68030/040 PECL-TTL Clock Driver

MC10H642
MC100H642

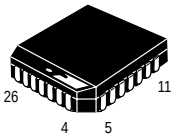
68030/040
PECL–TTL CLOCK
DRIVER

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 +5.0V) for the input clock. TTL clocks are typically used in present MPU systems. However, as clock speeds increase to 50MHz 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 50MHz processor application would use an input clock running at 100MHz, thus obtaining output clocks at 50MHz and 25MHz (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 +5.0V).



FN SUFFIX
PLASTIC PACKAGE
CASE 776–02

- 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 +5.0V Supply

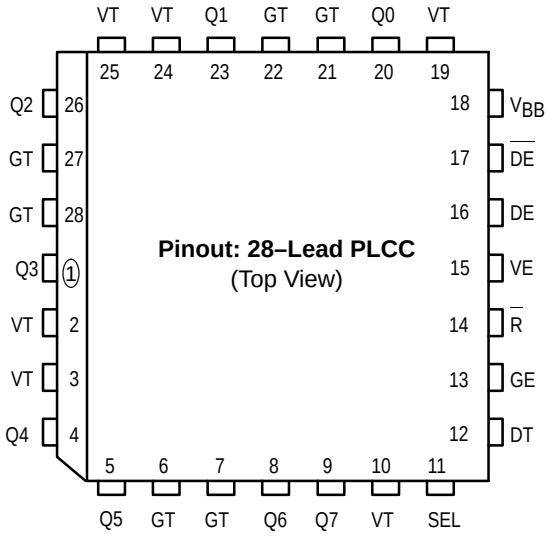
Function

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

Select(SEL): LOW selects the ECL input source (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 DE goes HIGH.

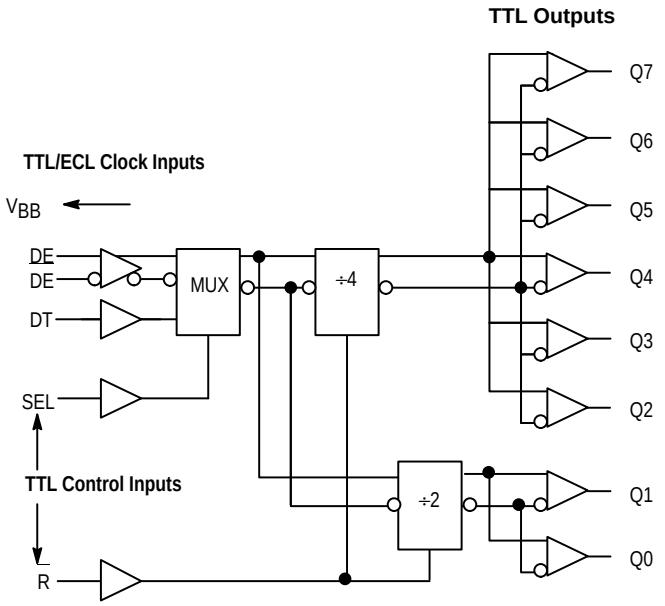
Power Up: The device is designed to have positive edges of the ÷2 and ÷4 outputs synchronized at Power Up.



Pinout: 28–Lead PLCC
(Top View)

MOTOROLA

LOGIC DIAGRAM



PIN NAMES

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

*Divide by 2
**Divide by 4

AC CHARACTERISTICS (VT = VE = 5.0V ±5%)

Symbol	Characteristic		T_A = 0°C Min	T_A = 0°C Max	T_A = 25°C Min	T_A = 25°C Max	T_A = 85°C Min	T_A = 85°C Max	Unit	Condition
t_{PLH}	Propagation Delay D to Output	Q2–Q7 C ECL C TTL	 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	CL = 25pF
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	 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	CL = 25pF
tskpp	Part–to–Part Skew	All Outputs		2.0		2.0		2.0	ns	CL = 25pF
tskwd	Within–Device Skew			1.0		1.0		1.0	ns	CL = 25pF
t_{PD}	Propagation Delay R to Output	All Outputs	4.3	6.3	4.0	6.0	4.5	6.5	ns	CL = 25pF
t_R t_F	Output Rise/Fall Time 0.8 V to 2.0 V	All Outputs		2.5 2.5		2.5 2.5		2.5 2.5	ns	CL = 25pF
f_{MAX}**	Maximum Input Frequency		100		100		100		MHz	CL = 25pF
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.
** NOTE: MAX Frequency is 135MHz.

10H PECL CHARACTERISTICS (VT = VE = 5.0V ±5%)

Symbol	Characteristic	T_A = 0°C Min	T_A = 0°C Max	T_A = 25°C Min	T_A = 25°C Max	T_A = 85°C Min	T_A = 85°C Max	Unit	Condition
I_{IH} I_{IL}	Input HIGH Current Input LOW Current	0.5	225	0.5	175	0.5	175	µA	
	* NOTE								
V_{IH} V_{IL}	Input HIGH Voltage Input LOW Voltage	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_{EE} = 5.0V
	* NOTE								
V_{BB}	Output Reference Voltage	3.62	3.73	3.65	3.75	3.69	3.81	V	

100H PECL CHARACTERISTICS (VT = VE = 5.0V ±5%)

Symbol	Characteristic	T_A = 0°C Min	T_A = 0°C Max	T_A = 25°C Min	T_A = 25°C Max	T_A = 85°C Min	T_A = 85°C Max	Unit	Condition
I_{IH} I_{IL}	Input HIGH Current Input LOW Current	0.5	225	0.5	175	0.5	175	µA	
	* NOTE								
V_{IH} V_{IL}	Input HIGH Voltage Input LOW Voltage	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_{EE} = 5.0V
	* NOTE								
V_{BB}	Output Reference Voltage	3.620	3.740	3.620	3.740	3.620	3.740	V	

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

10H/100H DC CHARACTERISTICS (VT = VE = 5.0V ±5%)

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

10H/100H TTL DC CHARACTERISTICS (VT = VE = 5.0V ±5%)

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

10/100H642
DUTY CYCLE CONTROL

To maintain a duty cycle of ±5% at 50 MHz, limit the load capacitance and/or power supply variation as shown in Figures 1 and 2. For a ±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.

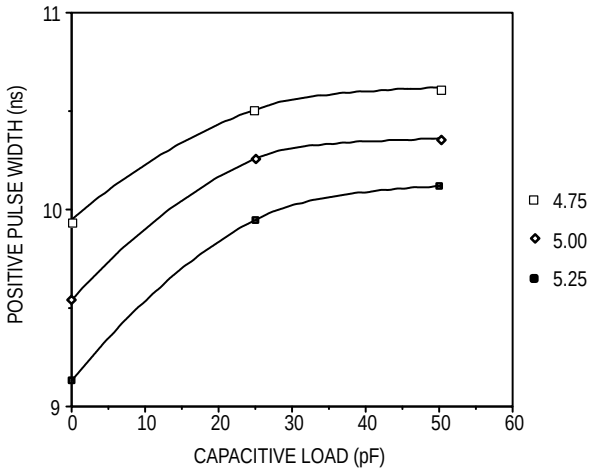


Figure 1. MC10H642 Positive PW versus Load @ ±5% V_{CC}, T_A = 25°C

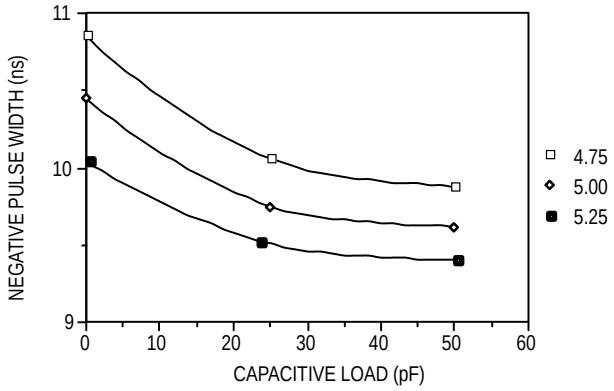


Figure 2. MC10H642 Negative PW versus Load @ ±5% V_{CC}, T_A = 25°C

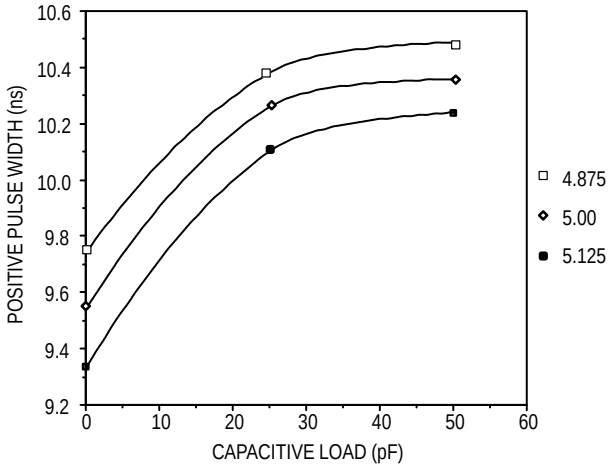


Figure 3. MC10H642 Positive PW versus Load @ ±2.5% V_{CC}, T_A = 25°C

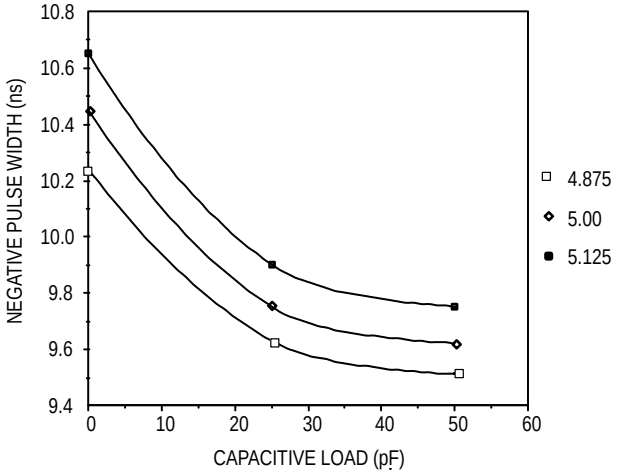


Figure 4. MC10H642 Negative PW versus Load @ ±2.5% V_{CC}, T_A = 25°C

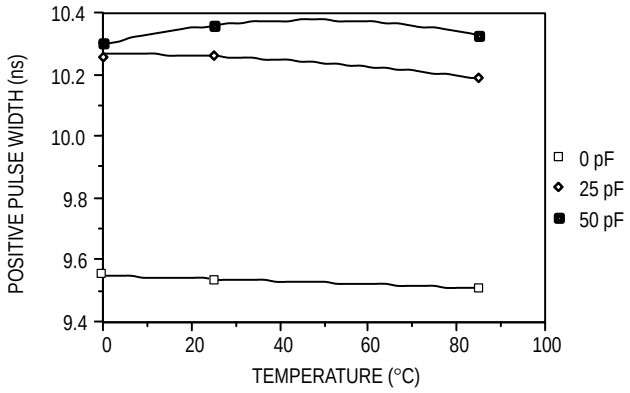


Figure 5. MC10H642 Positive PW versus Temperature, V_{CC} = 5.0V

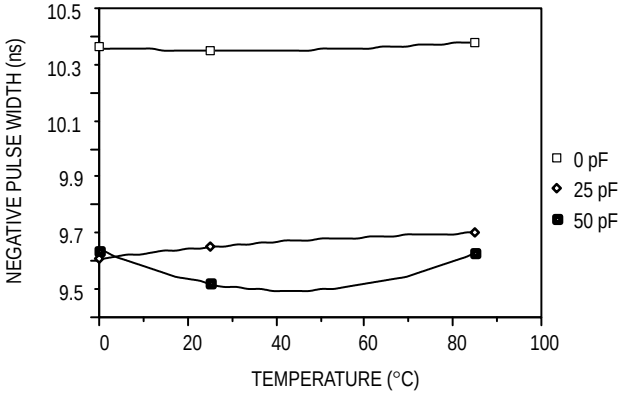


Figure 6. MC10H642 Negative PW versus Temperature, V_{CC} = 5.0V

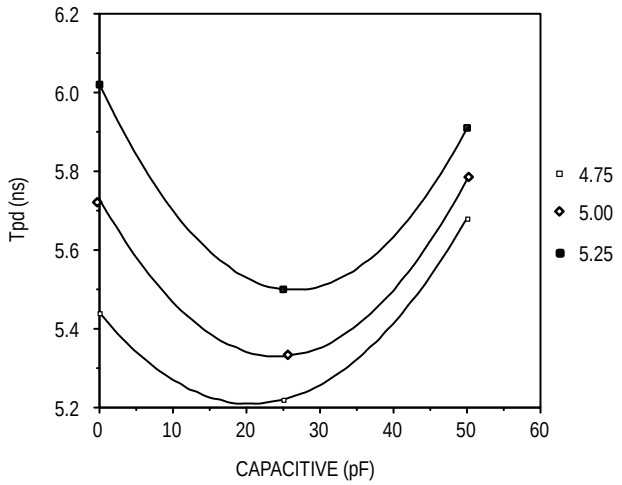


Figure 7. MC10H642 + Tpd versus Load, V_{CC} ±5%, T_A = 25°C (Overshoot at 50 MHz with no load makes graph non linear)

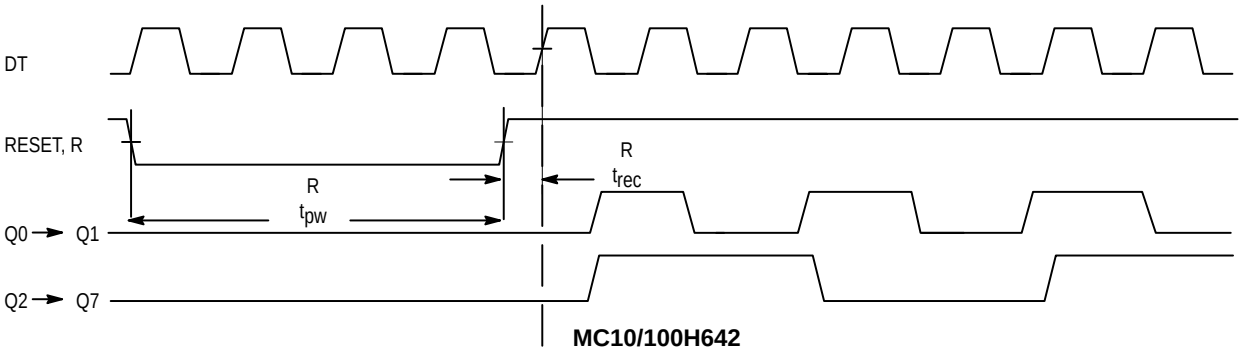
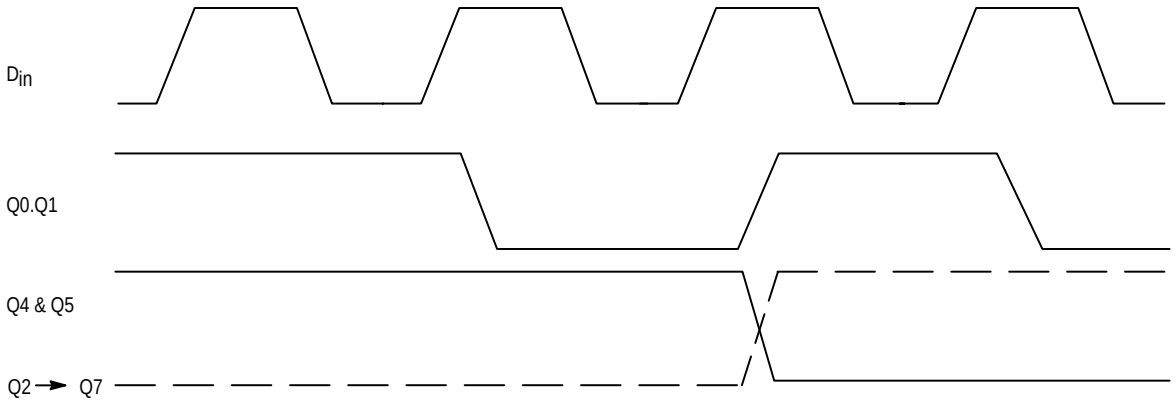


Figure 8. Clock Phase and Reset Recovery Time After Reset Pulse

MC10/100H642



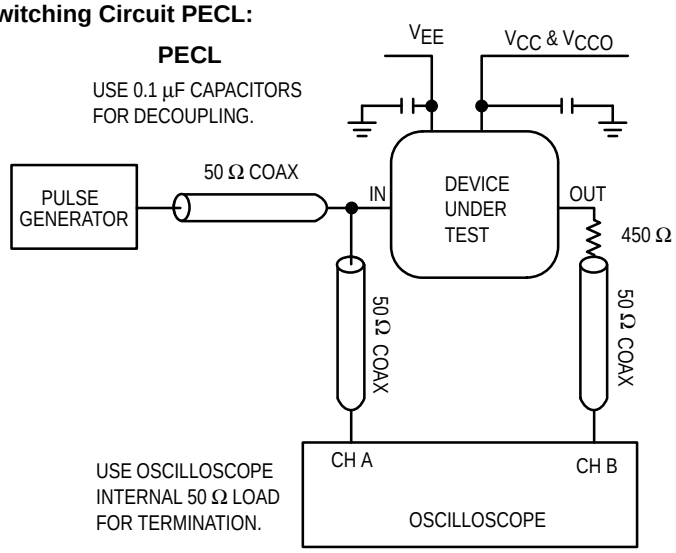
After Power Up

Figure 9. Outputs Q2 → Q7 will Synchronize with Pos Edges of D_{in} & Q0 → Q1

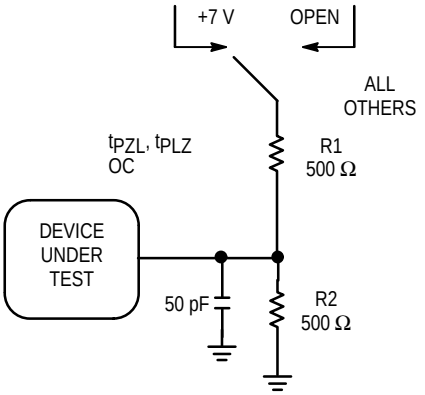
SWITCHING CIRCUIT AND WAVEFORMS

Switching Circuit PECL:

PECL

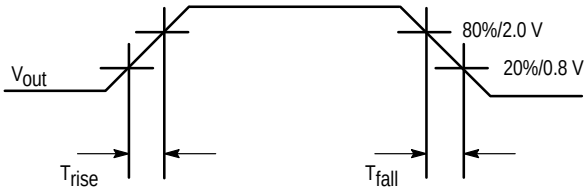


TTL



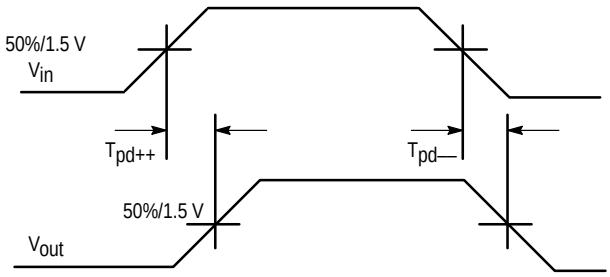
WAVEFORMS: Rise and Fall Times

PECL/TTL



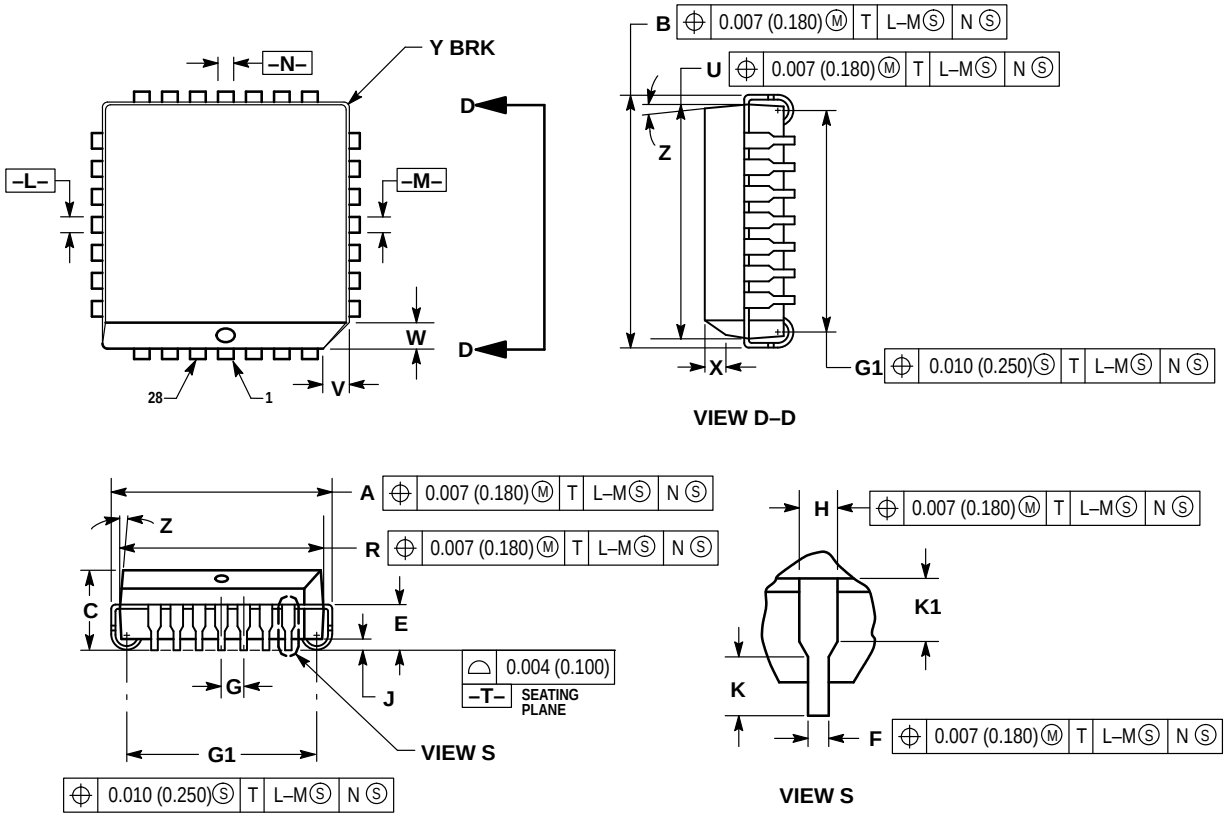
Propagation Delay — Single Ended

PECL/TTL



OUTLINE DIMENSIONS

FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 776–02
ISSUE D



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).

	INCHES		MILLIMETERS	
DIM	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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