

MC10H642, MC100H642

68030/040 PECL to TTL Clock Driver

The MC10H/100H642 generates the necessary clocks for the 68030, 68040 and similar microprocessors. It is guaranteed to meet the clock specifications required by the 68030 and 68040 in terms of part-to-part skew, within-part skew and also duty cycle skew.

The user has a choice of using either TTL or PECL (ECL referenced to +5.0 V) for the input clock. TTL clocks are typically used in present MPU systems. However, as clock speeds increase to 50 MHz and beyond, the inherent superiority of ECL (particularly differential ECL) as a means of clock signal distribution becomes increasingly evident. The H642 also uses differential PECL internally to achieve its superior skew characteristic.

The H642 includes divide-by-two and divide-by-four stages, both to achieve the necessary duty cycle skew and to generate MPU clocks as required. A typical 50 MHz processor application would use an input clock running at 100 MHz, thus obtaining output clocks at 50 MHz and 25 MHz (see Logic Diagram).

The 10H version is compatible with MECL 10H™ ECL logic levels, while the 100H version is compatible with 100K levels (referenced to +5.0 V).

- Generates Clocks for 68030/040
- Meets 030/040 Skew Requirements
- TTL or PECL Input Clock
- Extra TTL and PECL Power/Ground Pins
- Asynchronous Reset
- Single +5.0 V Supply

Function

Reset(R): LOW on RESET forces all Q outputs LOW.

Select(SEL): LOW selects the ECL input source ($\overline{DE}/\overline{DE}$). HIGH selects the TTL input source (DT).

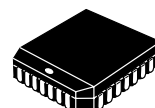
The H642 also contains circuitry to force a stable input state of the ECL differential input pair, should both sides be left open. In this Case, the DE side of the input is pulled LOW, and \overline{DE} goes HIGH.

Power Up: The device is designed to have positive edges of the ± 2 and ± 4 outputs synchronized at Power Up.



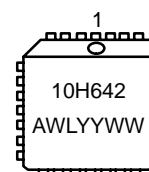
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**PLCC-28
FN SUFFIX
CASE 776**

MARKING DIAGRAM



A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
MC10H642FN	PLCC-28	37 Units/Rail
MC100H642FN	PLCC-28	37 Units/Rail

MC10H642, MC100H642

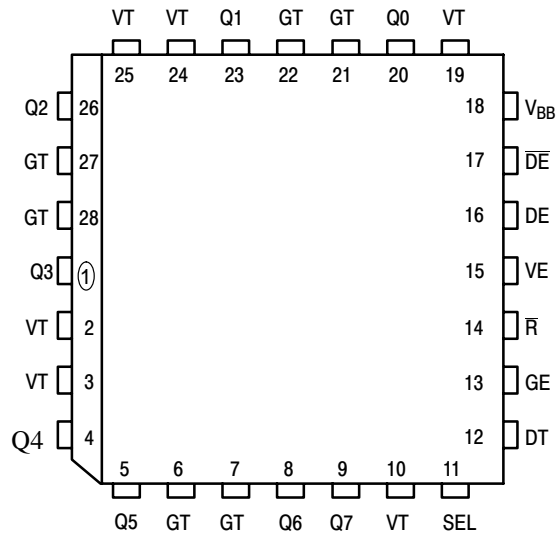


Figure 1. Pinout: PLCC-28
(Top View)

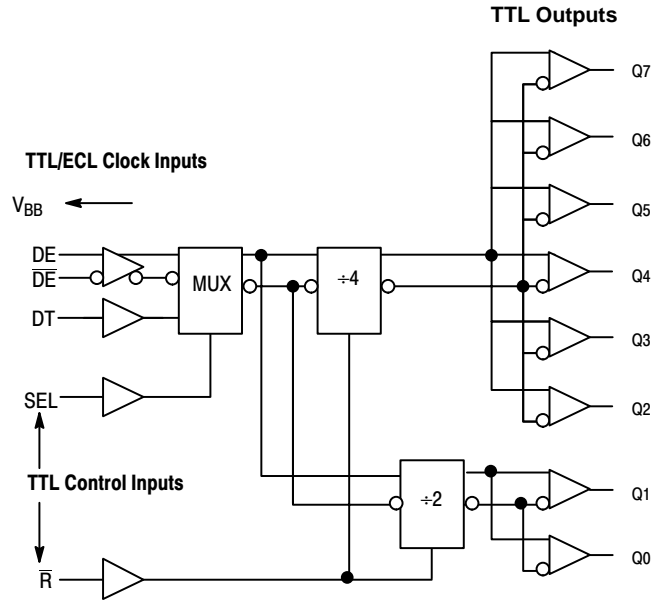


Figure 2. Logic Diagram

MC10H642, MC100H642

PIN NAMES

Pin	Symbol	Description	Pin	Symbol	Description
1	Q3	Signal Output (TTL)**	15	VE	ECL V_{CC} (+5.0 V)
2	VT	TTL V_{CC} (+5.0 V)	16	DE	ECL Signal Input (Non-Inverting)
3	VT	TTL V_{CC} (+5.0 V)	17	\overline{DE}	ECL Signal Input (Inverting)
4	Q4	Signal Output (TTL)**	18	V_{BB}	V_{BB} Reference Output
5	Q5	Signal Output (TTL)**	19	VT	TTL V_{CC} (+5.0 V)
6	GT	TTL Ground (0 V)	20	Q0	Signal Output (TTL)*
7	GT	TTL Ground (0 V)	21	GT	TTL Ground (0 V)
8	Q6	Signal Output (TTL)**	22	GT	TTL Ground (0 V)
9	Q7	Signal Output (TTL)**	23	Q1	Signal Output (TTL)*
10	VT	TTL V_{CC} (+5.0 V)	24	VT	TTL V_{CC} (+5.0 V)
11	SEL	Input Select (TTL)	25	VT	TTL V_{CC} (+5.0 V)
12	DT	TTL Signal Input	26	Q2	Signal Output (TTL)**
13	GE	ECL Ground (0 V)	27	GT	TTL Ground (0 V)
14	R	Reset (TTL)	28	GT	TTL Ground (0 V)

* Divide by 2

**Divide by 4

MC10H642, MC100H642

10H PECL CHARACTERISTICS ($V_T = V_E = 5.0 \text{ V} \pm 5\%$)

Symbol	Characteristic	Condition	$T_A = 0^\circ\text{C}$		$T_A = 25^\circ\text{C}$		$T_A = 85^\circ\text{C}$		Unit
			Min	Max	Min	Max	Min	Max	
I_{INH} I_{INL}	Input HIGH Current Input LOW Current		0.5	255	0.5	175	0.5	175	μA
V_{IH} V_{IL}	* NOTE Input HIGH Voltage Input LOW Voltage	$V_{EE} = 5.0 \text{ V}$	3.83 3.05	4.16 3.52	3.87 3.05	4.19 3.52	3.94 3.05	4.28 3.555	V
V_{BB}	* NOTE Output Reference Voltage		3.62	3.73	3.65	3.75	3.69	3.81	V

100H PECL CHARACTERISTICS ($V_T = V_E = 5.0 \text{ V} \pm 5\%$)

Symbol	Characteristic	Condition	$T_A = 0^\circ\text{C}$		$T_A = 25^\circ\text{C}$		$T_A = 85^\circ\text{C}$		Unit
			Min	Max	Min	Max	Min	Max	
I_{INH} I_{INL}	Input HIGH Current Input LOW Current		0.5	255	0.5	175	0.5	175	μA
V_{IH} V_{IL}	* NOTE Input HIGH Voltage Input LOW Voltage	$V_{EE} = 5.0 \text{ V}$	3.835 3.190	4.120 3.525	3.835 3.190	4.120 3.525	3.835 3.190	4.120 3.525	V
V_{BB}	* NOTE Output Reference Voltage		3.620	3.740	3.620	3.740	3.620	3.740	V

*PECL LEVELS are referenced to V_{CC} and will vary 1:1 with the power supply. The VALUES shown are for $V_{CC} = 5.0\text{V}$.

10H/100H DC CHARACTERISTICS ($V_T = V_E = 5.0 \text{ V} \pm 5\%$)

Symbol	Characteristic		Condition	$T_A = 0^\circ\text{C}$		$T_A = 25^\circ\text{C}$		$T_A = 85^\circ\text{C}$		Unit
				Min	Max	Min	Max	Min	Max	
I_{EE}	Power Supply Current	PECL	VE Pin		57		57		57	mA
I_{CCH}		TTL	Total All VT Pins		30		30		30	mA
I_{CCL}					30		30		30	mA

10H/100H TTL DC CHARACTERISTICS ($V_T = V_E = 5.0 \text{ V} \pm 5\%$)

Symbol	Characteristic	Condition	$T_A = 0^\circ\text{C}$		$T_A = 25^\circ\text{C}$		$T_A = 85^\circ\text{C}$		Unit
			Min	Max	Min	Max	Min	Max	
V_{IH} V_{IL}	Input HIGH Voltage Input LOW Voltage		2.0	0.8	2.0	0.8	2.0	0.8	V
I_{IH}	Input HIGH Current	$V_{IN} = 2.7 \text{ V}$ $V_{IN} = 7.0 \text{ V}$		20 100		20 100		20 100	μA
I_{IL}	Input LOW Current	$V_{IN} = 0.5 \text{ V}$		-0.6		-0.6		-0.6	mA
V_{OH}	Output HIGH Voltage	$I_{OH} = -3.0 \text{ mA}$ $I_{OH} = -15 \text{ mA}$	2.5 2.0		2.5 2.0		2.5 2.0		V
V_{OL}	Output LOW Voltage	$I_{OL} = 24 \text{ mA}$		0.5		0.5		0.5	V
V_{IK}	Input Clamp Voltage	$I_{IN} = -18 \text{ mA}$		-1.2		-1.2		-1.2	V
I_{OS}	Output Short Circuit Current	$V_{OUT} = 0 \text{ V}$	-100	-225	-100	-225	-100	-225	mA

MC10H642, MC100H642

AC CHARACTERISTICS ($V_T = V_E = 5.0\text{ V} \pm 5\%$)

Symbol	Characteristic		Condition	T _A = 0°C		T _A = 25°C		T _A = 85°C		Unit
				Min	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay D to Output	Q2–Q7 C ECL C TTL	CL = 25 pF	4.70 4.70	5.70 5.70	4.75 4.75	5.75 5.75	4.60 4.50	5.60 5.50	ns
tskpp	Part–to–Part Skew				1.0		1.0		1.0	ns
tskwd*	Within–Device Skew				0.5		0.5		0.5	ns
t _{PLH}	Propagation Delay D to Output	Q0, Q1 C ECL C TTL	CL = 25 pF	4.30 4.30	5.30 5.30	4.50 4.50	5.50 5.50	4.25 4.25	5.25 5.25	ns
tskpp	Part–to–Part Skew	All Outputs	CL = 25 pF		2.0		2.0		2.0	ns
tskwd	Within–Device Skew		CL = 25 pF		1.0		1.0		1.0	ns
t _{PD}	Propagation Delay R to Output	All Outputs	CL = 25 pF	4.3	6.3	4.0	6.0	4.5	6.5	ns
t _R t _F	Output Rise/Fall Time 0.8 V to 2.0 V	All Outputs	CL = 25 pF		2.5 2.5		2.5 2.5		2.5 2.5	ns
f _{MAX} **	Maximum Input Frequency		CL = 25 pF	100		100		100		MHz
RPW	Reset Pulse Width			1.5		1.5		1.5		ns
RRT	Reset Recovery Time			1.25		1.25		1.25		ns

* Within–Device Skew defined as identical transactions on similar paths through a device.

**MAX Frequency is 135MHz.

MC10H642, MC100H642

10/100H642 – DUTY CYCLE CONTROL

To maintain a duty cycle of $\pm 5\%$ at 50 MHz, limit the load capacitance and/or power supply variation as shown in Figures 1 and 2. For a $\pm 2.5\%$ duty cycle limit, see Figures 3 and 4. Figures 5 and 6 show duty cycle variation with temperature. Figure 7 shows typical TPD versus load. Figure 8 shows reset recovery time. Figure 9 shows output states after power up.

Best duty cycle control is obtained with a single μP load and minimum line length.

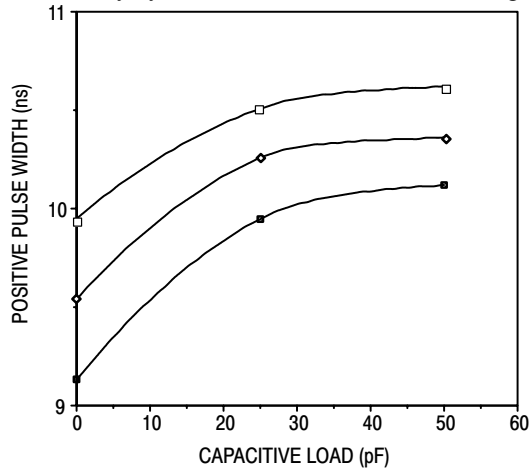


Figure 3. MC10H642 Positive PW versus Load
@ $\pm 5\% V_{CC}$, $T_A = 25^\circ\text{C}$

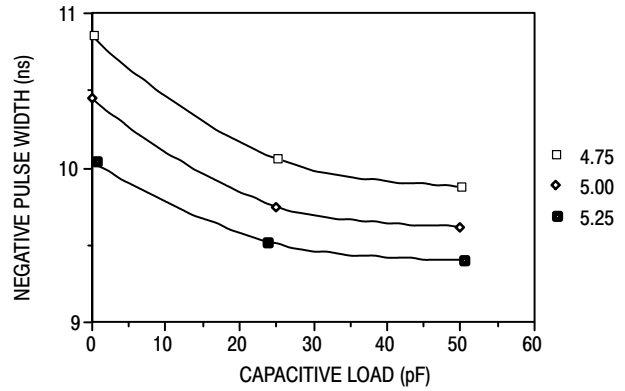


Figure 4. MC10H642 Negative PW versus Load
@ $\pm 5\% V_{CC}$, $T_A = 25^\circ\text{C}$

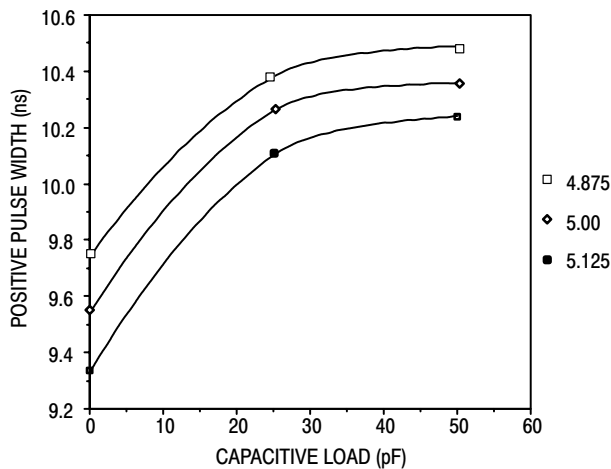


Figure 5. MC10H642 Positive PW versus Load
@ $\pm 2.5\% V_{CC}$, $T_A = 25^\circ\text{C}$

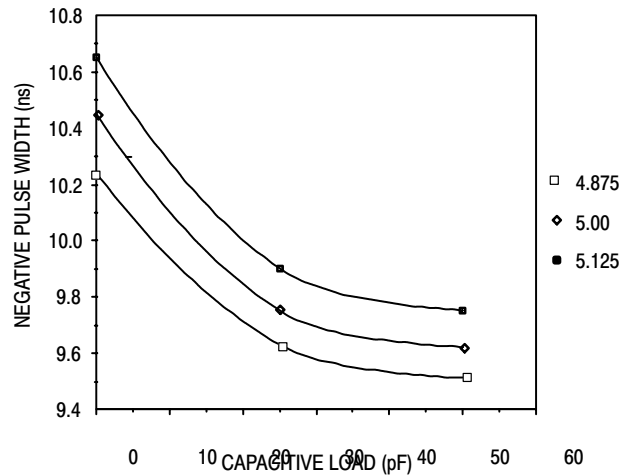


Figure 6. MC10H642 Negative PW versus Load
@ $\pm 2.5\% V_{CC}$, $T_A = 25^\circ\text{C}$

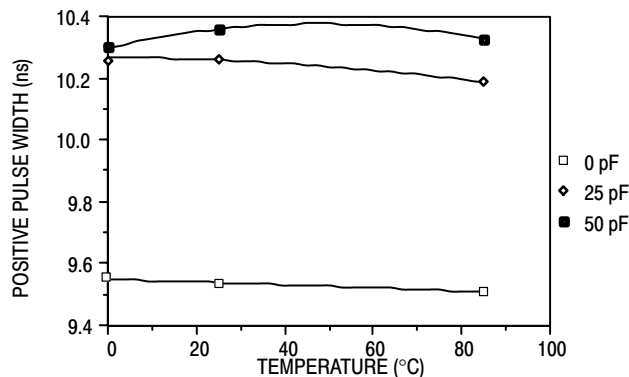


Figure 7. MC10H642 Positive PW versus Temperature,
 $V_{CC} = 5.0\text{ V}$

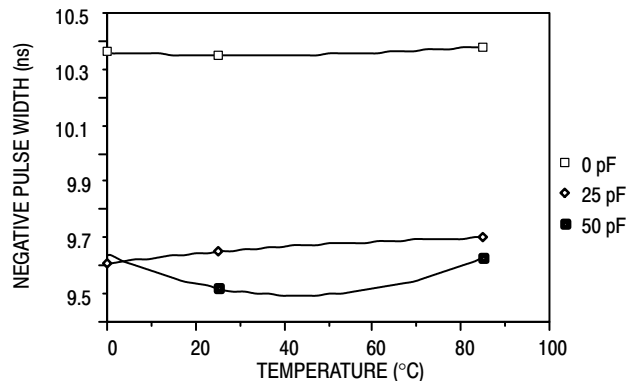


Figure 8. MC10H642 Negative PW versus Temperature,
 $V_{CC} = 5.0\text{ V}$

MC10H642, MC100H642

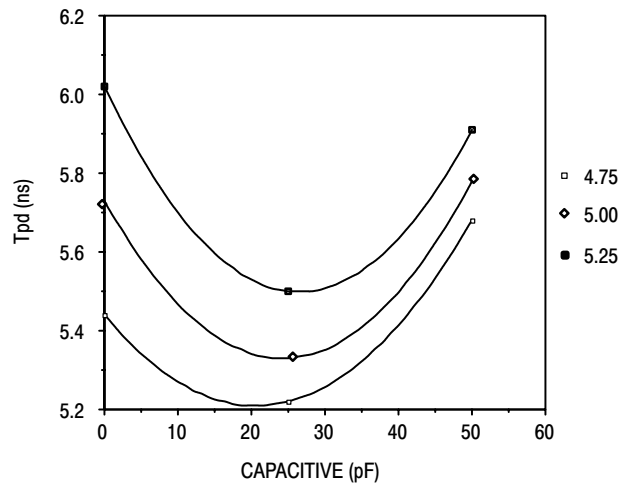


Figure 9. MC10H642 + Tpd versus Load, $V_{CC} \pm 5\%$, $T_A = 25^\circ\text{C}$
(Overshoot at 50 MHz with no load makes graph non linear)

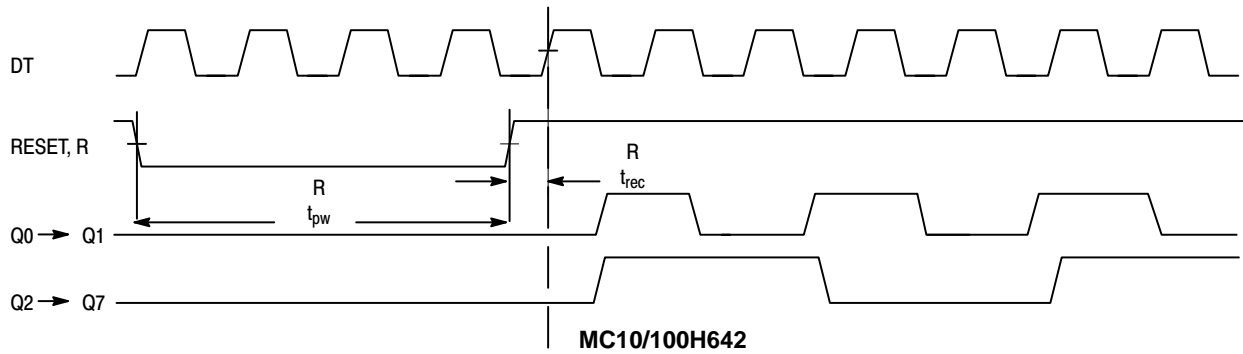


Figure 10. Clock Phase and Reset Recovery Time After Reset Pulse

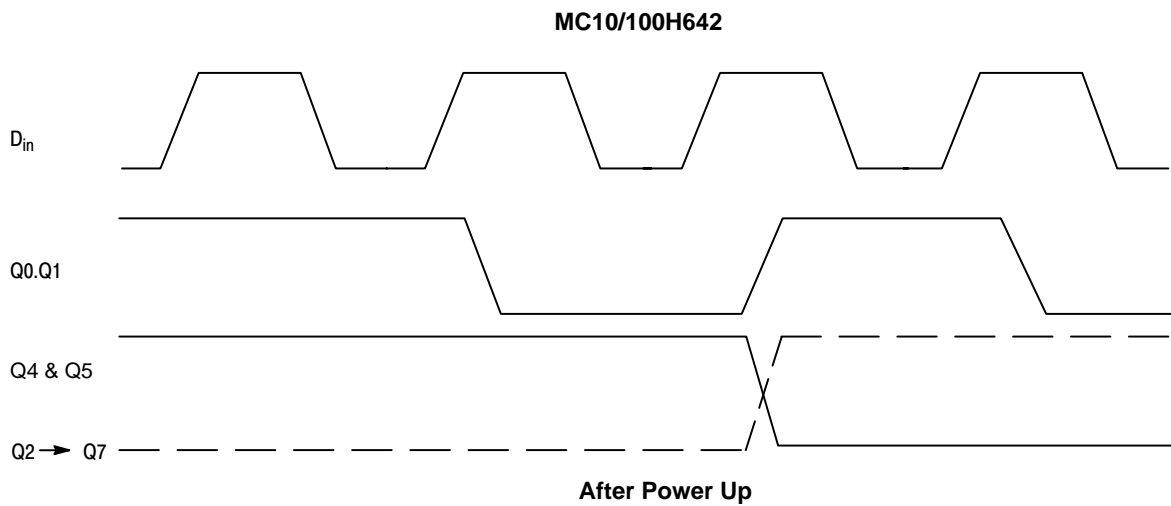
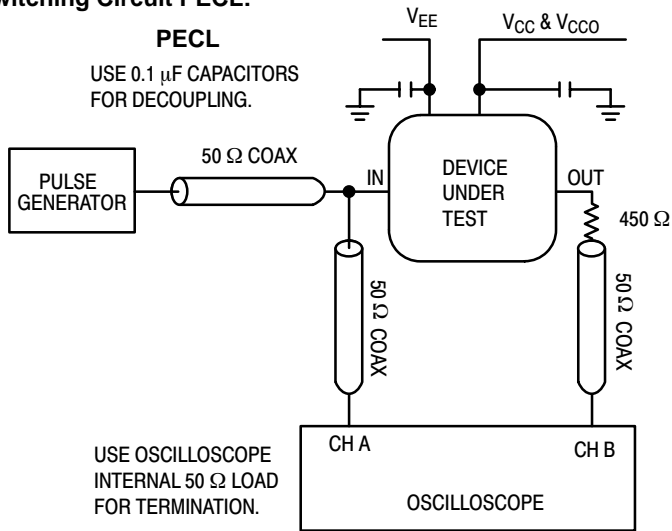


Figure 11. Q2 → Q7 will Synchronize with Pos Edges of D_{in} & Q0 → Q1
Outputs

MC10H642, MC100H642

Switching Circuit PECL:



TTL

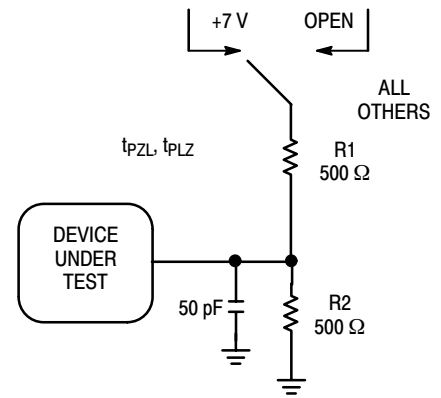


Figure 12. Switching Circuit and Waveforms

PECL/TTL



Figure 14. Waveforms: Rise and Fall Times

PECL/TTL

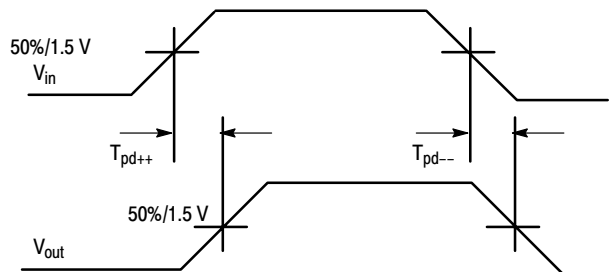
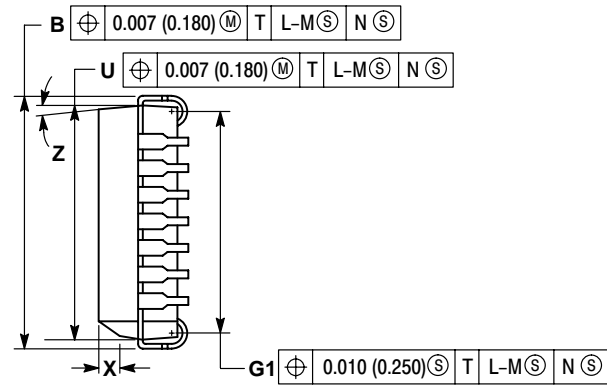
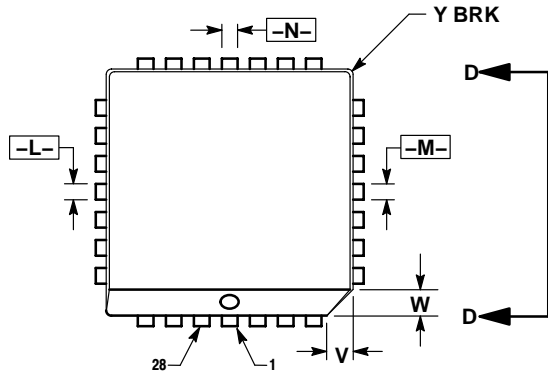


Figure 13. Propagation Delay — Single-Ended

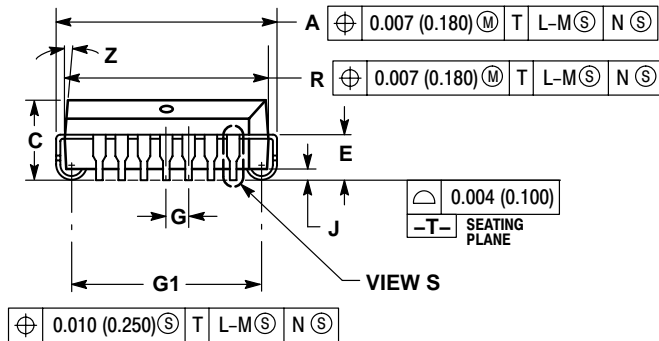
MC10H642, MC100H642

PACKAGE DIMENSIONS

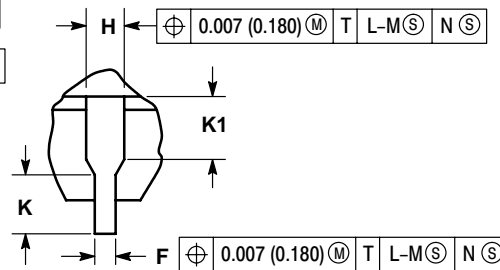
PLCC-28
FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 776-02
ISSUE E



VIEW D-D



VIEW S



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	---

MC10H642, MC100H642

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