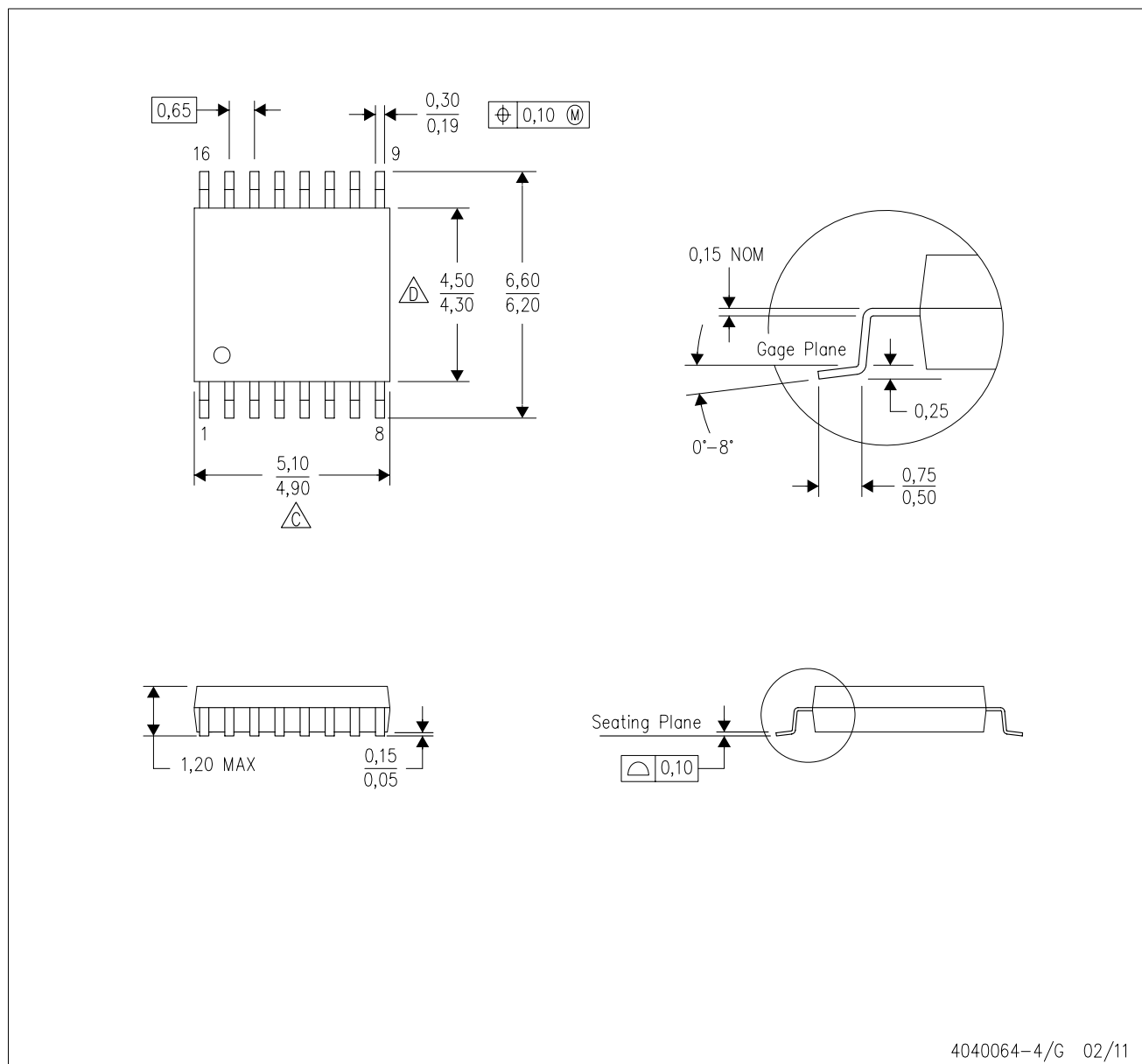
4040047-6/M 06/11

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.

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040064-4/G 02/11

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  - 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

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