MC10ELT21, MC100ELT21

5 V Differential PECL to TTL Translator

ON Semiconductor®

http://onsemi.com

Description

The MC10ELT/100ELT21 is a differential PECL to TTL translator. Because PECL (Positive ECL) levels are used, only +5 V and ground are required. The small outline 8-lead package and the single gate of the ELT21 makes it ideal for those applications where space, performance and low power are at a premium.

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

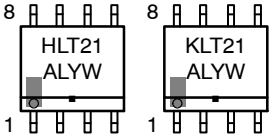
The 100 Series contains temperature compensation.

Features

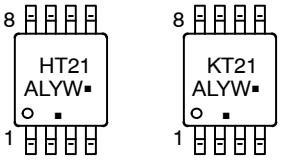
- 3.5 ns Typical Propagation Delay
- 24 mA TTL Output
- Flow Through Pinouts
- Operating Range: V_{CC} = 4.75 V to 5.25 V with GND = 0 V
- Q Output Will Default LOW with Inputs Left Open or < 1.3 V
- Pb−Free Packages are Available

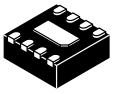
MARKING DIAGRAMS*

SOIC−8
D SUFFIX
CASE 751

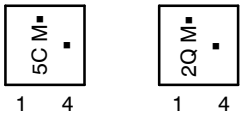


TSSOP−8
DT SUFFIX
CASE 948R





DFN8
MN SUFFIX
CASE 506AA



H	= MC10	A	= Assembly Location
K	= MC100	L	= Wafer Lot
5C	= MC10	Y	= Year
2Q	= MC100	W	= Work Week
M	= Date Code	▪	= 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 5 of this data sheet.

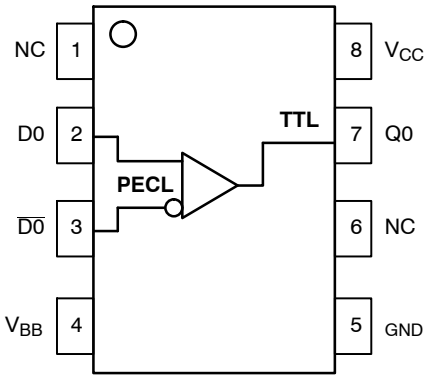


Figure 1. 8−Lead Pinout and Logic Diagram
(Top View)

Table 1. PIN DESCRIPTION

Pin	Function
Q0	TTL Outputs
D0, $\overline{DO}$	PECL Differential Outputs
V_{BB}	Reference Voltage Output
V_{CC}	Positive Supply
GND	Ground
NC	No Connect
EP	(DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

Table 2. ATTRIBUTES

Characteristics		Value	
Internal Input Pulldown Resistor		50 kΩ	
Internal Input Pullup Resistor		N/A	
ESD Protection	Human Body Model	> 2 kV	
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)		Pb Pkg	Pb−Free Pkg
	SOIC−8 TSSOP−8 DFN8	Level 1 Level 1 Level 1	Level 1 Level 3 Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
Transistor Count		81 Devices	
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test			

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

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Power Supply	GND = 0 V		7	V
V_{IN}	PECL Input Voltage	GND = 0 V	$V_I \leq V_{CC}$	0 to 6	V
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
TA	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 500 lfpm	SOIC−8 SOIC−8	190 130	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	Standard Board	SOIC−8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	TSSOP−8 TSSOP−8	185 140	°C/W °C/W
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °C/W
T_{sol}	Wave Solder Pb Pb−Free	<2 to 3 sec @ 248°C <2 to 3 sec @ 260°C		265 265	°C
θ_{JC}	Thermal Resistance (Junction−to−Case)	(Note 2)	DFN8	35 to 40	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

Table 4. 10ELT SERIES PECL INPUT DC CHARACTERISTICS V_{CC} = 5.0 V; GND = 0.0 V (Note 3)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V_{IH}	Input HIGH Voltage (Single−Ended)	3770		4110	3870		4190	3930		4265	mV
V_{IL}	Input LOW Voltage (Single−Ended)	3050		3500	3050		3520	3050		3555	mV
V_{BB}	Output Voltage Reference	3.57		3.7	3.65		3.75	3.69		3.81	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 4)	2.2		5.0	2.2		5.0	2.2		5.0	V
I_{IH}	Input HIGH Current			255			175			175	μA
I_{IL}	Input LOW Current	0.5			0.5			0.3			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.

3. Output parameters vary 1:1 with V_{CC}. V_{CC} can vary ± 0.25 V.
4. V_{IHCMR} min varies 1:1 with GND, V_{IHCMR} max varies 1:1 with V_{CC}.

Table 5. 100ELT SERIES PECL INPUT DC CHARACTERISTICS V_{CC} = 5.0 V; GND = 0.0 V (Note 5)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V_{IH}	Input HIGH Voltage (Single−Ended)	3835		4120	3835		4120	3835		4120	mV
V_{IL}	Input LOW Voltage (Single−Ended)	3190		3525	3190		3525	3190		3525	mV
V_{BB}	Output Voltage Reference	3.62		3.74	3.62		3.74	3.62		3.745	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 6)	2.2		5.0	2.2		5.0	2.2		5.0	V
I_{IH}	Input HIGH Current			255			175			175	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket o 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.

5. Input parameters vary 1:1 with V_{CC}. V_{CC} can vary ± 0.25 V.
6. V_{IHCMR} min varies 1:1 with GND, V_{IHCMR} max varies 1:1 with V_{CC}.

Table 6. TTL OUTPUT DC CHARACTERISTICS V_{CC} = 4.75 V to 5.25 V; T_A = −40°C to 85°C)

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{OH}	Output HIGH Voltage	I_{OH} = −3.0 mA	2.4		(Note 7)	V
V_{OL}	Output LOW Voltage	I_{OL} = 24 mA			0.5	V
I_{CCH}	Power Supply Current			20	29	mA
I_{CCL}	Power Supply Current			22	32	mA
I_{OS}	Output Short Circuit Current		−150		−60	mA

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.

7. Maximum level is V_{CC} − 0.7 by design.

AC CHARACTERISTICS V_{CC} = 4.75 V to 5.25 V; GND = 0.0 V (Note 8)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Toggle Frequency					100					MHz
t_{JITTER}	Random Clock Jitter (RMS)					35					ps
t_{PLH}	Propagation Delay @ 1.5 V	2.0		5.5	2.0		5.5	2.0		5.5	ns
t_{PHL}	Propagation Delay @ 1.5 V	2.0		5.5	2.0		5.5	2.0		5.5	ns
V_{PP}	Input Swing (Note 9)	200		1000	200		1000	200		1000	mV
t_r/t_f	Output Rise/Fall Time (10−90%)					750					ps

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.

8. R_L = 500 Ω to GND and C_L = 20 pF to GND. Refer to Figure 2.
9. V_{PP}(min) is the minimum input swing for which AC parameters are guaranteed. The device has a DC gain of ≈ 40.

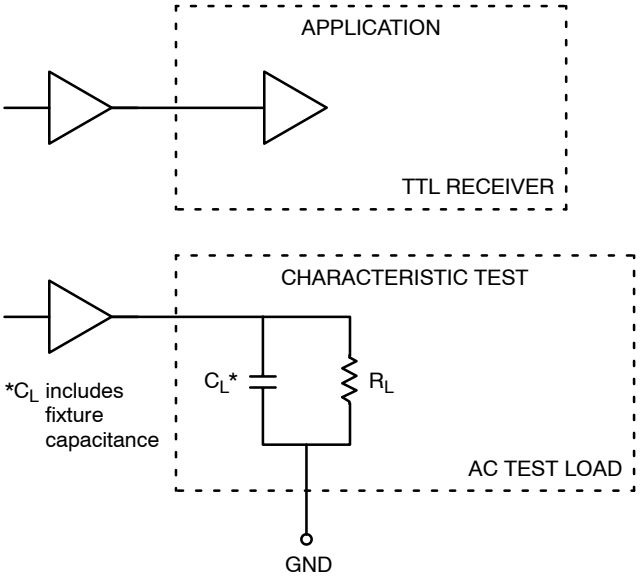


Figure 2. TTL Output Loading Used for Device Evaluation

ORDERING INFORMATION

Device	Package	Shipping†
MC10ELT21D	SOIC−8	98 Units / Rail
MC10ELT21DG	SOIC−8 (Pb−Free)	98 Units / Rail
MC10ELT21DR2	SOIC−8	2500 / Tape & Reel
MC10ELT21DR2G	SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC10ELT21DT	TSSOP−8	100 Units / Rail
MC10ELT21DTG	TSSOP−8 (Pb−Free)	100 Units / Rail
MC10ELT21DTR2	TSSOP−8	2500 / Tape & Reel
MC10ELT21DTR2G	TSSOP−8 (Pb−Free)	2500 / Tape & Reel
MC10ELT21MNR4	DFN8	1000 / Tape & Reel
MC10ELT21MNR4G	DFN8 (Pb−Free)	1000 / Tape & Reel
MC100ELT21D	SOIC−8	98 Units / Rail
MC100ELT21DG	SOIC−8 (Pb−Free)	98 Units / Rail
MC100ELT21DR2	SOIC−8	2500 / Tape & Reel
MC100ELT21DR2G	SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC100ELT21DT	TSSOP−8	100 Units / Rail
MC100ELT21DTG	TSSOP−8 (Pb−Free)	100 Units / Rail
MC100ELT21DTR2	TSSOP−8	2500 / Tape & Reel
MC100ELT21DTR2G	TSSOP−8 (Pb−Free)	2500 / Tape & Reel
MC100ELT21MNR4	DFN8	1000 / Tape & Reel
MC100ELT21MNR4G	DFN8 (Pb−Free)	1000 / Tape & Reel

†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

AN1672/D – The ECL Translator Guide

AND8001/D – Odd Number Counters Design

AND8002/D – Marking and Date Codes

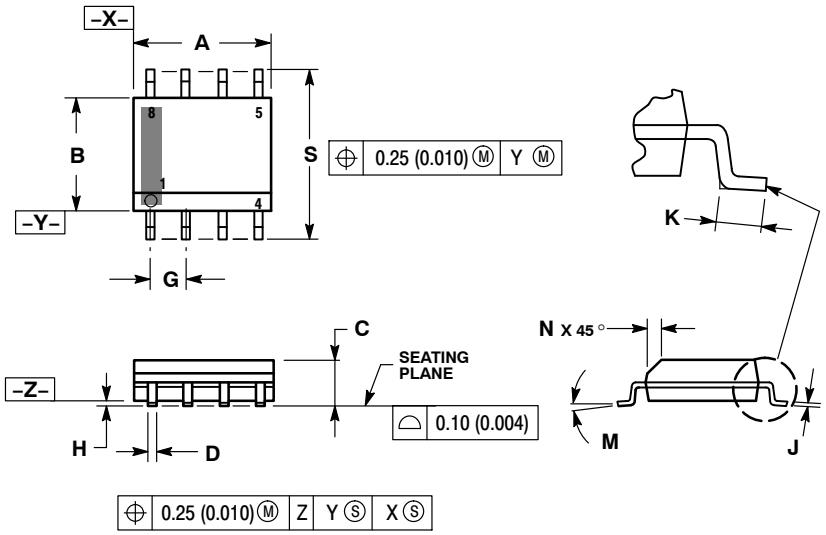
AND8020/D – Termination of ECL Logic Devices

AND8066/D – Interfacing with ECLinPS

AND8090/D – AC Characteristics of ECL Devices

PACKAGE DIMENSIONS

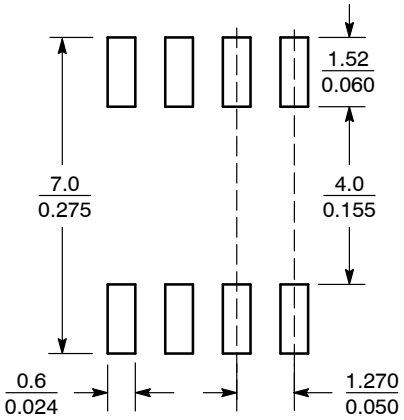
SOIC−8 NB
CASE 751−07
ISSUE AH



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.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	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

SOLDERING FOOTPRINT*

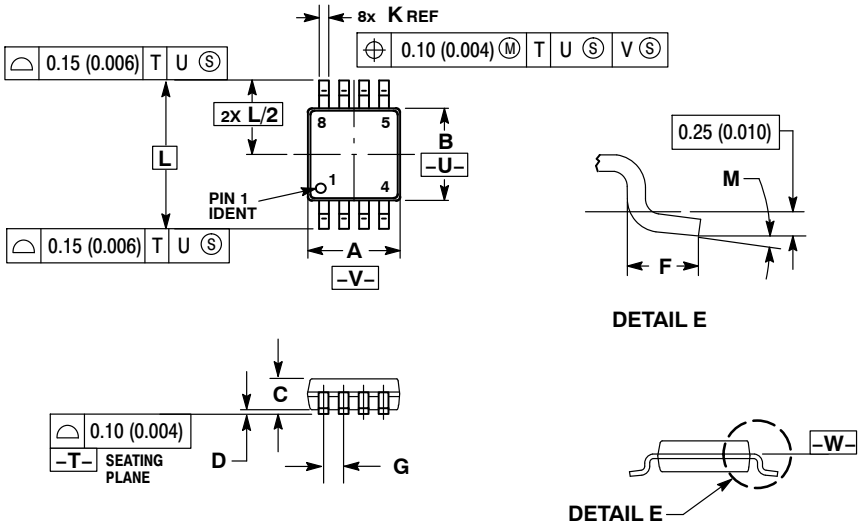


SCALE 6:1 (mm / inches)

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

PACKAGE DIMENSIONS

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

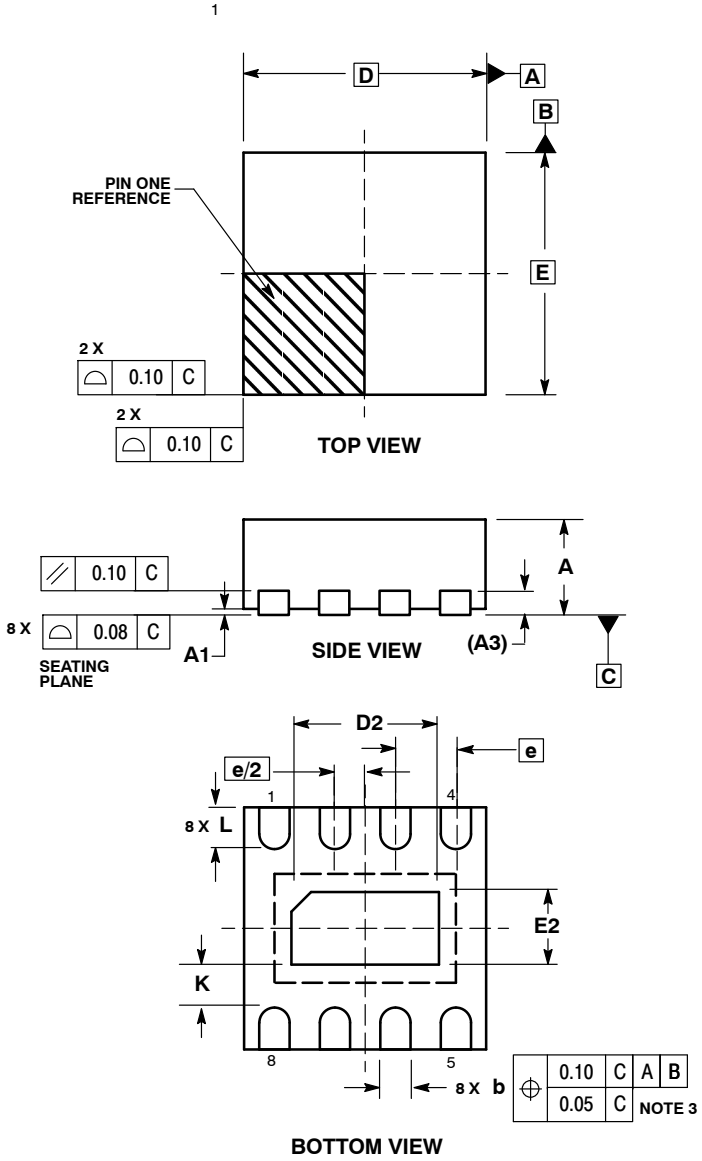


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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−.

	MILLIMETERS		INCHES	
DIM	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°

PACKAGE DIMENSIONS

DFN8
CASE 506AA−01
ISSUE D



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.

	MILLIMETERS	
DIM	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.20	0.30
D	2.00 BSC	
D2	1.10	1.30
E	2.00 BSC	
E2	0.70	0.90
e	0.50 BSC	
K	0.20	−−−
L	0.25	0.35

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PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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MC10ELT21/D