

**NRND – Not Recommend for New Designs**

**Product Discontinuance Notice – Last Time Buy Expires on (12/23/2013)**

The MC100ES6056 is a dual, fully differential 2:1 multiplexer. The differential data path makes the device ideal for multiplexing low skew clock or other skew sensitive signals. Multiple  $V_{BB}$  pins are provided.


The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  via a 0.01  $\mu\text{F}$  capacitor and limit current sourcing or sinking to 0.5 mA. When not used,  $V_{BB}$  should be left open.

The device features both individual and common select inputs to address both data path and random logic applications.


The 100ES Series contains temperature compensation.

### Features


- 360 ps Typical Propagation Delays
- 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
- Separate and Common Select
- Q Output Will Default LOW with Inputs Open or at  $V_{EE}$
- $V_{BB}$  Outputs
- LVDS Input Compatible
- 20-Lead Pb-Free Package Available



**DT SUFFIX**  
**20-LEAD TSSOP PACKAGE**  
**CASE 948E-03**

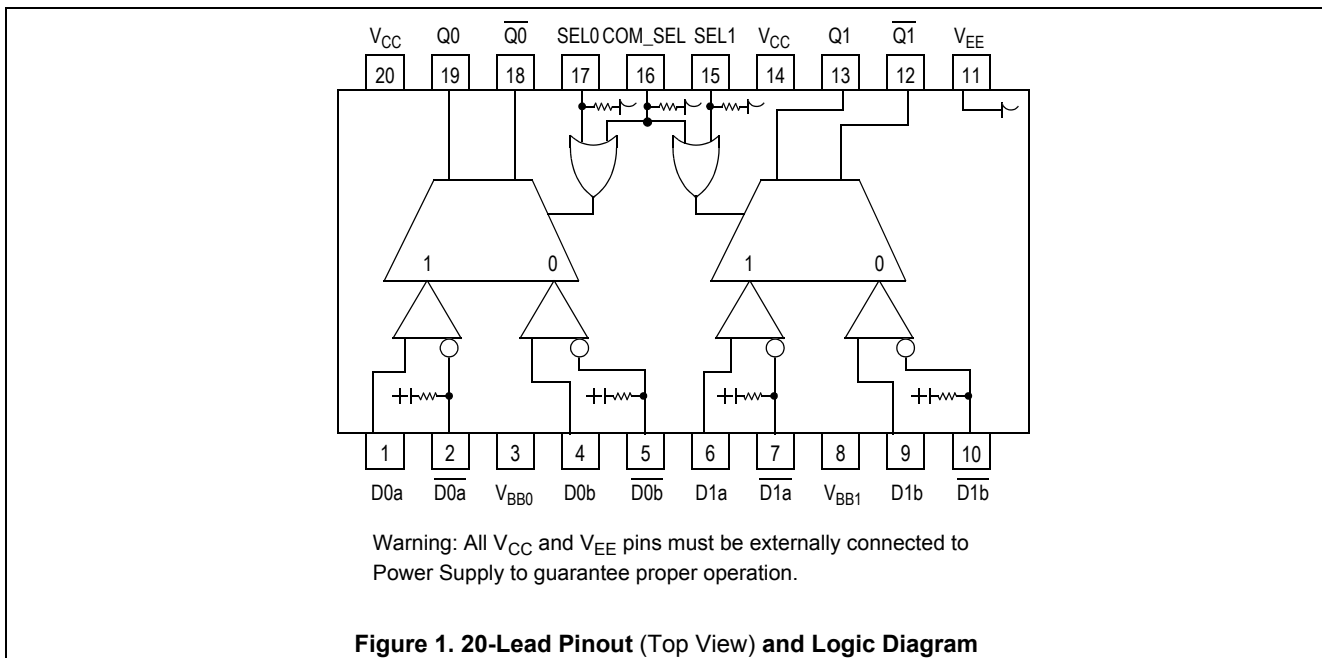


**EJ SUFFIX**  
**20-LEAD TSSOP PACKAGE**  
**Pb-FREE PACKAGE**  
**CASE 948E-03**



**EG SUFFIX**  
**20-LEAD SOIC PACKAGE**  
**Pb-FREE PACKAGE**  
**CASE 751D-07**

ORDERING INFORMATION	
Device	Package
MC100ES6056DT	TSSOP-20
MC100ES6056DTR2	TSSOP-20
MC100ES6056EJ	TSSOP-20 (Pb-Free)
MC100ES6056EJR2	TSSOP-20 (Pb-Free)
MC100ES6056EG	SOIC-20 (Pb-Free)
MC100ES6056EGR2	SOIC-20 (Pb-Free)



**Figure 1. 20-Lead Pinout (Top View) and Logic Diagram**

**Table 1. Pin Description**

Pin	Function
D0a* – D1a*	ECL Input Data a
$\overline{D0a^*} - \overline{D1a^*}$	ECL Input Data a Invert
D0b* – D1b*	ECL Input Data b
$\overline{D0b^*} - \overline{D1b^*}$	ECL Input Data b Invert
SEL0* – SEL1*	ECL Indiv. Select Input
COM_SEL*	ECL Common Select Input
V <sub>BB0</sub> , V <sub>BB1</sub>	Output Reference Voltage
Q0 – Q1	ECL True Outputs
$\overline{Q0} - \overline{Q1}$	ECL Inverted Outputs
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply

\* Input function will default LOW when left open.

**Table 2. Function Table**

SEL0	SEL1	COM_SEL	Q0, $\overline{Q0}$	Q1, $\overline{Q1}$
X	X	H	a	a
L	L	L	b	b
L	H	L	b	a
H	H	L	a	a
H	L	L	a	b

**Table 3. General Specifications**

Characteristics		Value
Internal Input Pulldown Resistor		75 k $\Omega$
Internal Input Pullup Resistor		75 k $\Omega$
ESD Protection	Human Body Model	> 4 kV
	Machine Model	> 400 V
	Charged Device Model	> 2 kV
Thermal Resistance (Junction-to-Ambient)	0 LFPM, 20 TSSOP	140°C/W
	500 LFPM, 20 TSSOP	100°C/W

Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test

**Table 4. DC Characteristics** ( $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -2.5\text{ V} \pm 5\%$  or  $3.8\text{ V}$  to  $-3.135\text{ V}$ ;  $V_{CC} = 2.5\text{ V} \pm 5\%$  or  $3.135\text{ V}$  to  $3.8\text{ V}$ ,  $V_{EE} = 0\text{ V}$ )

Symbol	Characteristics	-40°C			0°C to 85°C			Unit
		Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		30	60		30	60	mA
$V_{OH}$	Output HIGH Voltage <sup>(1)</sup>	$V_{CC} - 1150$	$V_{CC} - 1020$	$V_{CC} - 800$	$V_{CC} - 1200$	$V_{CC} - 970$	$V_{CC} - 750$	mV
$V_{OL}$	Output LOW Voltage <sup>(1)</sup>	$V_{CC} - 1950$	$V_{CC} - 1620$	$V_{CC} - 1250$	$V_{CC} - 2000$	$V_{CC} - 1680$	$V_{CC} - 1300$	mV
$V_{IH}$	Input HIGH Voltage	$V_{CC} - 1165$		$V_{CC} - 880$	$V_{CC} - 1165$		$V_{CC} - 880$	mV
$V_{IL}$	Input LOW Voltage	$V_{CC} - 1810$		$V_{CC} - 1475$	$V_{CC} - 1810$		$V_{CC} - 1475$	mV
$V_{BB}$	Output Reference Voltage	$V_{CC} - 1380$	$V_{CC} - 1290$	$V_{CC} - 1220$	$V_{CC} - 1380$	$V_{CC} - 1290$	$V_{CC} - 1200$	mV
$V_{PP}$	Differential Input Voltage <sup>(2)</sup>	0.15		1.3	0.15		1.3	V
$V_{CMR}$	Differential Cross Point Voltage <sup>(3)</sup>	$V_{CC} - 2.3$		$V_{CC} - 0.8$	$V_{CC} - 2.3$		$V_{CC} - 0.8$	V
$I_{IH}$	Input HIGH Current			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	-200			-200			$\mu\text{A}$

1. 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.
2.  $V_{PP}$  (DC) is the minimum differential input voltage swing required to maintain device functionality.
3.  $V_{CMR}$  (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. Absolute Maximum Ratings<sup>(1)</sup>**

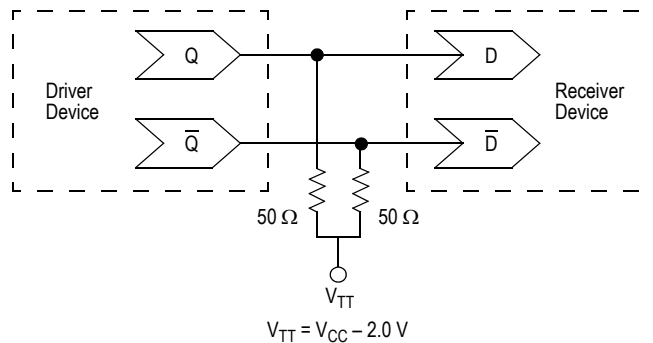
Symbol	Characteristic	Conditions	Rating	Units
$V_{SUPPLY}$	Power Supply Voltage	Difference between $V_{CC}$ & $V_{EE}$	3.9	V
$V_{IN}$	Input Voltage	$V_{CC} - V_{EE} \leq 3.6\text{ V}$	$V_{CC} + 0.3$ $V_{EE} - 0.3$	V
$I_{OUT}$	Output Current	Continuous Surge	50 100	mA mA
$I_{BB}$	$V_{BB}$ Sink/Source Current		$\pm 0.5$	°C
$T_A$	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.

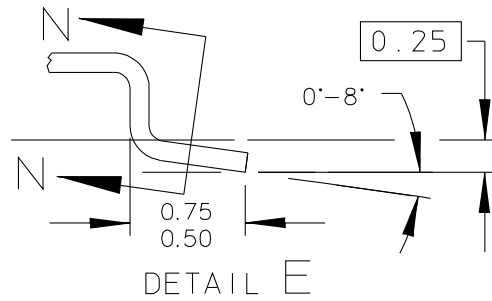
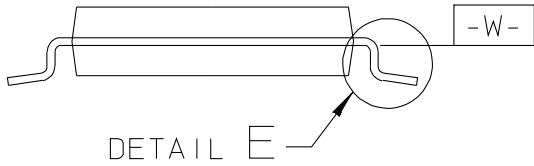
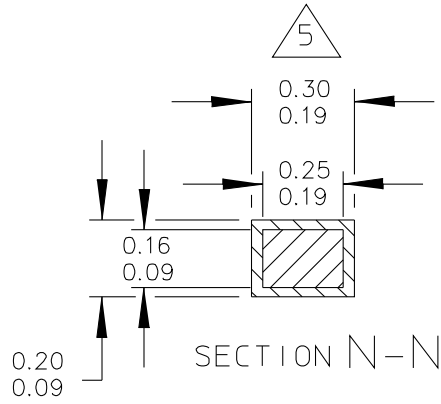
**Table 6. AC Characteristics** ( $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -2.5\text{ V} \pm 5\%$  or  $-3.8\text{ V}$  to  $-3.135\text{ V}$ ;  $V_{CC} = 2.5\text{ V} \pm 5\%$  or  $3.135\text{ V}$  to  $3.8\text{ V}$ ;  $V_{EE} = 0\text{ V}$ )<sup>(1)</sup>

Symbol	Characteristics	-40°C to 85°C			Unit
		Min	Typ	Max	
$f_{\max}$	Maximum Frequency		> 3		GHz
$t_{\text{PLH}}, t_{\text{PHL}}$	Propagation Delay to Output Differential				
	D to Q, $\bar{Q}$	300	400	500	ps
	SEL to Q, $\bar{Q}$	300	430	600	ps
	COM_SEL to Q, $\bar{Q}$	300	490	650	ps
$t_{\text{SKEW}}$	Skew				
	Output-to-Output <sup>(2)</sup>		10	50	ps
	Part-to-Part			200	ps
$t_{\text{JITTER}}$	Cycle-to-Cycle Jitter			1	ps
	RMS ( $1\sigma$ )				
$V_{\text{PP}}$	Minimum Input Swing	200	800	1200	mV
$V_{\text{CMR}}$	Differential Cross Point Voltage	$V_{CC}-2.1$		$V_{CC}-1.1$	V
$t_r / t_f$	Output Rise/Fall Time (20%–80%)	70	120	230	ps

1. Measured using a 750 mV source, 50% duty cycle clock source. All loading with  $50\Omega$  to  $V_{CC}-2.0\text{ V}$ .
2. Skew is measured between outputs under identical transitions. Duty cycle skew is defined only for differential operation when the delays are measured from the cross point of the inputs to the cross point of the outputs.

**Figure 2. Typical Termination for Output Driver and Device Evaluation**

**PACKAGE DIMENSIONS**



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TITLE: 20 LD TSSOP, PITCH 0.65MM	DOCUMENT NO: 98ASH70169A		REV: B
	CASE NUMBER: 948E-03		09 MAR 2005
	STANDARD: JEDEC		

**CASE 948E-03  
ISSUE B  
20-LEAD TSSOP PACKAGE**

**PACKAGE DIMENSIONS**

## NOTES:

1. CONTROLLING DIMENSION: MILLIMETER
2. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M-1982.

3. DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

4. DIMENSION DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE.

5. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF THE DIMENSION AT MAXIMUM MATERIAL CONDITION.

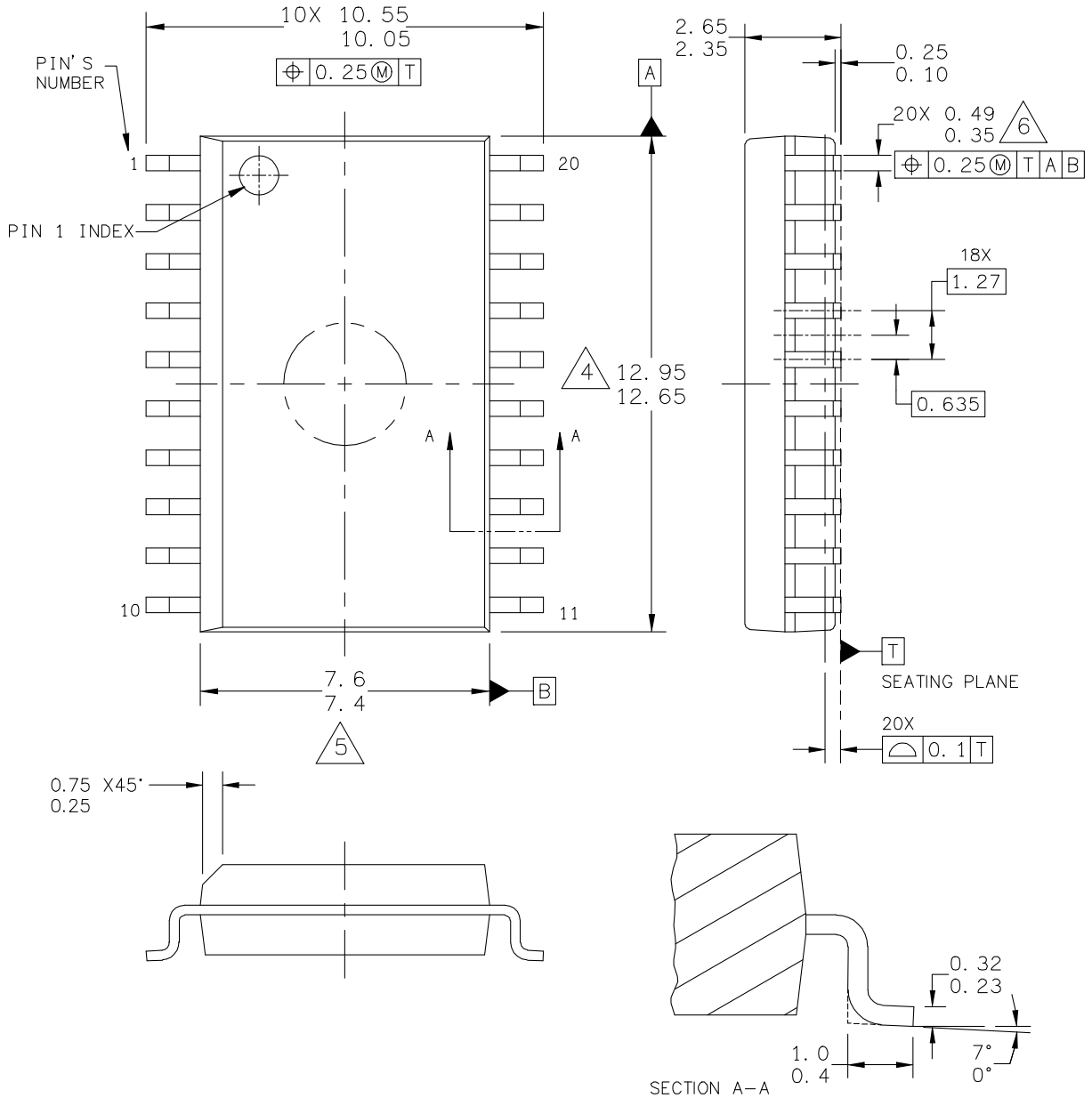
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

7. DIMENSIONS ARE TO BE DETERMINED AT DATUM PLANE -W-.

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TITLE: 20 LD TSSOP, PITCH 0.65MM	DOCUMENT NO: 98ASH70169A		REV: B
	CASE NUMBER: 948E-03		09 MAR 2005
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**CASE 948E-03  
ISSUE B  
20-LEAD TSSOP PACKAGE**

**PACKAGE DIMENSIONS**



© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: 20LD SOIC W/B, 1.27 PITCH CASE-OUTLINE	DOCUMENT NO: 98ASB42343B	REV: J
	CASE NUMBER: 751D-07	23 MAR 2005
	STANDARD: JEDEC MS-013AC	

**CASE 751D-07  
ISSUE J  
20-LEAD SOIC PACKAGE**

**PACKAGE DIMENSIONS**

## NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. DATUMS A AND B TO BE DETERMINED AT THE PLANE WHERE THE BOTTOM OF THE LEADS EXIT THE PLASTIC BODY.
4. THIS DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS. MOLD FLASH, PROTRUSION OR GATE BURRS SHALL NOT EXCEED 0.15 MM PER SIDE. THIS DIMENSION IS DETERMINED AT THE PLANE WHERE THE BOTTOM OF THE LEADS EXIT THE PLASTIC BODY.
5. THIS DIMENSION DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.25 MM PER SIDE. THIS DIMENSION IS DETERMINED AT THE PLANE WHERE THE BOTTOM OF THE LEADS EXIT THE PLASTIC BODY.
6. THIS DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED 0.62 mm.

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TITLE: 20LD SOIC W/B, 1.27 PITCH, CASE OUTLINE	DOCUMENT NO: 98ASB42343B	REV: J	
	CASE NUMBER: 751D-07	23 MAR 2005	
	STANDARD: JEDEC MS-013AC		

**CASE 751D-07  
ISSUE J  
20-LEAD SOIC PACKAGE**



## Revision History Sheet

Rev	Table	Page	Description of Change	Date
6		1	NRND – Not Recommend for New Designs	12/19/12
6		1	Product Discontinuance Notice – Last Time Buy Expires on (12/23/2013)	2/26/13

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