NBSG72A

2.5V/3.3V SiGe Differential 2 X 2 Crosspoint Switch with Output Level Select

The NBSG72A is a high−bandwidth fully differential 2 X 2 crosspoint switch with Output Level Select (OLS) capabilities. This is a part of the GigaComm™ family of high performance Silicon Germanium products. The device is housed in a low profile 3 X 3 mm 16−pin QFN package.

Differential inputs incorporate internal 50 Ω termination resistors and accept NECL (Negative ECL), PECL (Positive ECL), LVCMOS/LVTTL, CML, or LVDS. The OLS input is used to program the peak−to−peak output amplitude between 0 mV and 800 mV in five discrete steps. The SELECT inputs are single−ended and can be driven with either LVECL or LVCMOS/LVTTL input levels.

Features

- Maximum Input Clock Frequency > 7 GHz Typical
- Maximum Input Data Rate > 7 Gb/s Typical
- 200 ps Typical Propagation Delay (OLS = FLOAT)
- 55/45 ps Typical Rise/Fall Times (OLS = FLOAT)
- Selectable Swing PECL Output with Operating Range: V_{CC} = 2.375 V to 3.465 V with V_{EE} = 0 V
- Selectable Swing NECL Output with NECL Inputs with Operating Range: V_{CC} = 0 V with V_{EE} = −2.375 V to −3.465 V
- Selectable Output Levels (0 mV, 200 mV, 400 mV, 600 mV or 800 mV Peak−to−Peak Output)
- 50 Ω Internal Input Termination Resistors
- Single−Ended LVECL or LVCMOS/LVTTL Select Inputs (SELA, SELB)
- Pb−Free Packages are Available

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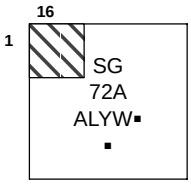
MARKING DIAGRAM*

QFN−16
MN SUFFIX
CASE 485G



A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 13 of this data sheet.

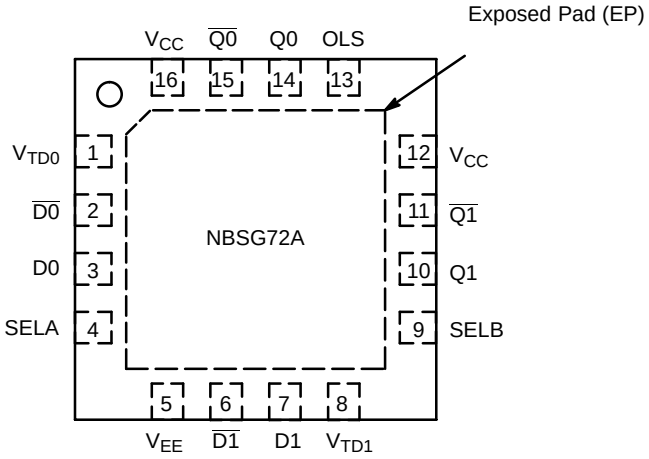


Figure 1. QFN−16 Pinout (Top View)

Table 1. PIN DESCRIPTION

Pin No.	Name	I/O	Description
1	VTD0	−	Common Internal 50 Ω Termination Pin for D0 and $\overline{D0}$ Input. See Table 4. (Note 1)
2	$\overline{D0}$	LVDS, CML, ECL, LVTTL, LVCMOS Input	Inverted Differential Input 0.
3	D0	LVDS, CML, ECL, LVTTL, LVCMOS Input	Noninverted Differential Input 0.
4	SELA	LVECL, LVCMOS Input	Select Logic Input A. Internal 75 kΩ Pulldown to V_{EE}.
5	V_{EE}	−	Negative Supply. All V_{EE} Pins must be Externally Connected to Power Supply to Guarantee Proper Operation.
6	$\overline{D1}$	LVDS, CML, ECL, LVTTL, LVCMOS Input	Inverted Differential Input 1.
7	D1	LVDS, CML, ECL, LVTTL, LVCMOS Input	Noninverted Differential Input 1.
8	VTD1	−	Common Internal 50 Ω Termination Pin for D1 and $\overline{D1}$ Input. See Table 4. (Note 1)
9	SELB	LVECL, LVCMOS Input	Select Logic Input B. Internal 75 kΩ Pulldown to V_{EE}.
10	Q1	RSECL Output	Noninverted Differential Output.
11	$\overline{Q1}$	RSECL Output	Inverted Differential Output.
12	V_{CC}	−	Positive Supply. All V_{CC} Pins must be Externally Connected to Power Supply to Guarantee Proper Operation.
13	OLS (Note 2)	Input	Input Pin for Output Level Select (OLS) See Table 3.
14	Q0	RSECL Output	Noninverted Differential Output Typically Terminated with 50 Ω Resistor to $V_{TT} = V_{CC} - 2.0$ V.
15	$\overline{Q0}$	RSECL Output	Inverted Differential Output Typically Terminated with 50 Ω Resistor to $V_{TT} = V_{CC} - 2.0$ V.
16	V_{CC}	−	Positive Supply. All V_{CC} Pins must be Externally Connected to Power Supply to Guarantee Proper Operation.
−	EP	−	Exposed Pad. The thermally exposed pad on package bottom (see case drawing) must be attached to a heat−sinking conduit.

1. In the differential configuration when the input termination pins (VTD0, VTD1) are connected to a common termination voltage, and if no signal is applied then the device will be susceptible to self−oscillation.
2. When an output level of 400 mV is desired and $V_{CC} - V_{EE} > 3.0$ V, 2 kΩ resistor should be connected from OLS pin to V_{EE}.

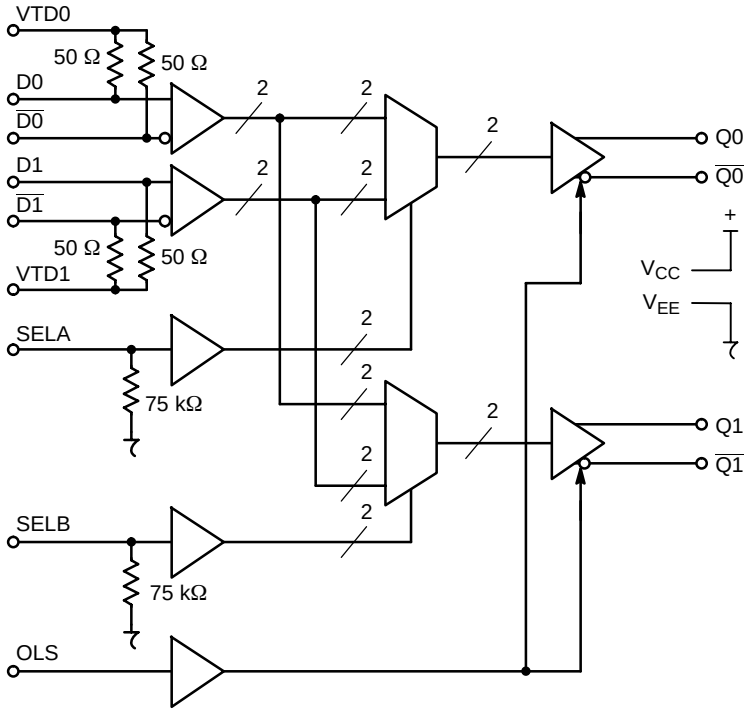


Figure 2. Logic/Block Diagram

Table 2. TRUTH TABLE

SELA	SELB	Q0	Q1
LOW	LOW	D0	D0
HIGH	LOW	D1	D0
LOW	HIGH	D0	D1
HIGH	HIGH	D1	D1

Table 3. OUTPUT LEVEL SELECT (OLS)

OLS	Output Amplitude (V_{OUTPP})	OLS Sensitivity
V_{CC}	800 mV	OLS − 75 mV
V_{CC} − 0.4 V	200 mV	OLS ± 150 mV
V_{CC} − 0.8 V	600 mV	OLS ± 100 mV
V_{CC} − 1.2 V	0	OLS ± 75 mV
V_{EE} (Note 3)	400 mV	OLS ± 100 mV
FLOAT	600 mV	N/A

3. When an output level of 400 mV is desired and $V_{CC} - V_{EE} > 3.0$ V, a 2 kΩ resistor should be connected from OLS to V_{EE}.

Table 4. INTERFACING OPTIONS

Interfacing Options	Connections
CML	Connect VTD0 and VTD1 to V_{CC}
LVDS	VTD0 and VTD1 Should Be Left Floating.
AC−COUPLED	Bias VTD0 and VTD1 Inputs within Common Mode Range (VIHCMR)
RSECL, PECL, NECL	Standard ECL Termination Techniques
LVCMOS / LVTTL	The external voltage should be applied to the unused complementary differential input. Nominal voltage is 1.5 V for LVTTL and $V_{CC}/2$ for LVCMOS Inputs.

Table 5. ATTRIBUTES

Characteristics		Value
Internal Input Pulldown Resistor (SELA, SELB)		75 kΩ
ESD Protection	Human Body Model Machine Model Charged Device Model	> 2 kV > 50 V > 1 kV
Moisture Sensitivity (Note 1)		Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in
Transistor Count		436
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

1. For additional information, see Application Note AND8003/D.

Table 6. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V_{CC}	Positive Power Supply	V_{EE} = 0 V		3.6	V
V_{EE}	Negative Power Supply	V_{CC} = 0 V		−3.6	V
V_I	Positive Input Negative Input	V_{EE} = 0 V V_{CC} = 0 V	$V_I \leq V_{CC}$ $V_I \geq V_{EE}$	3.6 −3.6	V V
V_{INPP}	Differential Input Voltage $\|D_X - \overline{D_X}\|$	$V_{EE} - V_{CC} \geq$ 2.8 V $V_{EE} - V_{CC} <$ 2.8 V		2.8 $\|V_{CC} - V_{EE}\|$	V
I_{out}	Output Current	Continuous Surge		25 50	mA mA
I_{IN}	Input Current Through R_T (50 Ω Resistor)	Static Surge		45 80	mA mA
T_A	Operating Temperature Range			−40 to +85	°C
T_{stg}	Storage Temperature Range			−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient) (Note 2)	0 lfpm 500 lfpm	QFN−16 QFN−16	42 35	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	(Note 2)	QFN−16	4	°C/W
T_{sol}	Wave Solder Pb Pb−Free	< 3 sec @ 260°C < 3 sec @ 260°C		265 265	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

2. JEDEC standard multilayer board − 1S2P (1 signal, 2 power).

Table 7. DC CHARACTERISTICS, INPUT WITH PECL OUTPUT V_{CC} = 2.5 V; V_{EE} = 0 V (Note 3)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Negative Power Supply Current	40	55	65	40	55	65	40	55	65	mA
V_{OH}	Output HIGH Voltage (Note 4)	1460	1510	1560	1490	1540	1590	1515	1565	1615	mV
V_{OL}	Output LOW Voltage (Note 4)										mV
	(OLS = V_{CC})	555	705	855	595	745	895	625	775	925	
	(OLS = V_{CC} − 0.4 V)	1235	1295	1385	1270	1330	1420	1295	1355	1445	
	(OLS = V_{CC} − 0.8 V, OLS = FLOAT)	775	895	1015	810	930	1050	840	960	1080	
	(OLS = V_{CC} − 1.2 V)	1455	1505	1585	1490	1540	1620	1510	1560	1640	
	(OLS = V_{EE})	1005	1095	1215	1040	1130	1250	1065	1155	1275	
V_{OUTPP}	Output Voltage Amplitude										mV
	(OLS = V_{CC})	670	800		660	795		655	790		
	(OLS = V_{CC} − 0.4 V)	125	215		120	210		120	210		
	(OLS = V_{CC} − 0.8 V, OLS = FLOAT)	510	615		505	610		500	605		
	(OLS = V_{CC} − 1.2 V)	0	5		0	0		0	5		
	(OLS = V_{EE})	325	415		320	410		320	410		
V_{IH}	Input HIGH Voltage (Single−Ended) (Note 6) D0, $\overline{D0}$, D1, $\overline{D1}$	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	V_{EE} + 1275	V_{CC}− 1000*	V_{CC}	mV
V_{IL}	Input LOW Voltage (Single−Ended) (Note 7) D0, $\overline{D0}$, D1, $\overline{D1}$	V_{EE}	V_{CC}− 1400*	V_{IH}− 150	V_{EE}	V_{CC}− 1400*	V_{IH}− 150	V_{EE}	V_{CC}− 1400*	V_{IH}− 150	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 5)	1.2		2.5	1.2		2.5	1.2		2.5	V
R_{TIN}	Internal Input Termination Resistor	45	50	55	45	50	55	45	50	55	Ω
I_{IH}	Input HIGH Current (@V_{IH})		35	100		35	100		35	100	μA
I_{IL}	Input LOW Current (@V_{IL})		20	100		20	100		20	100	μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

*Typicals used for testing purposes.

3. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.125 V to −0.965 V.
4. All loading with 50 Ω to V_{CC} − 2.0 V.
5. V_{IHCMR} min varies 1:1 with V_{EE}, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.
6. V_{IH} cannot exceed V_{CC}.
7. V_{IL} always $\geq$ V_{EE}.

Table 8. DC CHARACTERISTICS, INPUT WITH PECL OUTPUT V_{CC} = 3.3 V; V_{EE} = 0 V (Note 8)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Negative Power Supply Current	40	55	65	40	55	65	40	55	65	mA
V_{OH}	Output HIGH Voltage (Note 9)	2260	2310	2360	2290	2340	2390	2315	2365	2415	mV
V_{OL}	Output LOW Voltage (Note 9)										mV
	(OLS = V_{CC})	1320	1470	1620	1360	1510	1660	1390	1540	1690	
	(OLS = V_{CC} − 0.4 V)	2030	2090	2180	2065	2125	2215	2090	2150	2240	
	(OLS = V_{CC} − 0.8 V, OLS = FLOAT)	1550	1670	1790	1585	1705	1825	1615	1735	1855	
	(OLS = V_{CC} − 1.2 V)	2260	2310	2390	2290	2340	2420	2315	2365	2445	
	**(OLS = V_{EE})	1785	1875	1995	1820	1910	2030	1850	1940	2060	
V_{OUTPP}	Output Amplitude Voltage										mV
	(OLS = V_{CC})	705	815		695	805		690	800		
	(OLS = V_{CC} − 0.4 V)	130	220		125	215		125	215		
	(OLS = V_{CC} − 0.8 V, OLS = FLOAT)	535	640		530	635		525	630		
	(OLS = V_{CC} − 1.2 V)	0	0		0	0		0	0		
	**(OLS = V_{EE})	345	435		340	430		335	425		
V_{IH}	Input HIGH Voltage (Single−Ended) (Note 11) D0, $\overline{D0}$, D1, $\overline{D1}$	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	mV
V_{IL}	Input LOW Voltage (Single−Ended) (Note 12) D0, $\overline{D0}$, D1, $\overline{D1}$	V_{IH}− 2600	V_{CC}− 1400*	V_{IH}− 150	V_{IH}− 2600	V_{CC}− 1400*	V_{IH}− 150	V_{IH}− 2600	V_{CC}− 1400*	V_{IH}− 150	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 10)	1.2		3.3	1.2		3.3	1.2		3.3	V
R_{TIN}	Internal Input Termination Resistor	45	50	55	45	50	55	45	50	55	Ω
I_{IH}	Input HIGH Current (@V_{IH})		35	100		35	100		35	100	μA
I_{IL}	Input LOW Current (@V_{IL})		20	100		20	100		20	100	μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

*Typicals used for testing purposes.

**When an output level of 400 mV is desired and V_{CC} − V_{EE} > 3.0 V, a 2 kΩ resistor should be connected from OLS to V_{EE}.

8. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.925 V to −0.165 V.
9. All loading with 50 Ω to V_{CC} − 2.0 V.
10. V_{IHCMR} min varies 1:1 with V_{EE}, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.
11. V_{IH} cannot exceed V_{CC}.
12. V_{IL} always ≥ V_{EE}.

Table 9. DC CHARACTERISTICS, NECL INPUT WITH NECL OUTPUT V_{CC} = 0 V; V_{EE} = −3.465 V to −2.375 V (Note 13)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Negative Power Supply Current	40	55	65	40	55	65	40	55	65	mA
V_{OH}	Output HIGH Voltage (Note 14)	−1040	−990	−940	−1010	−960	−910	−985	−935	−885	mV
V_{OL}	Output LOW Voltage (Note 14)										mV
	−3.465 V ≤ V_{EE} ≤ −3.0 V										
	(OLS = V_{CC})	−1980	−1830	−1680	−1940	−1790	−1640	−1910	−1760	−1610	
	(OLS = V_{CC} − 0.4 V)	−1270	−1210	−1120	−1235	−1175	−1085	−1210	−1150	−1060	
	(OLS = V_{CC} − 0.8 V, OLS =FLOAT)	−1750	−1630	−1510	−1715	−1595	−1475	−1685	−1565	−1445	
	(OLS = V_{CC} − 1.2 V)	−1040	−990	−910	−1010	−960	−880	−985	−935	−855	
	**(OLS = V_{EE})	−1515	−1425	−1305	−1480	−1390	−1270	−1450	−1360	−1240	
	−3.0 V < V_{EE} ≤ −2.375 V										
	(OLS = V_{CC})	−1945	−1795	−1645	−1905	−1755	−1605	−1875	−1725	−1575	
	(OLS = V_{CC} − 0.4 V)	−1265	−1205	−1115	−1230	−1170	−1080	−1205	−1145	−1055	
	(OLS = V_{CC} − 0.8 V, OLS =FLOAT)	−1725	−1605	−1485	−1690	−1570	−1450	−1660	−1540	−1420	
	(OLS = V_{CC} − 1.2 V)	−1045	−995	−915	−1010	−960	−880	−990	−940	−860	
	(OLS = V_{EE})	−1495	−1405	−1285	−1460	−1370	−1250	−1435	−1345	−1225	
V_{OUTPP}	Output Voltage Amplitude										mV
	−3.465 V ≤ V_{EE} ≤ −3.0 V										
	(OLS = V_{CC})	705	815		695	805		690	800		
	(OLS = V_{CC} − 0.4 V)	130	220		125	215		125	215		
	(OLS = V_{CC} − 0.8 V, OLS = FLOAT)	535	640		530	635		525	630		
	(OLS = V_{CC} − 1.2 V)	0	0		0	0		0	0		
	**(OLS = V_{EE})	345	435		340	430		335	425		
	−3.0 V < V_{EE} ≤ −2.375 V										
	(OLS = V_{CC})	670	800		660	795		655	790		
	(OLS = V_{CC} − 0.4 V)	125	215		120	210		120	210		
	(OLS = V_{CC} − 0.8 V, OLS =FLOAT)	510	615		505	610		500	605		
	(OLS = V_{CC} − 1.2 V)	0	5		0	0		0	5		
	(OLS = V_{EE})	325	415		320	410		320	410		
V_{IH}	Input HIGH Voltage (Single−Ended) (Note 16) D0, $\overline{D0}$, D1, $\overline{D1}$	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	V_{EE} + 1275	V_{CC} − 1000*	V_{CC}	mV
V_{IL}	Input LOW Voltage (Single−Ended) (Note 17) D0, $\overline{D0}$, D1, $\overline{D1}$	V_{IH}− 2600	V_{CC}− 1400*	V_{IH}− 150	V_{IH}− 2600	V_{CC}− 1400*	V_{IH}− 150	V_{IH}− 2600	V_{CC}− 1400*	V_{IH}− 150	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 15)	V_{EE}+1.2		0.0	V_{EE}+1.2		0.0	V_{EE}+1.2		0.0	V
R_{TIN}	Internal Input Termination Resistor	45	50	55	45	50	55	45	50	55	Ω
I_{IH}	Input HIGH Current (@V_{IH})		35	100		35	100		35	100	μA
I_{IL}	Input LOW Current (@V_{IL})		20	100		20	100		20	100	μA
I_{OLS}	OLS Input Current (See Figure 9)										μA
	(OLS = V_{CC})		300	900		300	900		300	900	
	(OLS = V_{CC} − 0.4 V)		100	300		100	300		100	300	
	(OLS = V_{CC} − 0.8 V, OLS = FLOAT)		5	100		5	100		5	100	
	(OLS = V_{CC} − 1.2 V)	−300	−100		−300	−100		−300	−100		
	−3.0 V < V_{EE} ≤ −2.375 V										
	(OLS = V_{EE})	−1000	−400		−1000	−400		−1000	−400		
	−3.465 V ≤ V_{EE} ≤ −3.0 V										
	*(OLS = V_{EE})	−1500	−600		−1500	−600		−1500	−600		

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

*Typicals used for testing purposes.

**When an output level of 400 mV is desired and V_{CC} − V_{EE} > 3.0 V, a 2 kΩ resistor should be connected from OLS to V_{EE}.

13. Input and output parameters vary 1:1 with V_{CC}.
14. All loading with 50 Ω to V_{CC} − 2.0 V.
15. V_{IHCMR} min varies 1:1 with V_{EE}, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.
16. V_{IH} cannot exceed V_{CC}.
17. V_{IL} always ≥ V_{EE}.

Table 10. AC CHARACTERISTICS V_{CC} = 0 V; V_{EE} = −3.465 V to −2.375 V or V_{CC} = 2.375 V to 3.465 V; V_{EE} = 0 V (Note 18)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
V_{OUTPP}	Output Voltage Amplitude (Note 18) f_{in} < 5 GHz	400	590		450	590		440	590		mV
	$f_{in} \leq$ 7 GHz	200	250		180	250		130	250		
t_{PLH}	Propagation Delay to Output Differential										ps
	D0, D1 → Q0, Q1	170	205	255	170	205	255	170	210	260	
	SELA, SELB → Q0, Q1	190	265	350	190	265	350	190	265	350	
t_{PHL}	Propagation Delay to Output Differential										ps
	D0, D1 → Q0, Q1	170	205	255	170	205	255	170	210	260	
	SELA, SELB → Q0, Q1	150	215	270	150	215	270	150	215	270	
t_{SKEW}	Duty Cycle Skew (Note 19)		5.0	25		5.0	25		5.0	25	ps
	Within−Device Skew		5.0	25		5.0	25		5.0	25	
	Device−to−Device Skew		15	50		15	50		15	50	
t_{JITTER}	RMS Random Clock Jitter (Note 20)										ps
	≤ 1 GHz OLS = V_{CC}		0.16	0.3		0.17	0.3		0.18	0.4	
	≤ 5 GHz OLS = V_{CC}		0.14	0.4		0.16	0.4		0.19	0.4	
	≤ 6.5 GHz OLS = V_{CC}		0.21	0.5		0.31	0.7		0.44	0.9	
	≤ 1 GHz OLS = V_{CC} − 400 mV		0.23	0.4		0.23	0.4		0.25	0.4	
	≤ 5 GHz OLS = V_{CC} − 400 mV		0.18	0.5		0.19	0.5		0.23	0.5	
	≤ 6.5 GHz OLS = V_{CC} − 400 mV		0.2	0.5		0.25	0.6		0.32	0.7	
	≤ 1 GHz OLS = V_{CC} − 800 mV		0.17	0.3		0.18	0.3		0.19	0.3	
	≤ 5 GHz OLS = V_{CC} − 800 mV		0.14	0.4		0.16	0.3		0.2	0.3	
	≤ 6.5 GHz OLS = V_{CC} − 800 mV		0.2	0.5		0.27	0.7		0.38	0.9	
	≤ 1 GHz OLS = V_{EE}		0.18	0.3		0.19	0.3		0.2	0.3	
	≤ 5 GHz OLS = V_{EE}		0.16	0.6		0.17	0.4		0.2	0.4	
	≤ 6.5 GHz OLS = V_{EE}		0.18	0.5		0.24	0.6		0.34	0.8	
	Peak−to−Peak Data Dependent Jitter (Note 21) $f_{in} \leq$ 7 Gb/s		12	18		12	18		12	18	
V_{INPP}	Input Voltage Swing/Sensitivity (Differential Configuration) (Note 22)	75		2600	75		2600	75		2600	mV
t_r	Output Rise/Fall Times (Q0, Q1)										ps
t_f	(20% − 80%) t_r	40	55	70	40	55	70	40	55	70	
	@ 1 GHz t_f	30	45	55	30	45	55	30	45	55	

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

18. Measured using a 75 mV source, 50% duty cycle clock source. All loading with 50 Ω to V_{CC} − 2.0 V. OLS = FLOAT. Input edge rates 40 ps (20% − 80%).
19. $t_{SKEW} = |t_{PLH} - t_{PHL}|$ for a nominal 50% differential clock input waveform.
20. Additive RMS jitter with 50% Duty Cycle clock signal.
21. Additive Peak−to−Peak data dependent jitter with NRZ PRBS 2^{31-1} data at 7 Gb/s.
22. Input Voltage Swing is a single−ended measurement operating in differential mode. V_{INPP} (max) cannot exceed $V_{CC} - V_{EE}$.

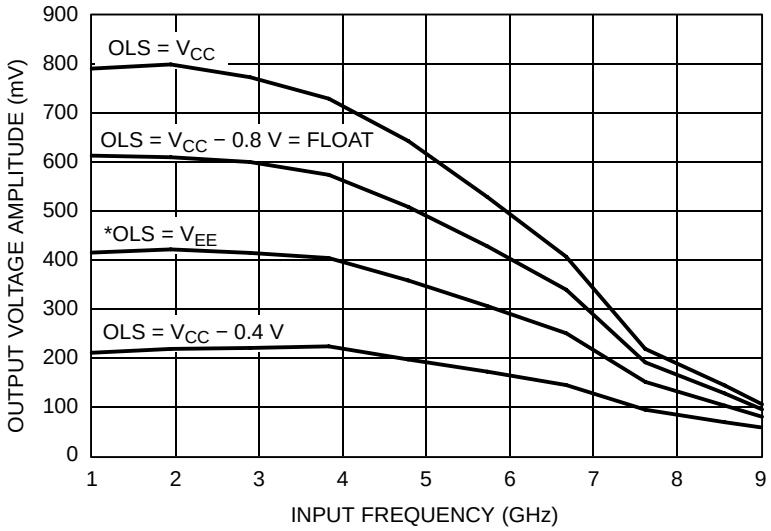


Figure 3. Output Voltage Amplitude (V_{OUTPP}) vs. Input Clock Frequency (f_{in}) @ Ambient Temperature (Typical)

*When an output level of 400 mV is desired and V_{CC} − V_{EE} > 3.0 V, a 2 kΩ resistor should be connected from OLS to V_{EE}.

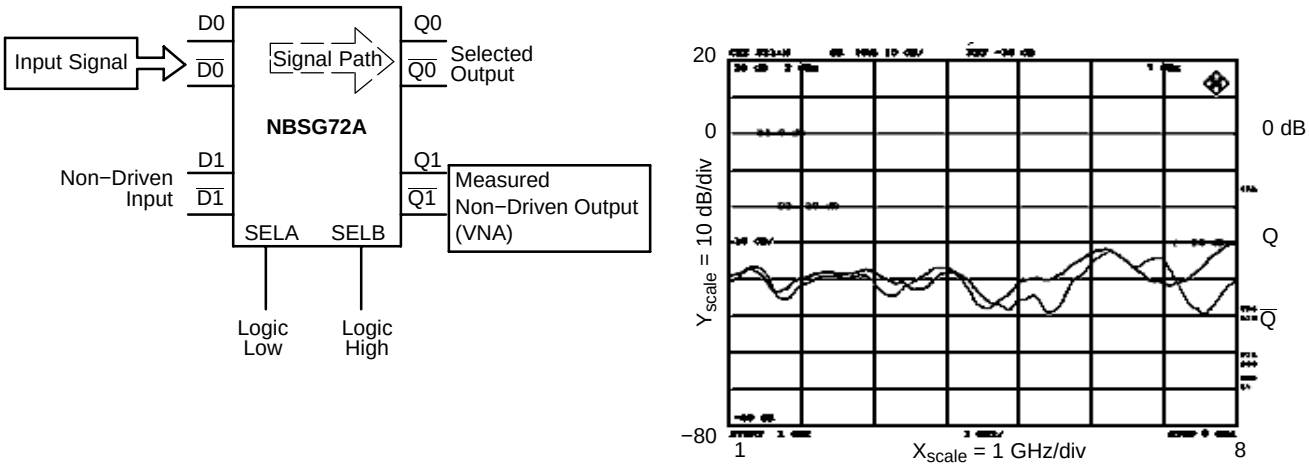


Figure 4. Channel−to−Channel Crosstalk Isolation at Ambient Temperature (D0 to Q0 Signal Path Selected; SelA = Low, SelB = High)

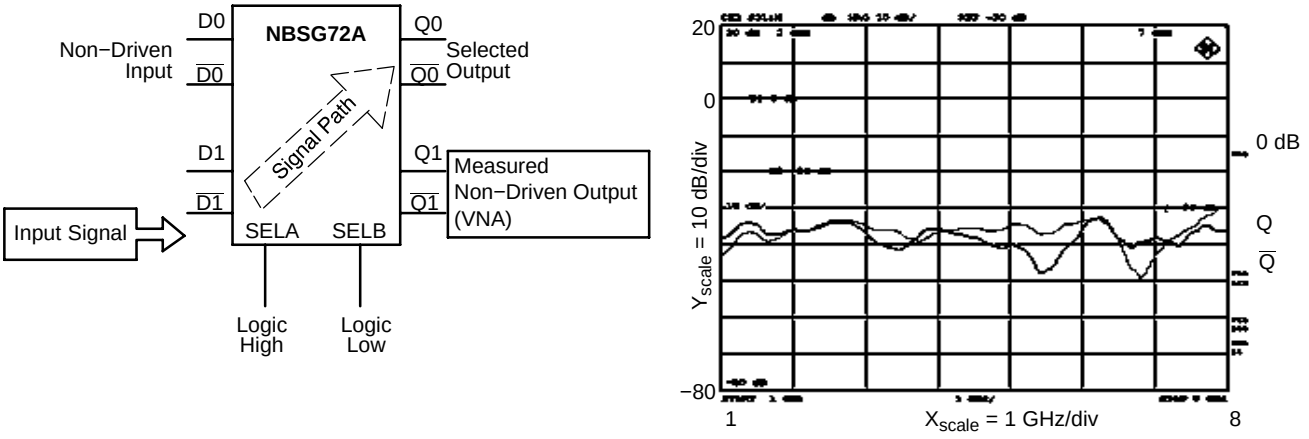


Figure 5. Channel−to−Channel Crosstalk Isolation at Ambient Temperature (D1 to Q0 Signal Path Selected; SelA = High, SelB = Low)

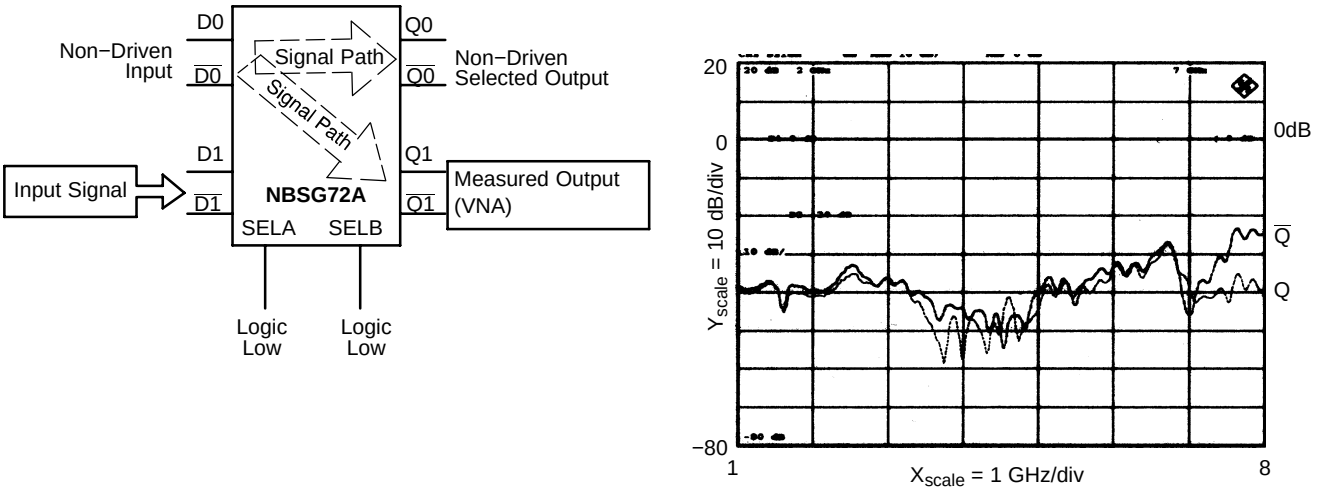


Figure 6. Channel−to−Channel Crosstalk Isolation at Ambient Temperature (D0 to Q0 and Q1 Signal Path Selected; SelA = Low, SelB = Low)

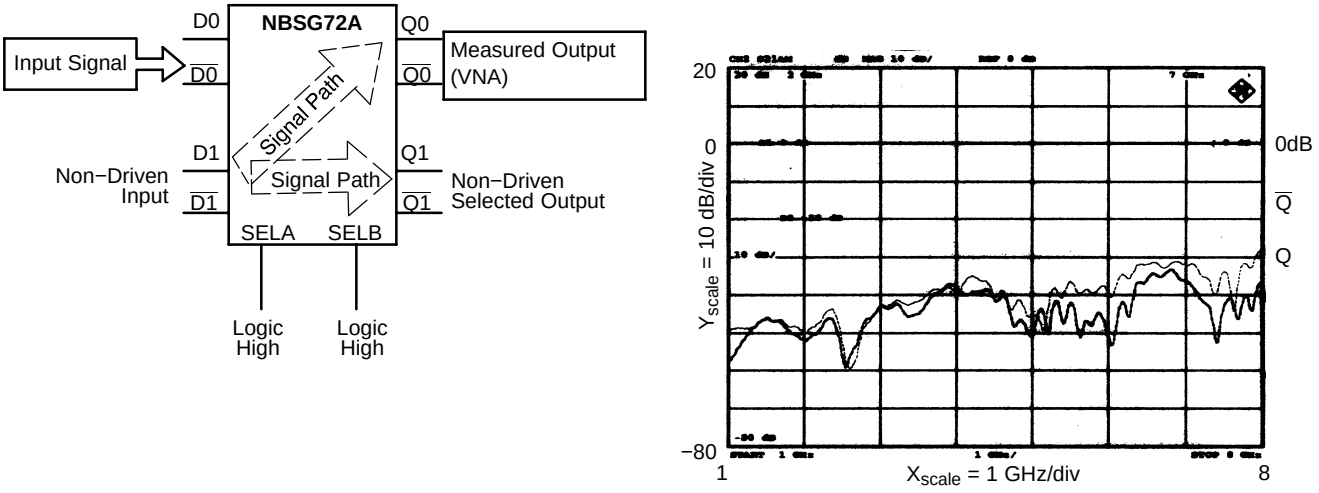
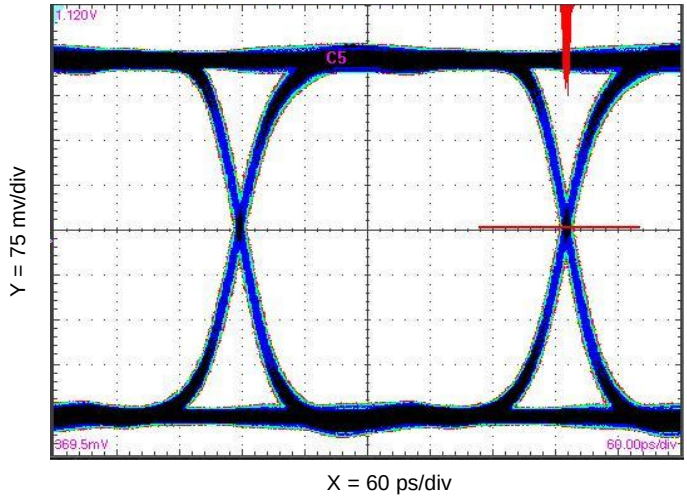
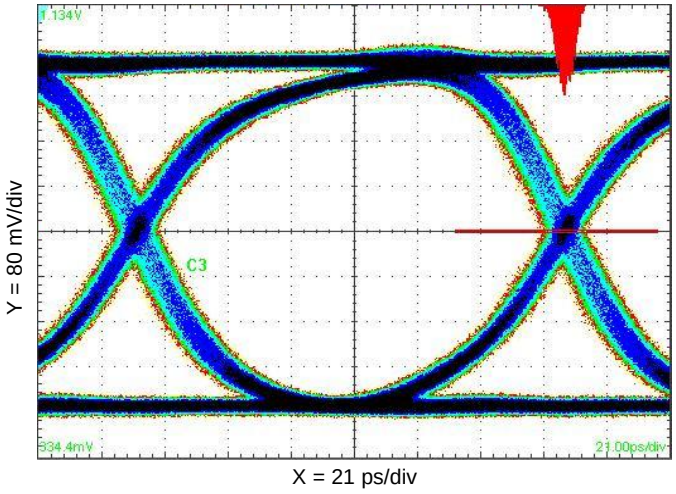


Figure 7. Channel−to−Channel Crosstalk Isolation at Ambient Temperature (D1 to Q0 and Q1 Signal Path Selected; SelA = High, SelB = High)



Total System Jitter = 17.2 ps
Input Generator Jitter = 10 ps
Device Jitter = 6.8 ps

Figure 8. Eye Diagram at 3.2 Gb/s
(V_{CC} − V_{EE} = 3.3 V, OLS = FLOAT @ 25°C with input pattern of 2^{31-1} PRBS, 5000 Waveforms)



Total System Jitter = 17.2 ps
Input Generator Jitter = 10 ps
Device Jitter = 7.2 ps

Figure 9. Eye Diagram at 7 Gb/s/s
(V_{CC} − V_{EE} = 3.3 V, OLS = FLOAT @ 25°C with input pattern of 2^{31-1} PRBS, 5000 Waveforms)

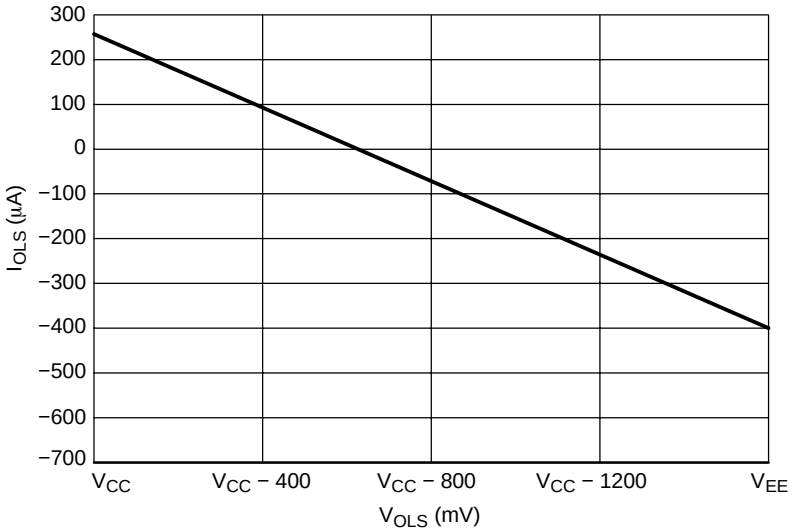


Figure 10. Typical OLS Input Current vs. OLS Input Voltage
(V_{CC} − V_{EE} = 3.3 V @ 25°C)

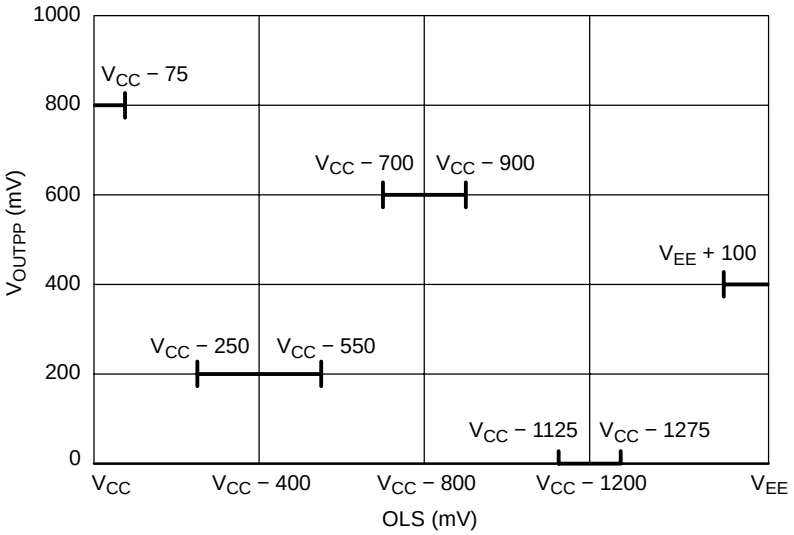


Figure 11. OLS Operating Area

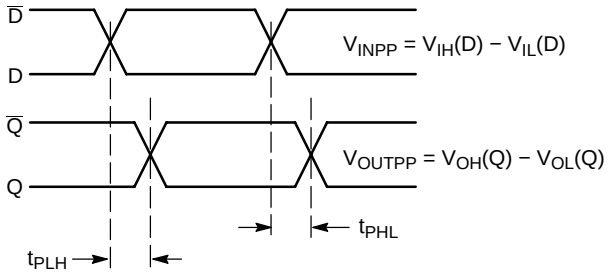


Figure 12. AC Reference Measurement

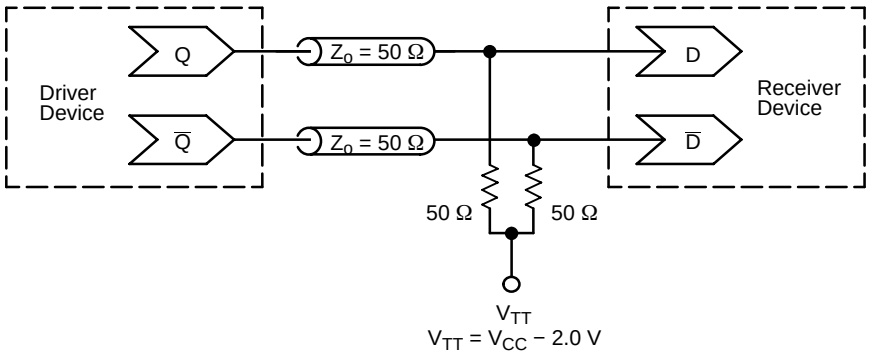


Figure 13. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D − Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping†
NBSG72AMN	QFN−16	123 Units / Rail
NBSG72AMNG	QFN−16 (Pb−Free)	123 Units / Rail
NBSG72AMNR2	QFN−16	3000 / Tape & Reel
NBSG72AMNR2G	QFN−16 (Pb−Free)	3000 / Tape & Reel

Board	Description
NBSG72AMNEVB	NBSG72AMN Evaluation Board

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Resource Reference of Application Notes

AN1405/D − ECL Clock Distribution Techniques

AN1406/D − Designing with PECL (ECL at +5.0 V)

AN1503/D − ECLinPS™ I/O SPiCE Modeling Kit

AN1504/D − Metastability and the ECLinPS Family

AN1568/D − Interfacing Between LVDS and ECL

AN1642/D − The ECL Translator Guide

AND8001/D − Odd Number Counters Design

AND8002/D − Marking and Date Codes

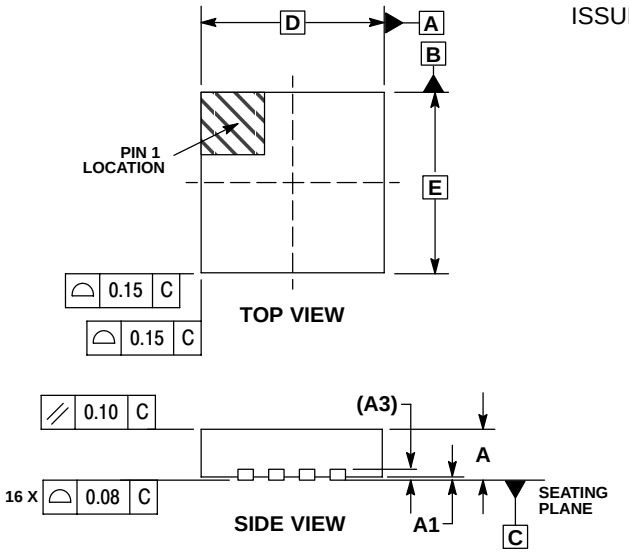
AND8020/D − Termination of ECL Logic Devices

AND8066/D − Interfacing with ECLinPS

AND8090/D − AC Characteristics of ECL Devices

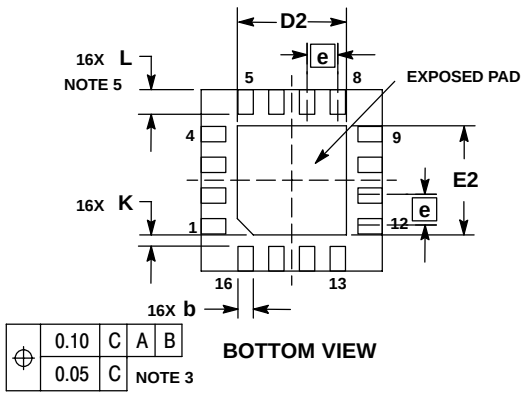
PACKAGE DIMENSIONS

16 PIN QFN
MN SUFFIX
CASE 485G−01
ISSUE B

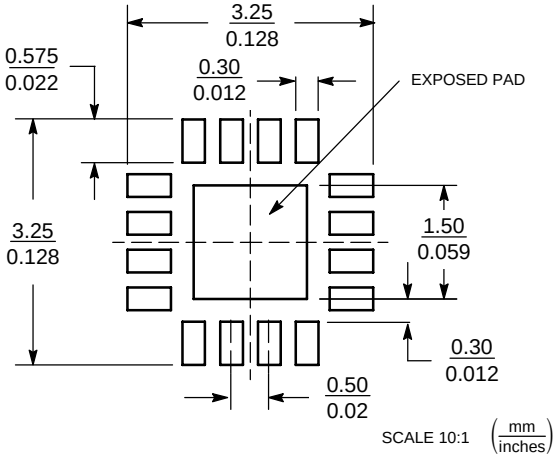


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. L_{max} CONDITION CAN NOT VIOLATE 0.2 MM MINIMUM SPACING BETWEEN LEAD TIP AND FLAG

	MILLIMETERS	
DIM	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.18	0.30
D	3.00 BSC	
D2	1.65	1.85
E	3.00 BSC	
E2	1.65	1.85
e	0.50 BSC	
K	0.20	−−−
L	0.30	0.50



SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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