

MC100EP16F

3.3V / 5V ECL Differential Receiver/Driver With Reduced Output Swing

The MC100EP16F is a differential receiver/driver. The device is functionally equivalent to the EP16 device with higher performance capabilities. With reduced output swings, rise/fall transition times are significantly faster than on the EP16. The EP16F is ideally suited for interfacing with high frequency sources.

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 μ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used, V_{BB} should be left open.

- 100 ps Typical Rise and Fall Time
- Max Frequency >4 GHz Typical
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: $V_{CC} = 3.0$ V to 5.5 V with $V_{EE} = 0$ V
- NECL Mode Operating Range: $V_{CC} = 0$ V with $V_{EE} = -3.0$ V to -5.5 V
- Open Input Default State
- Safety Clamp on Inputs



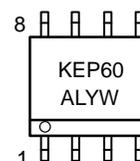
ON Semiconductor™

<http://onsemi.com>

MARKING DIAGRAMS*



SO-8
D SUFFIX
CASE 751



TSSOP-8
DT SUFFIX
CASE 948R



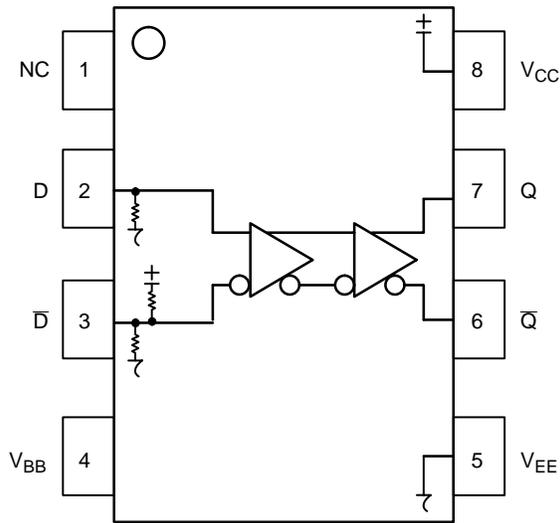
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week

*For additional information, see Application Note AND8002/D

ORDERING INFORMATION

Device	Package	Shipping
MC100EP16FD	SO-8	98 Units/Rail
MC100EP16FDR2	SO-8	2500 Tape & Reel
MC100EP16FDT	TSSOP-8	100 Units/Rail
MC100EP16FDTR2	TSSOP-8	2500 Tape & Reel

MC100EP16F



PIN DESCRIPTION

PIN	FUNCTION
D*, \bar{D}^{**}	ECL Data Inputs
Q, \bar{Q}	ECL Data Outputs
V _{BB}	Reference Voltage Output
V _{CC}	Positive Supply
V _{EE}	Negative Supply
NC	No Connect

* Pins will default LOW when left open.

** Pins will default to V_{CC}/2 when left open.

Figure 1. 8-Lead Pinout (Top View) and Logic Diagram

ATTRIBUTES

Characteristics	Value	
Internal Input Pulldown Resistor	75 kΩ	
Internal Input Pullup Resistor	37.5 kΩ	
ESD Protection	Human Body Model	> 4 kV
	Machine Model	> 200 V
	Charged Device Model	> 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1.)	Level 1	
Flammability Rating Oxygen Index	UL-94 code V-0 A 1/8" 28 to 34	
Transistor Count	139	
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

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

MAXIMUM RATINGS (Note 2.)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V _{CC}	PECL Mode Power Supply	V _{EE} = 0 V		6	V
V _{EE}	NECL Mode Power Supply	V _{CC} = 0 V		-6	V
V _I	PECL Mode Input Voltage	V _{EE} = 0 V	V _I ≤ V _{CC}	6	V
	NECL Mode Input Voltage	V _{CC} = 0 V	V _I ≥ V _{EE}	-6	V
I _{out}	Output Current	Continuous Surge		50	mA
				100	mA
I _{BB}	V _{BB} Sink/Source			± 0.5	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)	0 LFPM	8 SOIC	190	°C/W
		500 LFPM	8 SOIC	130	°C/W
θ _{JC}	Thermal Resistance (Junction to Case)	std bd	8 SOIC	41 to 44 ± 5%	°C/W
θ _{JA}	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	8 TSSOP	185	°C/W
			8 TSSOP	140	°C/W
θ _{JC}	Thermal Resistance (Junction to Case)	std bd	8 TSSOP	41 to 44 ± 5%	°C/W
T _{sol}	Wave Solder	<2 to 3 sec @ 248°C		265	°C

2. Maximum Ratings are those values beyond which device damage may occur.

MC100EP16F

DC CHARACTERISTICS, PECL $V_{CC} = 3.3\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 3.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
IEE	Power Supply Current	23	28	35	25	31	38	26	33	40	mA
V _{OH}	Output HIGH Voltage (Note 4.)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
V _{OL}	Output LOW Voltage (Note 4.)	1575	1690	1775	1575	1690	1775	1575	1690	1775	mV
V _{IH}	Input HIGH Voltage (Single Ended)	2075		2420	2075		2420	2075		2420	mV
V _{IL}	Input LOW Voltage (Single Ended) (Note 5.)	1490		1675	1490		1675	1490		1675	mV
V _{BB}	Output Voltage Reference	1775	1875	1975	1775	1875	1975	1775	1875	1975	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 6.)	2.0		3.3	2.0		3.3	2.0		3.3	V
I _{IH}	Input HIGH Current			150			150			150	μA
I _{IL}	Input LOW Current	D D	0.5 -150		0.5 -150			0.5 -150			μA

NOTE: EP 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 greater than 500 lfm is maintained.

- Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.3 V to -2.2 V.
- All loading with 50 ohms to V_{CC} -2.0 volts.
- Not recommended for single ended operation when using an EP16F to drive another EP16F. V_{OL} has reduced output swing and may not meet the V_{IL} specification over temperature.
- 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.

DC CHARACTERISTICS, PECL $V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 7.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
IEE	Power Supply Current	23	28	35	25	31	38	26	33	40	mA
V _{OH}	Output HIGH Voltage (Note 8.)	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV
V _{OL}	Output LOW Voltage (Note 8.)	3275	3390	3475	3275	3390	3475	3275	3390	3475	mV
V _{IH}	Input HIGH Voltage (Single Ended)	3775		4120	3775		4120	3775		4120	mV
V _{IL}	Input LOW Voltage (Single Ended) (Note 9.)	3190		3375	3190		3375	3190		3375	mV
V _{BB}	Output Voltage Reference	3475	3575	3675	3475	3575	3675	3475	3575	3675	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 10.)	2.0		5.0	2.0		5.0	2.0		5.0	V
I _{IH}	Input HIGH Current			150			150			150	μA
I _{IL}	Input LOW Current	D D	0.5 -150		0.5 -150			0.5 -150			μA

NOTE: EP 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 greater than 500 lfm is maintained.

- Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +2.0 V to -0.5 V.
- All loading with 50 ohms to V_{CC} -2.0 volts.
- Not recommended for single ended operation when using an EP16F to drive another EP16F. V_{OL} has reduced output swing and may not meet the V_{IL} specification over temperature.
- 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.

MC100EP16F

DC CHARACTERISTICS, NECL $V_{CC} = 0V$; $V_{EE} = -5.5V$ to $-3.0V$ (Note 11.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	23	28	35	25	31	38	26	33	40	mA
V_{OH}	Output HIGH Voltage (Note 12.)	-1145	-1020	-895	-1145	-1020	-895	-1145	-1020	-895	mV
V_{OL}	Output LOW Voltage (Note 12.)	-1725	-1610	-1525	-1725	-1610	-1525	-1725	-1610	-1525	mV
V_{IH}	Input HIGH Voltage (Single Ended)	-1225		-880	-1225		-880	-1225		-880	mV
V_{IL}	Input LOW Voltage (Single Ended) (Note 13.)	-1810		-1625	-1810		-1625	-1810		-1625	mV
V_{BB}	Output Voltage Reference	-1525	-1425	-1325	-1525	-1425	-1325	-1525	-1425	-1325	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 14.)	$V_{EE}+2.0$		0.0	$V_{EE}+2.0$		0.0	$V_{EE}+2.0$		0.0	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	D 0.5 D -150			0.5 -150			0.5 -150			μA

NOTE: EP 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 greater than 500 lfm is maintained.

11. Input and output parameters vary 1:1 with V_{CC} .

12. All loading with 50 ohms to $V_{CC}-2.0$ volts.

13. Not recommended for single ended operation when using an EP16F to drive another EP16F. V_{OL} has reduced output swing and may not meet the V_{IL} specification over temperature.

14. 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.

AC CHARACTERISTICS $V_{CC} = 0V$; $V_{EE} = -3.0V$ to $-5.5V$ or $V_{CC} = 3.0V$ to $5.5V$; $V_{EE} = 0V$ (Note 15.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
f_{max}	Maximum Toggle Frequency (See Figure 2. $F_{max}/JITTER$)		> 4			> 4			> 4		GHz	
t_{PLH} , t_{PHL}	Propagation Delay to Output Differential	170	210	250	180	220	260	200	250	300	ps	
t_{SKEW}	Duty Cycle Skew		5.0	20		5.0	20		5.0	20	ps	
t_{JITTER}	Cycle-to-Cycle Jitter (RMS) (See Figure 2. $F_{max}/JITTER$)		0.2	< 1		0.2	< 1		0.2	< 1	ps	
V_{PP}	Input Voltage Swing (Differential)	150	800	1200	150	800	1200	150	800	1200	mV	
t_r , t_f	Output Rise/Fall Times (20% – 80%)	Q	70	85	110	80	100	120	90	110	130	ps

15. Measured using a 750 mV source, 50% duty cycle clock source. All loading with 50 ohms to $V_{CC}-2.0$ V.

MC100EP16F

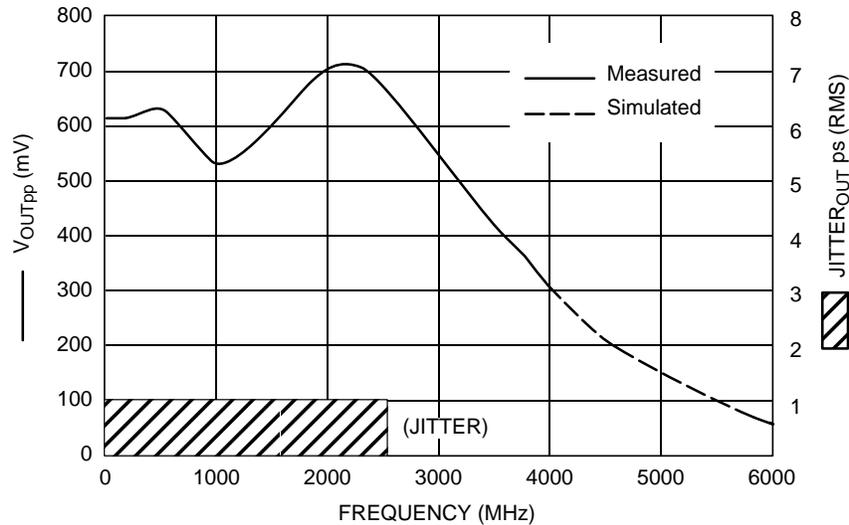


Figure 2. $F_{max}/JITTER$

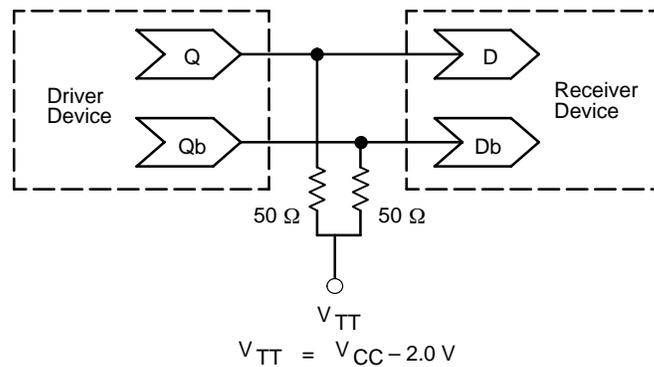


Figure 3. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020 – Termination of ECL Logic Devices.)

Resource Reference of Application Notes

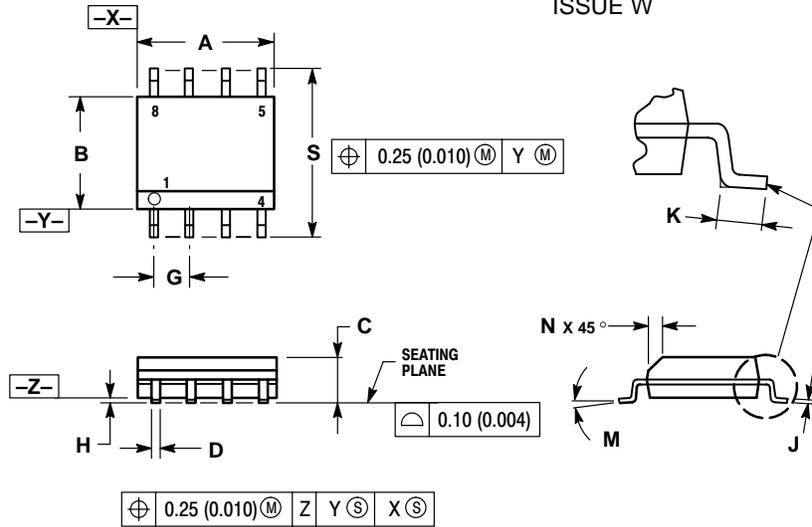
- AN1404** – ECLinPS Circuit Performance at Non-Standard V_{IH} Levels
- AN1405** – ECL Clock Distribution Techniques
- AN1406** – Designing with PECL (ECL at +5.0 V)
- AN1504** – Metastability and the ECLinPS Family
- AN1568** – Interfacing Between LVDS and ECL
- AN1650** – Using Wire-OR Ties in ECLinPS Designs
- AN1672** – The ECL Translator Guide
- AND8001** – Odd Number Counters Design
- AND8002** – Marking and Date Codes
- AND8009** – ECLinPS Plus Spice I/O Model Kit
- AND8020** – Termination of ECL Logic Devices
- AND8033** – Method for AC Data Measurement

For an updated list of Application Notes, please see our website at <http://onsemi.com>.

MC100EP16F

PACKAGE DIMENSIONS

SO-8 D SUFFIX PLASTIC SOIC PACKAGE CASE 751-07 ISSUE W

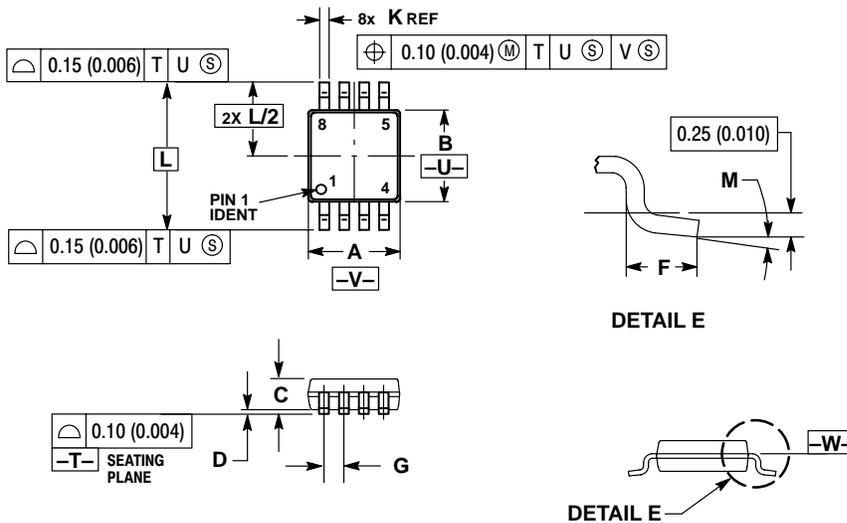


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

TSSOP-8 DT SUFFIX PLASTIC TSSOP PACKAGE CASE 948R-02 ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.80	1.10	0.031	0.043
D	0.05	0.15	0.002	0.006
F	0.40	0.70	0.016	0.028
G	0.65 BSC		0.026 BSC	
K	0.25	0.40	0.010	0.016
L	4.90 BSC		0.193 BSC	
M	0°	6°	0°	6°

Notes

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

PUBLICATION ORDERING INFORMATION

NORTH AMERICA Literature Fulfillment:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com
Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

EUROPE: LDC for ON Semiconductor – European Support

German Phone: (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)
Email: ONlit-german@hibbertco.com
French Phone: (+1) 303-308-7141 (Mon-Fri 2:00pm to 7:00pm CET)
Email: ONlit-french@hibbertco.com
English Phone: (+1) 303-308-7142 (Mon-Fri 12:00pm to 5:00pm GMT)
Email: ONlit@hibbertco.com

EUROPEAN TOLL-FREE ACCESS*: 00-800-4422-3781

*Available from Germany, France, Italy, UK, Ireland

CENTRAL/SOUTH AMERICA:

Spanish Phone: 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)
Email: ONlit-spanish@hibbertco.com
Toll-Free from Mexico: Dial 01-800-288-2872 for Access –
then Dial 866-297-9322

ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support

Phone: 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)
Toll Free from Hong Kong & Singapore:
001-800-4422-3781
Email: ONlit-asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031
Phone: 81-3-5740-2700
Email: r14525@onsemi.com

ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local Sales Representative.