MC10E457, MC100E457

5V ECL Triple Differential 2:1 Multiplexer

Description

The MC10E457/100E457 is a 3-bit differential 2:1 multiplexer. The fully differential data path makes the device ideal for multiplexing low skew clock or other skew sensitive signals.

The higher frequency outputs provide the device with a > 1.0 GHz bandwidth to meet the needs of the most demanding system clock.

Both, separate selects and a common select, are provided to make the device well suited for both data path and random logic applications.

The differential inputs have internal clamp structures which will force the Q output of a gate in an open input condition to go to a LOW state. Thus, inputs of unused gates can be left open and will not affect the operation of the rest of the device. Note that the input clamp will take affect only if both inputs fall 2.5 V below V_{CC}.

The 100 Series contains temperature compensation.

Multiple V_{BB} pins are provided to ease AC coupling input signals. The V_{BB} pins, internally generated voltage supply pins, are 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.
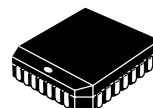
Features

- Differential D and Q; V_{BB} available
- 700 ps Max. Propagation Delay
- High Frequency Outputs
- Separate and Common Select
- PECL Mode Operating Range: V_{CC} = 4.2 V to 5.7 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = −4.2 V to −5.7 V
- Internal Input 50 kΩ Pulldown Resistors
- ESD Protection: Human Body Model; > 2 kV, Machine Model; > 200 V
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
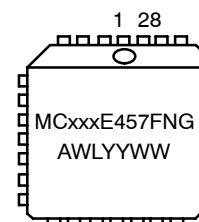- Moisture Sensitivity Level: Pb = 1; Pb−Free = 3 For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V−0 @ 0.125 in, Oxygen Index: 28 to 34
- Transistor Count = 218 devices
- Pb−Free Packages are Available*

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http://onsemi.com

PLCC−28
FN SUFFIX
CASE 776

MARKING DIAGRAM*

1 28

MCxxxE457FNG
AWLYYWW

xxx	= 10 or 100
A	= Assembly Location
WL	= Wafer Lot
YY	= Year
WW	= Work Week
G	= Pb−Free Package

*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 7 of this data sheet.

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

MC10E457, MC100E457

SEL2 D$_2$a $\overline{D_2a}$ V$_{BB}$ $\overline{D_2b}$ D$_2$b COMSEL

Pinout: 28-Lead PLCC
(Top View)
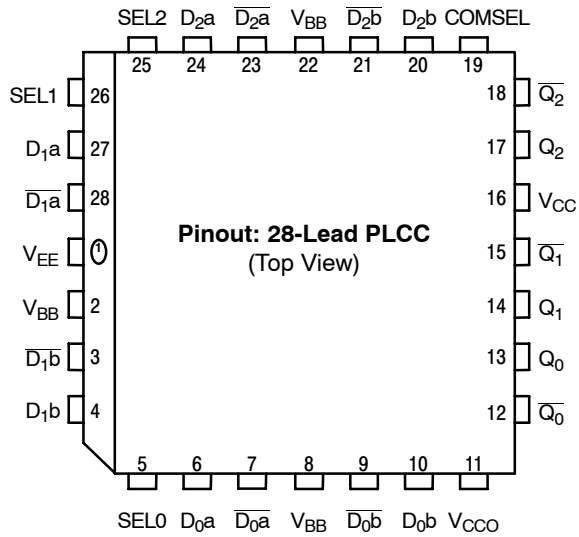
* All V$_{CC}$ and V$_{CCO}$ pins are tied together on the die.

Warning: All V$_{CC}$, V$_{CCO}$, and V$_{EE}$ pins must be externally connected to Power Supply to guarantee proper operation.
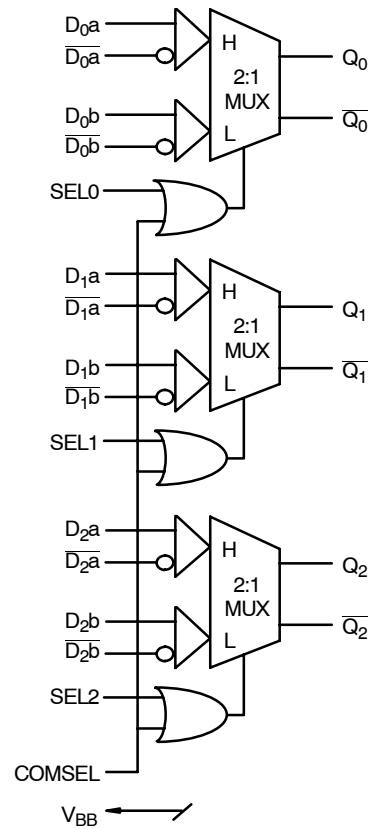
Figure 1. Pinout Assignment

Figure 2. Logic Diagram

Table 1. PIN DESCRIPTION

PIN	FUNCTION
Dn[0:2]; $\overline{Dn}$[0:2]	ECL Differential Data Inputs
SEL	ECL Individual Select Input
COMSEL	ECL Common Select Input
Q[0:2], $\overline{Q}$[0:2]	ECL Differential Data Outputs
V$_{BB}$	Reference Voltage Output
V$_{CC}$, V$_{CCO}$	Positive Supply
V$_{EE}$	Negative Supply

Table 2. FUNCTION TABLE

SEL	Data
H	a
L	b

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Mode Power Supply	V_{EE} = 0 V		8	V
V_{EE}	NECL Mode Power Supply	V_{CC} = 0 V		−8	V
V_I	PECL Mode Input Voltage NECL Mode Input Voltage	V_{EE} = 0 V V_{CC} = 0 V	$V_I \leq V_{CC}$ $V_I \geq V_{EE}$	6 −6	V V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
T_A	Operating Temperature Range			0 to +85	°C
T_{stg}	Storage Temperature Range			−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	PLCC−28 PLCC−28	63.5 43.5	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	Standard Board	PLCC−28	22 to 26	°C/W
T_{sol}	Wave Solder Pb Pb−Free			265 265	°C

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.

Table 4. 10E SERIES PECL DC CHARACTERISTICS V_{CCx} = 5.0 V, V_{EE} = 0.0 V (Note 1)

Symbol	Characteristic	−40°C Min	Typ	Max	0°C Min	Typ	Max	25°C Min	Typ	Max	85°C Min	Typ	Max	Unit
I_{EE}	Power Supply Current		92	110		92	110		92	110		92	110	mA
V_{OH}	Output HIGH Voltage (Note 2)				3980	4070	4160	4020	4105	4190	4090	4185	4280	mV
V_{OL}	Output LOW Voltage (Note 2)				3050	3210	3370	3050	3210	3370	3050	3227	3405	mV
V_{IH}	Input HIGH Voltage (Single−Ended)				3830	3995	4160	3870	4030	4190	3940	4110	4280	mV
V_{IL}	Input LOW Voltage (Single−Ended)				3050	3285	3520	3050	3285	3520	3050	3302	3555	mV
V_{BB}	Output Voltage Reference	3.57		3.7	3.62		3.73	3.65		3.75	3.69		3.81	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)				2.7		5.0	2.7		5.0	2.7		5.0	V
I_{IH}	Input HIGH Current			150			150			150			150	μA
I_{IL}	Input LOW Current				0.5	0.3		0.5	0.25		0.3	0.2		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.
1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.06 V.
2. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.
3. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.

Table 5. 10E SERIES NECL DC CHARACTERISTICS V_{CCx} = 0.0 V; V_{EE} = −5.0 V (Note 4)

Symbol	Characteristic	−40°C Min	Typ	Max	0°C Min	Typ	Max	25°C Min	Typ	Max	85°C Min	Typ	Max	Unit
I_{EE}	Power Supply Current		92	110		92	110		92	110		92	110	mA
V_{OH}	Output HIGH Voltage (Note 5)				−1020	−930	−840	−980	−895	−810	−910	−815	−720	mV
V_{OL}	Output LOW Voltage (Note 5)				−1950	−1790	−1630	−1950	−1790	−1630	−1950	−1773	−1595	mV
V_{IH}	Input HIGH Voltage (Single−Ended)				−1170	−1005	−840	−1130	−970	−810	−1060	−890	−720	mV
V_{IL}	Input LOW Voltage (Single−Ended)				−1950	−1715	−1480	−1950	−1715	−1480	−1950	−1698	−1445	mV
V_{BB}	Output Voltage Reference	−1.43		−1.3	−1.38		−1.27	−1.35		−1.25	−1.31		−1.19	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 6)				−2.3		0.0	−2.3		0.0	−2.3		0.0	V
I_{IH}	Input HIGH Current			150			150			150			150	μA
I_{IL}	Input LOW Current				0.5	0.3		0.5	0.065		0.3	0.2		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.
4. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.06 V.
5. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.
6. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.

Table 6. 100E SERIES PECL DC CHARACTERISTICS V_{CCx} = 5.0 V, V_{EE} = 0.0 V (Note 7)

Symbol	Characteristic	–40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current		92	110		92	110		92	110		106	127	mA
V_{OH}	Output HIGH Voltage (Note 8)				3975	4050	4120	3975	4050	4120	3975	4050	4120	mV
V_{OL}	Output LOW Voltage (Note 8)				3190	3295	3380	3190	3255	3380	3190	3260	3380	mV
V_{IH}	Input HIGH Voltage (Single–Ended)				3835	3975	4120	3835	3975	4120	3835	3975	4120	mV
V_{IL}	Input LOW Voltage (Single–Ended)				3190	3355	3525	3190	3355	3525	3190	3355	3525	mV
V_{BB}	Output Voltage Reference	3.62		3.74	3.62		3.74	3.62		3.74	3.62		3.74	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 9)				2.7		5.0	2.7		5.0	2.7		5.0	V
I_{IH}	Input HIGH Current			150			150			150			150	μA
I_{IL}	Input LOW Current				0.5	0.3		0.5	0.25		0.5	0.2		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.

7. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary –0.46 V / +0.8 V.
8. Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V.
9. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.

Table 7. 100E SERIES NECL DC CHARACTERISTICS V_{CCx} = 0.0 V; V_{EE} = –5.0 V (Note 10)

Symbol	Characteristic	–40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current		92	110		92	110		92	110		92	110	mA
I_{EE}	Power Supply Current		92	110		92	110		92	110		106	127	mA
V_{OH}	Output HIGH Voltage (Note 11)				–1025	–950	–880	–1025	–950	–880	–1025	–950	–880	mV
V_{OL}	Output LOW Voltage (Note 11)				–1810	–1705	–1620	–1810	–1745	–1620	–1810	–1740	–1620	mV
V_{IH}	Input HIGH Voltage (Single–Ended)				–1165	–1025	–880	–1165	–1025	–880	–1165	–1025	–880	mV
V_{IL}	Input LOW Voltage (Single–Ended)				–1810	–1645	–1475	–1810	–1645	–1475	–1810	–1645	–1475	mV
V_{BB}	Output Voltage Reference	–1.38		–1.26	–1.38		–1.26	–1.38		–1.26	–1.38		–1.26	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 12)				–2.3		0.0	–2.3		0.0	–2.3		0.0	V
I_{IH}	Input HIGH Current			150			150			150			150	μA
I_{IL}	Input LOW Current				0.5	0.3		0.5	0.25		0.5	0.2		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.

10. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary –0.46 V / +0.8 V.
11. Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V.
12. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.

Table 8. AC CHARACTERISTICS V_{CCx} = 5.0 V; V_{EE} = 0.0 V or V_{CCx} = 0.0 V; V_{EE} = −5.0 V (Note 13)

Symbol	Characteristic	0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{MAX}	Maximum Toggle Frequency	1.1			1.1			1.1			GHz
t_{PLH} t_{PHL}	Propagation Delay to Output D (Differential) D (Single−Ended) SEL COMSEL	325 275 300 325	475 475 500 525	700 750 775 800	375 325 350 375	475 475 500 525	650 700 725 750	375 325 350 375	475 475 500 525	650 700 725 750	ps
t_{skew}	Within-Device Skew (Note 14)		40			40			40		ps
t_{skew}	Duty Cycle Skew (Note 15) $t_{PLH} - t_{PHL}$		±10			±10			±10		ps
t_{JITTER}	Random Clock Jitter (rms)		<1.0			<1.0			<1.0		ps
V_{PP}	Input Voltage Swing (Differential Configuration)	150						150			mV
t_r/t_f	Rise/Fall Time 20−80%	125	275	500				150	275	450	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.

13. 10 Series: V_{EE} can vary −0.46 V / +0.06 V.
    100 Series: V_{EE} can vary −0.46 V / +0.8 V.
14. Within-device skew is defined as identical transitions on similar paths through a device.
15. 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.

MC10E457, MC100E457
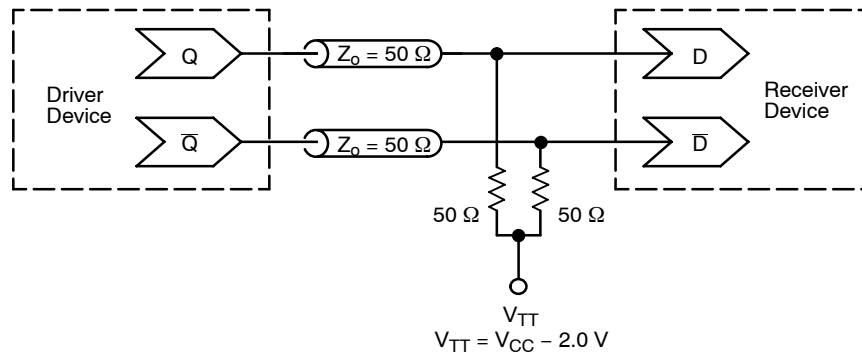
**Figure 3. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020/D – Termination of ECL Logic Devices.)**

ORDERING INFORMATION

Device	Package	Shipping†
MC10E457FN	PLCC−28	37 Units / Rail
MC10E457FNG	PLCC−28 (Pb−Free)	37 Units / Rail
MC10E457FNR2	PLCC−28	500 / Tape & Reel
MC10E457FNR2G	PLCC−28 (Pb−Free)	500 / Tape & Reel
MC100E457FN	PLCC−28	37 Units / Rail
MC100E457FNG	PLCC−28 (Pb−Free)	37 Units / Rail
MC100E457FNR2	PLCC−28	500 / Tape & Reel
MC100E457FNR2G	PLCC−28 (Pb−Free)	500 / 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

PLCC–28
FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 776–02
ISSUE E

VIEW D–D

VIEW S
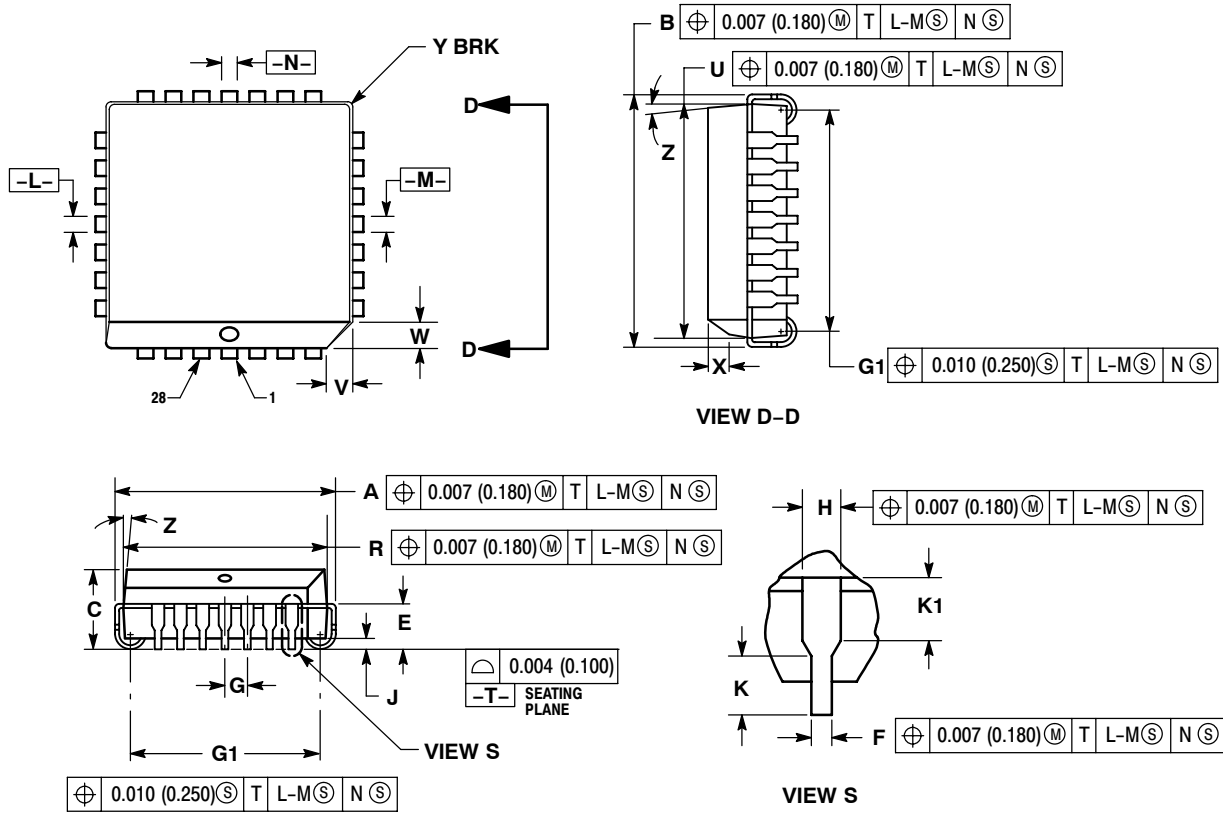
NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.
6. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.485	0.495	12.32	12.57
B	0.485	0.495	12.32	12.57
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.450	0.456	11.43	11.58
U	0.450	0.456	11.43	11.58
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	---	0.020	---	0.50
Z	2 °	10°	2 °	10°
G1	0.410	0.430	10.42	10.92
K1	0.040	---	1.02	---

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Mouser Electronics

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