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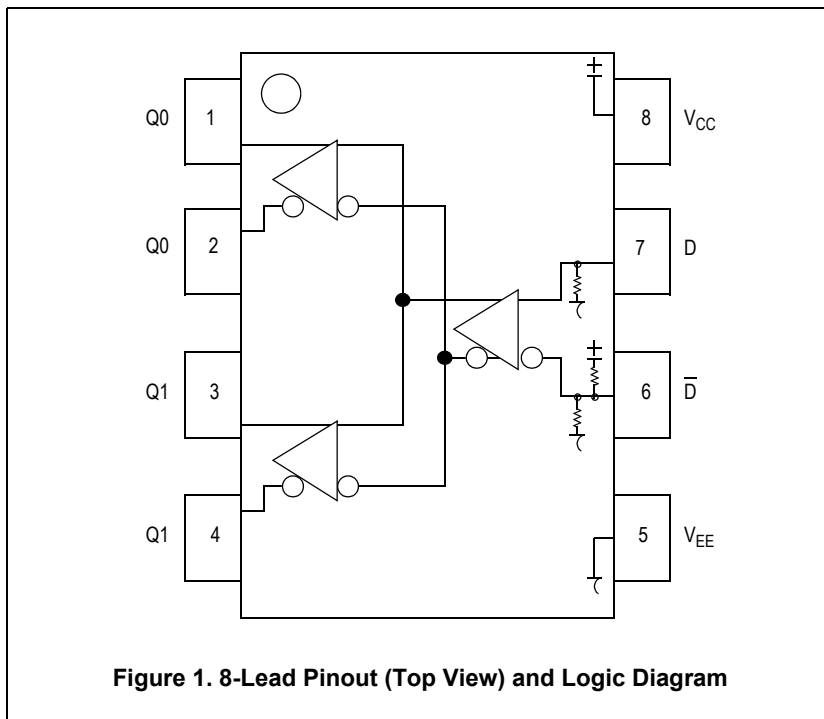
## 2.5 V/3.3 V ECL 1:2 Differential Fanout Buffer

The MC100ES6011 is a differential 1:2 fanout buffer. The ES6011 is ideal for applications requiring lower voltage.

The 100ES Series contains temperature compensation.

### Features

- 270 ps Typical Propagation Delay
- Maximum Frequency > 3 GHz Typical
- PECL Mode Operating Range:  $V_{CC} = 2.375\text{ V to }3.8\text{ V}$  with  $V_{EE} = 0\text{ V}$
- ECL Mode Operating Range:  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -2.375\text{ V to }-3.8\text{ V}$
- Open Input Default State
- Q Output Will Default LOW with Inputs Open or at  $V_{EE}$
- LVDS Input Compatible
- 8-Lead SOIC and TSSOP Pb-Free Packages Available



## MC100ES6011

**D SUFFIX**  
 8-LEAD SOIC PACKAGE  
 CASE 751-07

**EF SUFFIX**  
 8-LEAD SOIC PACKAGE  
 Pb-FREE PACKAGE  
 CASE 751-07

**DT SUFFIX**  
 8-LEAD TSSOP PACKAGE  
 CASE 1640-01

**EJ SUFFIX**  
 8-LEAD TSSOP PACKAGE  
 Pb-FREE PACKAGE  
 CASE 1640-01

### ORDERING INFORMATION

| Device          | Package           |
|-----------------|-------------------|
| MC100ES6011D    | SO-8              |
| MC100ES6011DR2  | SO-8              |
| MC100ES6011EF   | SO-8 (Pb-Free)    |
| MC100ES6011EFR2 | SO-8 (Pb-Free)    |
| MC100ES6011DT   | TSSOP-8           |
| MC100ES6011DTR2 | TSSOP-8           |
| MC100ES6011EJ   | TSSOP-8 (Pb-Free) |
| MC100ES6011EJR2 | TSSOP-8 (Pb-Free) |

### PIN DESCRIPTION

| Pin                                 | Function         |
|-------------------------------------|------------------|
| D <sup>(1)</sup> , D <sup>(2)</sup> | ECL Data Inputs  |
| Q0, Q0, Q1, Q1                      | ECL Data Outputs |
| V <sub>CC</sub>                     | Positive Supply  |
| V <sub>EE</sub>                     | Negative Supply  |

1. Pins will default LOW when left open.
2. Pins will default to  $0.572 V_{CC}/2$  when left open.

**Table 1. Attributes**

| Characteristics  |                                    | Value              |
|--|------------------------------------|--------------------|
| Internal Input Pulldown Resistor                       |                                    | 75 k $\Omega$      |
| Internal Input Pullup Resistor                         |                                    | 56 k $\Omega$      |
| ESD Protection   | Human Body Model                   | > 4000 V           |
|  | Machine Model                      | > 200 V            |
|  | Charged Device Model               | > 1500 V           |
| $\theta_{JA}$ Thermal Resistance (Junction to Ambient) | 0 LFPM, 8 SOIC<br>500 LFPM, 8 SOIC | 190°C/W<br>130°C/W |

Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test

**Table 2. Maximum Ratings<sup>(1)</sup>**

| Symbol       | Parameter                   | Conditions                             | Rating                           | Units    |
|--------------|-----------------------------|--|----------------------------------|----------|
| $V_{SUPPLY}$ | Power Supply Voltage        | Difference between $V_{CC}$ & $V_{EE}$ | 3.9                              | V        |
| $V_{IN}$     | Input Voltage               | $V_{CC}-V_{EE} < 3.6$ V                | $V_{CC} + 0.3$<br>$V_{EE} - 0.3$ | V<br>V   |
| $I_{OUT}$    | Output Current              | Continuous<br>Surge                    | 50<br>100                        | mA<br>mA |
| $T_A$        | Operating Temperature Range |  | -40 to +85                       | °C       |
| $T_{stg}$    | Storage Temperature Range   |  | -65 to +150                      | °C       |

1. Absolute maximum continuous ratings are those maximum values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation at absolute-maximum-rated conditions is not implied.

**Table 3. DC Characteristics ( $V_{CC} = 0$  V;  $V_{EE} = -2.5$  V  $\pm$  5% or  $V_{CC} = 2.5$  V  $\pm$  5%;  $V_{EE} = 0$  V)<sup>(1)</sup>**

| Symbol      | Characteristic                                  | -40°C          |     |                | 0°C to 85°C    |     |                | Unit    |
|-------------|---|----------------|-----|----------------|----------------|-----|----------------|---------|
|             |   | Min            | Typ | Max            | Min            | Typ | Max            |         |
| $I_{EE}$    | Power Supply Current                            |                | 12  | 25             |                | 12  | 25             | mA      |
| $V_{OH}$    | Output HIGH Voltage <sup>(2)</sup>              | $V_{CC}-1135$  |     | $V_{CC}-760$   | $V_{CC}-1070$  |     | $V_{CC}-760$   | mV      |
| $V_{OL}$    | Output LOW Voltage <sup>(2)</sup>               | $V_{CC}-1950$  |     | $V_{CC}-1350$  | $V_{CC}-1950$  |     | $V_{CC}-1520$  | mV      |
| $V_{OUTPP}$ | Output Peak-to-Peak Voltage                     | 200            |     |                | 200            |     |                | mV      |
| $V_{IH}$    | Input HIGH Voltage (Single Ended)               | $V_{CC}-1165$  |     | $V_{CC}-880$   | $V_{CC}-1165$  |     | $V_{CC}-880$   | mV      |
| $V_{IL}$    | Input LOW Voltage (Single Ended)                | $V_{CC}-1810$  |     | $V_{CC}-1475$  | $V_{CC}-1810$  |     | $V_{CC}-1475$  | mV      |
| $V_{PP}$    | Differential Input Voltage <sup>(3)</sup>       | 0.12           |     | 1.3            | 0.12           |     | 1.3            | V       |
| $V_{CMR}$   | Differential Cross Point Voltage <sup>(4)</sup> | $V_{EE} + 1.0$ |     | $V_{CC} - 0.8$ | $V_{EE} + 1.0$ |     | $V_{CC} - 0.8$ | V       |
| $I_{IN}$    | Input Current                                   |                |     | $\pm 150$      |                |     | $\pm 150$      | $\mu$ A |

- ES6011 circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow > 500 LFPM is maintained.
- Output termination voltage  $V_{TT} = 0$  V for  $V_{CC} = 2.5$  V operation is supported but the power consumption of the device will increase.
- $V_{PP}$  (DC) is the minimum differential input voltage swing required to maintain device functionality.
- $V_{CMR}$  (DC) is the crosspoint of the differential input signal. Functional operation is obtained when the crosspoint is within the  $V_{CMR}$  (DC) range and the input swing lies within the  $V_{PP}$  (DC) specification.

**Table 4. DC Characteristics** ( $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.8\text{ to }-3.135\text{ or }V_{CC} = 3.8\text{ to }3.135\text{ V}$ ;  $V_{EE} = 0\text{ V}$ )<sup>(1)</sup>

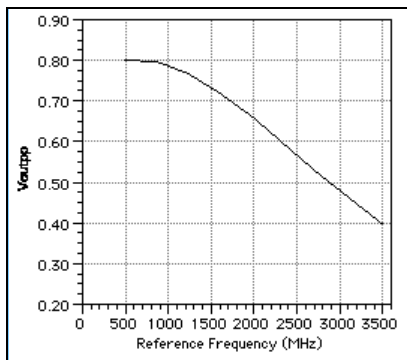
| Symbol      | Characteristic                                  | -40°C         |     |               | 0°C to 85°C   |     |               | Unit          |
|-------------|---|---------------|-----|---------------|---------------|-----|---------------|---------------|
|             |   | Min           | Typ | Max           | Min           | Typ | Max           |               |
| $I_{EE}$    | Power Supply Current                            |               | 12  | 25            |               | 12  | 25            | mA            |
| $V_{OH}$    | Output HIGH Voltage <sup>(2)</sup>              | $V_{CC}-1135$ |     | $V_{CC}-760$  | $V_{CC}-1070$ |     | $V_{CC}-760$  | mV            |
| $V_{OL}$    | Output LOW Voltage <sup>(2)</sup>               | $V_{CC}-1950$ |     | $V_{CC}-1500$ | $V_{CC}-1950$ |     | $V_{CC}-1520$ | mV            |
| $V_{OUTPP}$ | Output Peak-to-Peak Voltage                     | 200           |     |               | 200           |     |               | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single Ended)               | $V_{CC}-1165$ |     | $V_{CC}-880$  | $V_{CC}-1165$ |     | $V_{CC}-880$  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single Ended)                | $V_{CC}-1810$ |     | $V_{CC}-1475$ | $V_{CC}-1810$ |     | $V_{CC}-1475$ | mV            |
| $V_{PP}$    | Differential Input Voltage <sup>(3)</sup>       | 0.12          |     | 1.3           | 0.12          |     | 1.3           | V             |
| $V_{CMR}$   | Differential Cross Point Voltage <sup>(4)</sup> | $V_{EE}+1.0$  |     | $V_{CC}-0.8$  | $V_{EE}+1.0$  |     | $V_{CC}-0.8$  | V             |
| $I_{IN}$    | Input Current                                   |               |     | $\pm 150$     |               |     | $\pm 150$     | $\mu\text{A}$ |

- ES6011 circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow > 500 LFPM is maintained.
- Output termination voltage  $V_{TT} = 0\text{ V}$  for  $V_{CC} = 2.5\text{ V}$  operation is supported but the power consumption of the device will increase.
- $V_{PP}$  (DC) is the minimum differential input voltage swing required to maintain device functionality.
- $V_{CMR}$  (DC) is the crosspoint of the differential input signal. Functional operation is obtained when the crosspoint is within the  $V_{CMR}$  (DC) range and the input swing lies within the  $V_{PP}$  (DC) specification.

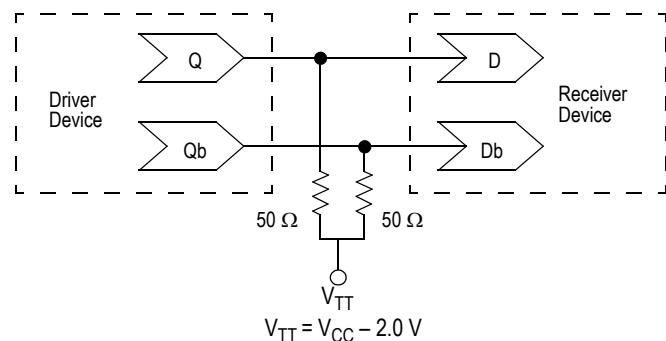
**Table 5. AC Characteristics** ( $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.8\text{ to }-2.375\text{ or }V_{CC} = 2.375\text{ to }3.8\text{ V}$ ;  $V_{EE} = 0\text{ V}$ )<sup>(1)</sup>

| Symbol                   | Characteristic  | -40°C        |     |              | 25°C         |     |              | 0°C to 85°C  |     |              | Unit |
|--------------------------|---|--------------|-----|--------------|--------------|-----|--------------|--------------|-----|--------------|------|
|                          |   | Min          | Typ | Max          | Min          | Typ | Max          | Min          | Typ | Max          |      |
| $f_{MAX}$                | Maximum Frequency   |              | > 3 |              | > 3          |     |              | > 3          |     |              | GHz  |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay (Differential)<br>CLK to Q, $\bar{Q}$                 | 170          | 260 | 300          | 180          | 270 | 310          | 210          | 285 | 360          | ps   |
| $t_{SKEW}$               | Within Device Skew Q, $\bar{Q}$<br>Device-to-Device Skew <sup>(2)</sup> |              | 9   | 20<br>130    |              | 9   | 20<br>130    |              | 9   | 20<br>150    | ps   |
| $t_{JITTER}$             | Cycle-to-Cycle Jitter RMS ( $1\sigma$ )                                 |              |     | 1            |              |     | 1            |              |     | 1            | ps   |
| $V_{PP}$                 | Input Voltage Swing<br>(Differential)                                   | 150          |     | 1200         | 150          |     | 1200         | 150          |     | 1200         | mV   |
| $V_{CMR}$                | Differential Cross Point Voltage  | $V_{EE}+1.2$ |     | $V_{CC}-1.1$ | $V_{EE}+1.2$ |     | $V_{CC}-1.1$ | $V_{EE}+1.2$ |     | $V_{CC}-1.1$ | V    |
| $t_r$<br>$t_f$           | Output Rise/Fall Times<br>(20% – 80%)                                   | 70           |     | 220          | 70           |     | 220          | 70           |     | 220          | ps   |

- Measured using a 750 mV source 50% Duty Cycle clock source. All loading with  $50\ \Omega$  to  $V_{CC}-2.0\text{ V}$ .
- Skew is measured between outputs under identical transitions.



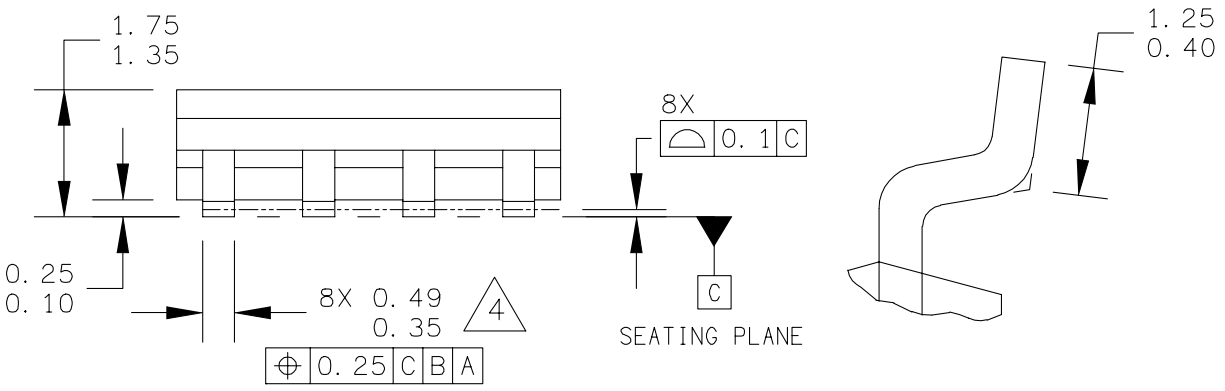
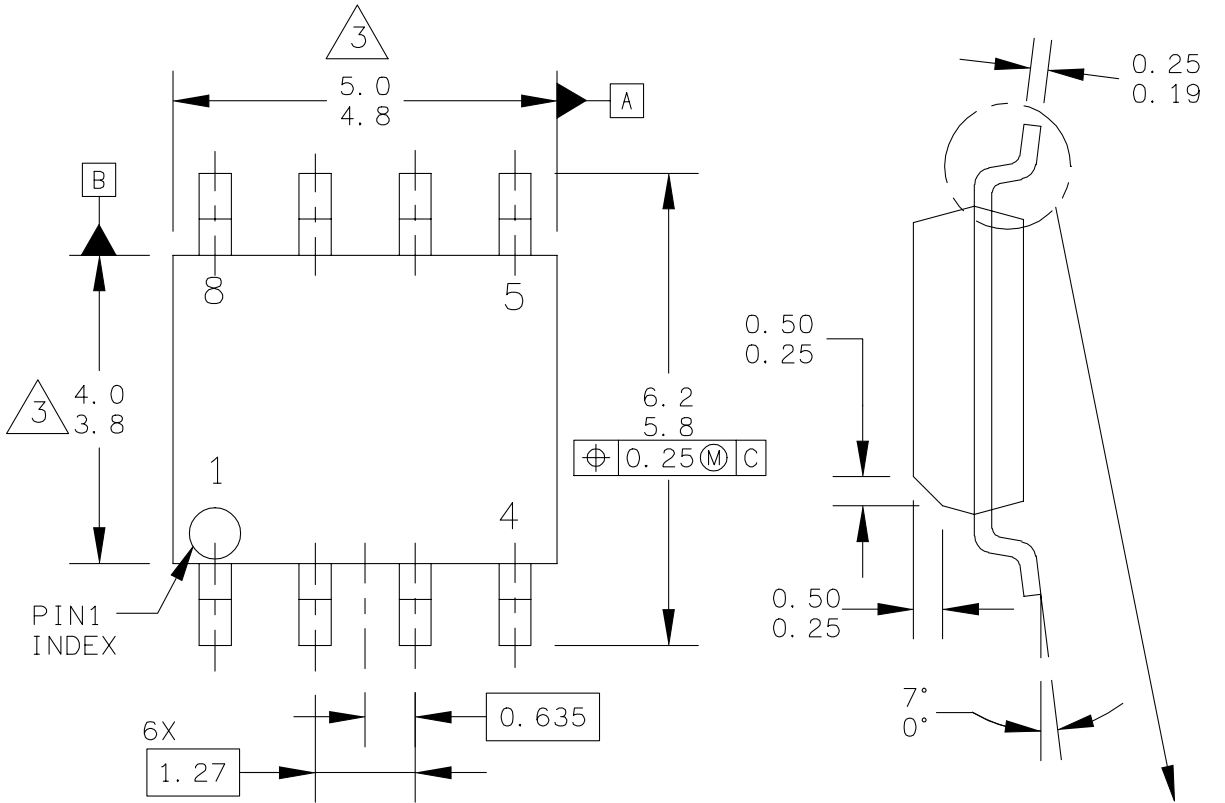
**Figure 2.  $V_{OUTPP}$  versus Frequency**



**Figure 3. Typical Termination for Output Driver and Device Evaluation**



# PACKAGE DIMENSIONS





|   |                          |                            |  |
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|   | CASE NUMBER: 751-07      | 07 APR 2005                |  |
|   | STANDARD: JEDEC MS-012AA |                            |  |

PAGE 1 OF 2

## CASE 751-07 ISSUE U 8-LEAD SOIC PACKAGE

## PACKAGE DIMENSIONS

NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3.  DIMENSION DOES NOT INCLUDE MOLD PROTRUSION. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
4.  DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE DIMENSION AT MAXIMUM MATERIAL CONDITION.

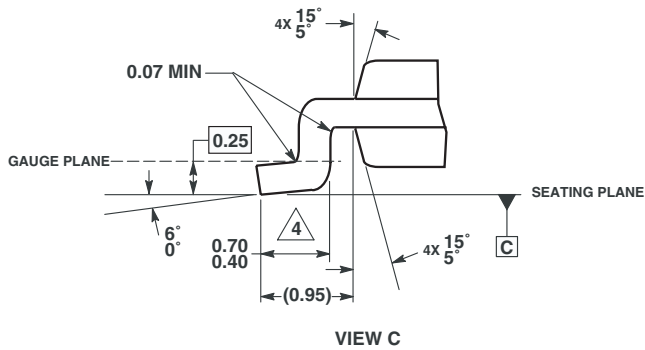
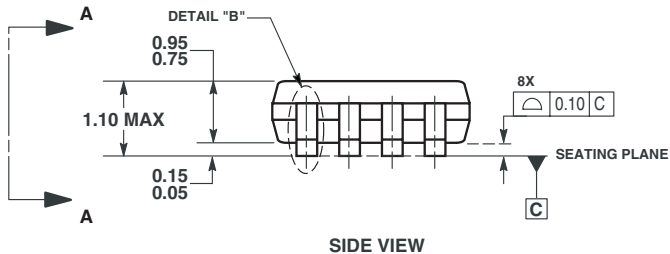
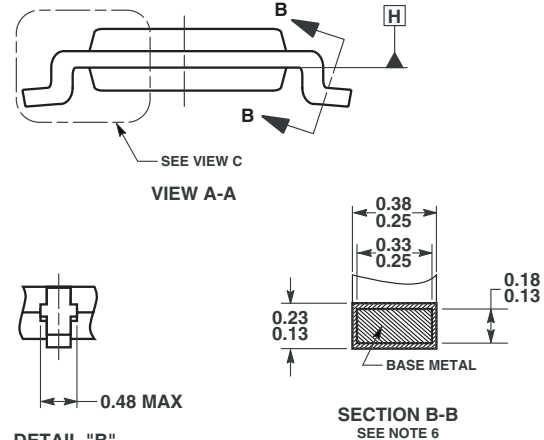
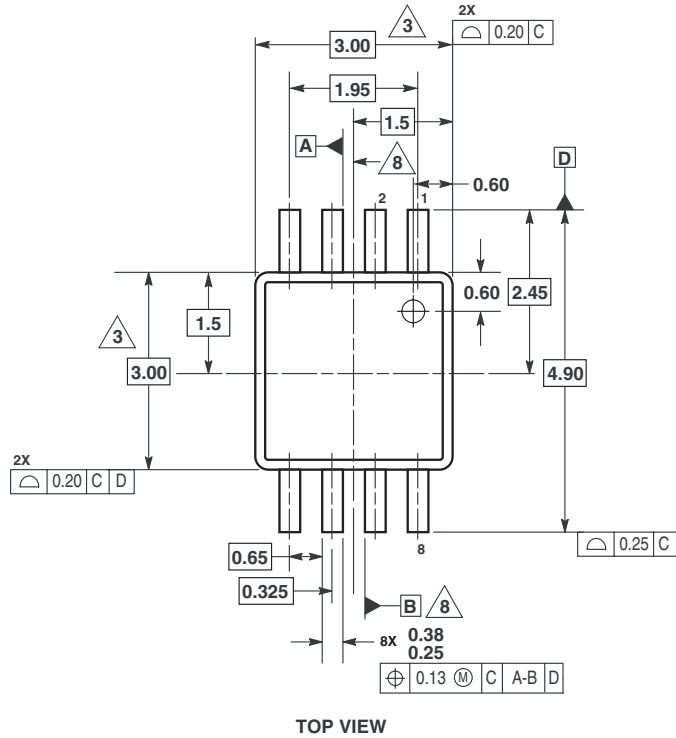
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| TITLE:<br><br>8LD SOIC NARROW BODY                      | DOCUMENT NO: 98ASB42564B | REV: U                     |  |
|   | CASE NUMBER: 751-07      | 07 APR 2005                |  |
|   | STANDARD: JEDEC MS-012AA |                            |  |

PAGE 2 OF 2

**CASE 751-07  
ISSUE U  
8-LEAD SOIC PACKAGE**

**MC100ES6011**

# PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. DIMENSIONS ARE IN MILLIMETERS.
  3. THIS DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT DATUM H. MOLD FLASH OR PROTRUSIONS, SHALL NOT EXCEED 0.15mm PER SIDE.
  4. DIMENSION IS THE LENGTH OF TERMINAL FOR SOLDERING TO A SUBSTRATE.
  5. THE LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE LEAD FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.14mm SEE DETAIL "B" AND SECTION B-B.
  6. SECTION B-B TO BE DETERMINED AT 0.10 TO 0.25mm FROM THE LEAD TIP.
  7. THIS PART IS COMPLIANT WITH JEDEC REGISTRATION MO-187 AA.
  8. DATUMS A AND B TO BE DETERMINED DATUM PLANE H.

## CASE 1640-01 ISSUE O 8-LEAD TSSOP PACKAGE

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# NOTES



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Freescale Semiconductor  
Technical Information Center, CH370  
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+1-800-521-6274 or +1-480-768-2130  
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### **Europe, Middle East, and Africa:**

Freescale Halbleiter Deutschland GmbH  
Technical Information Center  
Schatzbogen 7  
81829 Muenchen, Germany  
+44 1296 380 456 (English)  
+46 8 52200080 (English)  
+49 89 92103 559 (German)  
+33 1 69 35 48 48 (French)  
support@freescale.com

### **Japan:**

Freescale Semiconductor Japan Ltd.  
Headquarters  
ARCO Tower 15F  
1-8-1, Shimo-Meguro, Meguro-ku,  
Tokyo 153-0064  
Japan  
0120 191014 or +81 3 5437 9125  
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### **Asia/Pacific:**

Freescale Semiconductor Hong Kong Ltd.  
Technical Information Center  
2 Dai King Street  
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