

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).

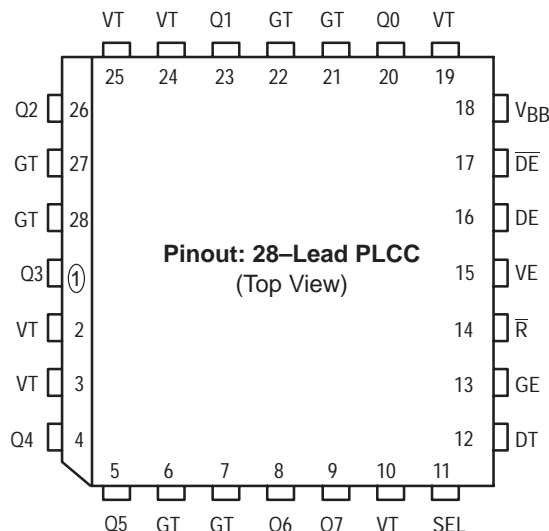
- Generates Clocks for 68030/040
- Meets 030/040 Skew Requirements
- TTL or PECL Input Clock
- Extra TTL and PECL Power/Ground Pins
- Asynchronous Reset
- Single +5.0V Supply

Function

- Reset(R)*: LOW on RESET forces all Q outputs LOW.
Select(SEL): LOW selects the ECL input source ($\overline{DE}/\overline{DE}$).
 HIGH selects the TTL input source (DT).

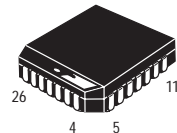
The H642 also contains circuitry to force a stable input state of the ECL differential input pair, should both sides be left open. In this Case, the DE side of the input is pulled LOW, and \overline{DE} goes HIGH.

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



MC10H642
MC100H642

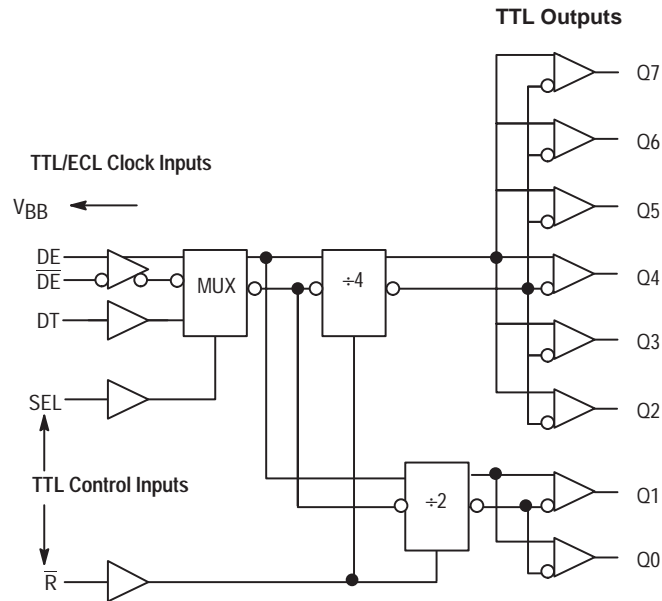
68030/040
PECL-TTL CLOCK
DRIVER



FN SUFFIX
PLASTIC PACKAGE
CASE 776-02



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 | DE | ECL Signal Input (Non-Inverting) |
| 3 | VT | TTL V _{CC} (+5.0V) | 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} (+5.0V) |
| 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 | | TA = 0°C | | TA = 25°C | | TA = 85°C | | Unit | Condition |
|----------|---|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|------|-----------|
| | | | Min | Max | Min | Max | Min | Max | | |
| tPLH | 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 | |
| tPLH | 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 |
| tPD | Propagation Delay R to Output | All Outputs | 4.3 | 6.3 | 4.0 | 6.0 | 4.5 | 6.5 | ns | CL = 25pF |
| tR tF | 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 |
| fMAX** | 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 | TA = 0°C | | TA = 25°C | | TA = 85°C | | Unit | Condition |
|------------------------------------|---|--------------|--------------|--------------|--------------|--------------|---------------|------|------------------------|
| | | Min | Max | Min | Max | Min | Max | | |
| I _{IH} I _{IL} | Input HIGH Current Input LOW Current | 0.5 | 225 | 0.5 | 175 | 0.5 | 175 | μA | |
| V _{IH} V _{IL} | * NOTE 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 |
| V _{BB} | * NOTE 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 | TA = 0°C | | TA = 25°C | | TA = 85°C | | Unit | Condition |
|------------------------------------|---|----------------|----------------|----------------|----------------|----------------|----------------|------|------------------------|
| | | Min | Max | Min | Max | Min | Max | | |
| I _{IH} I _{IL} | Input HIGH Current Input LOW Current | 0.5 | 225 | 0.5 | 175 | 0.5 | 175 | μA | |
| V _{IH} V _{IL} | * NOTE 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 |
| V _{BB} | * NOTE 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.

MC10H642 MC100H642

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

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

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

| Symbol | Characteristic | | TA = 0°C | | TA = 25°C | | TA = 85°C | | Unit | Condition |
|------------------------------------|---|------------|-----------|------------|-----------|------------|-----------|-----|---|-----------|
| | | | 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 | | 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.

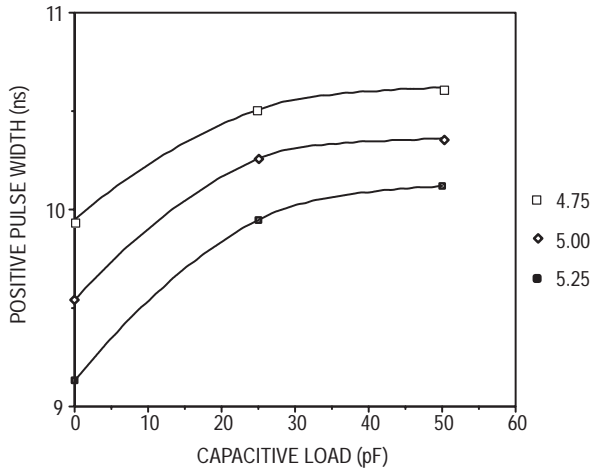


Figure 1. MC10H642 Positive PW versus Load @ ±5% V_{CC}, T_A = 25°C

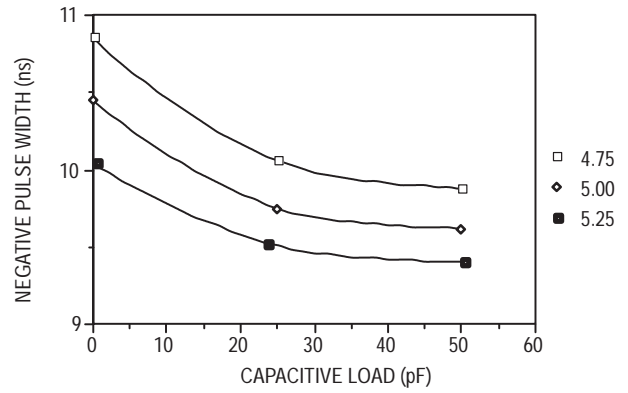


Figure 2. MC10H642 Negative PW versus Load @ ±5% V_{CC}, T_A = 25°C

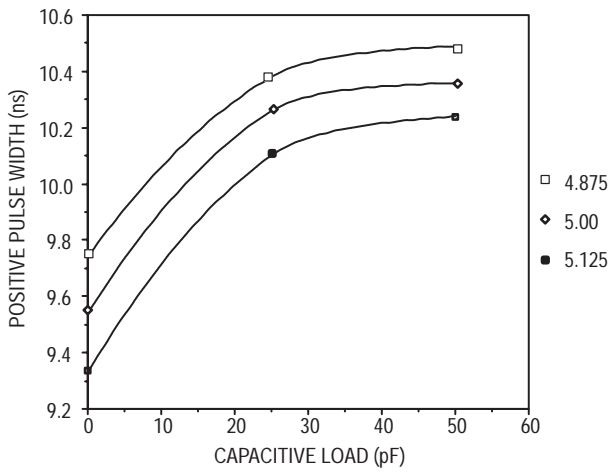


Figure 3. MC10H642 Positive PW versus Load @ ±2.5% V_{CC}, T_A = 25°C

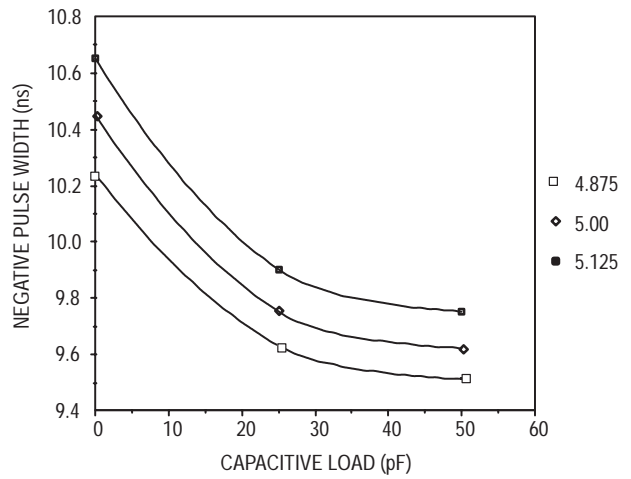


Figure 4. MC10H642 Negative PW versus Load @ ±2.5% V_{CC}, T_A = 25°C

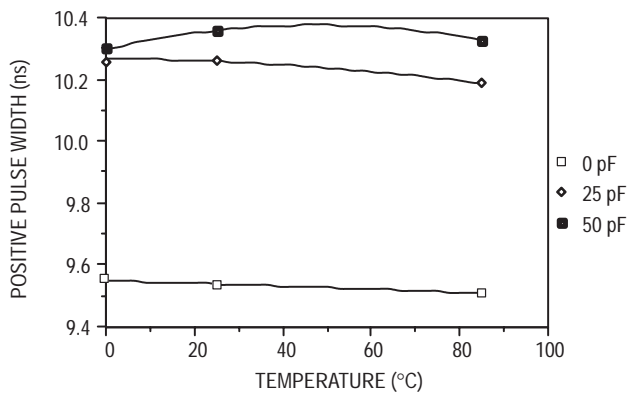


Figure 5. MC10H642 Positive PW versus Temperature, V_{CC} = 5.0V

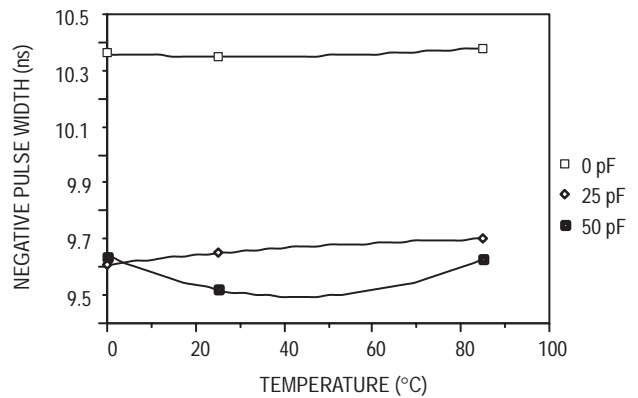


Figure 6. MC10H642 Negative PW versus Temperature, V_{CC} = 5.0V

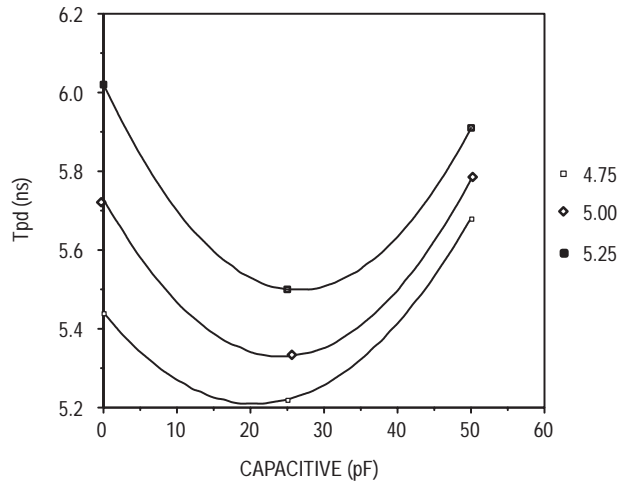


Figure 7. MC10H642 + Tpd versus Load, $V_{CC} \pm 5\%$, $T_A = 25^\circ C$
 (Overshoot at 50 MHz with no load makes graph non linear)

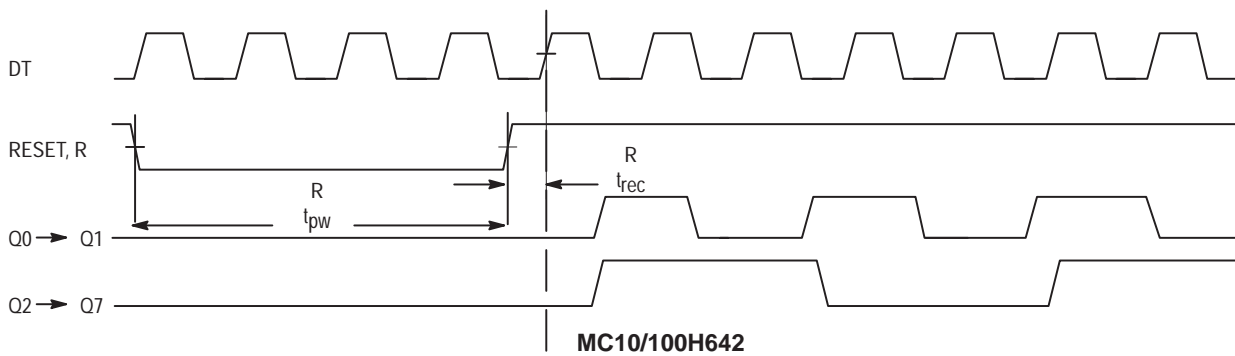


Figure 8. Clock Phase and Reset Recovery Time After Reset Pulse

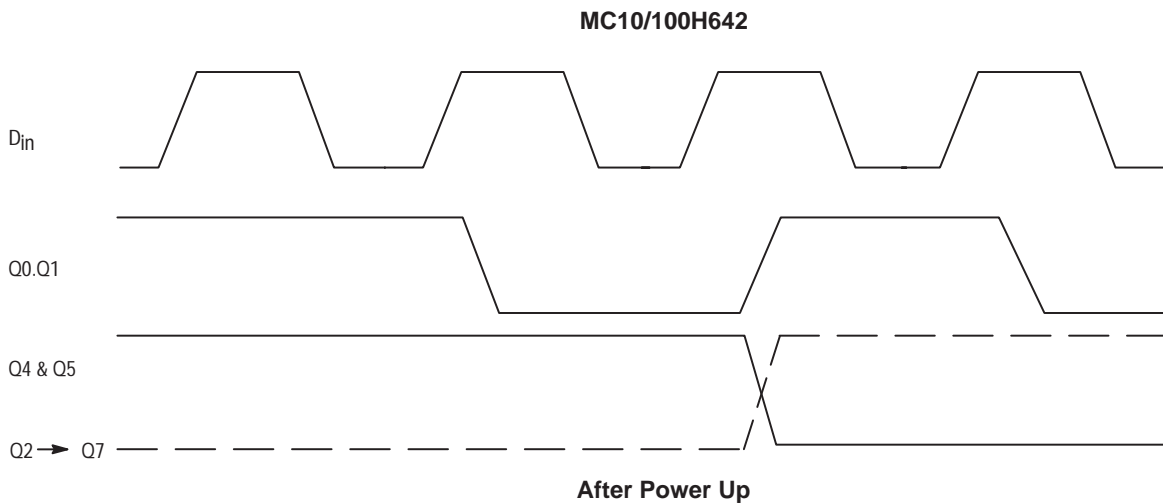
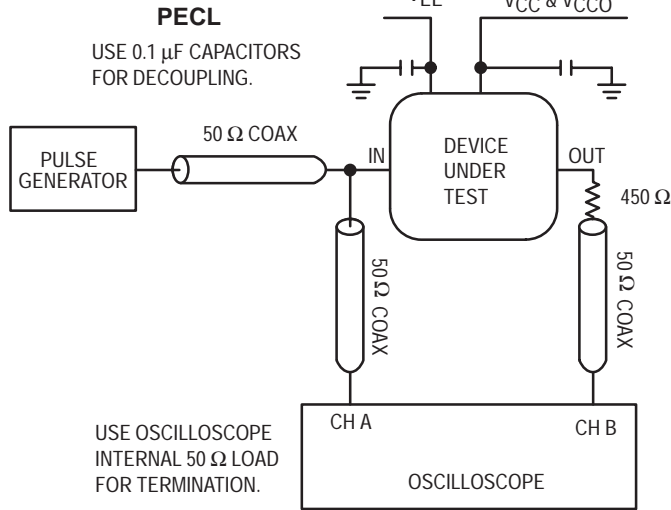


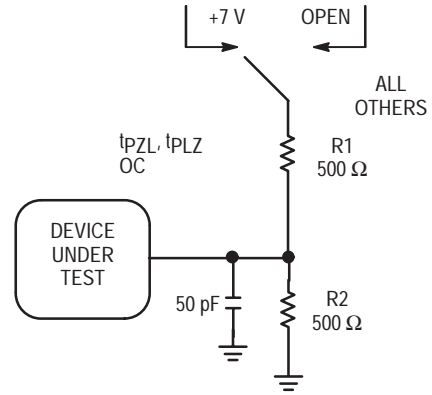
Figure 9. Outputs Q2 → Q7 will Synchronize with Pos Edges of D_{in} & Q0 → Q1

SWITCHING CIRCUIT AND WAVEFORMS

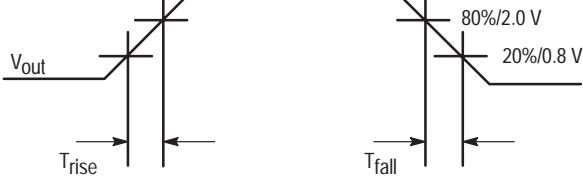
Switching Circuit PECL:



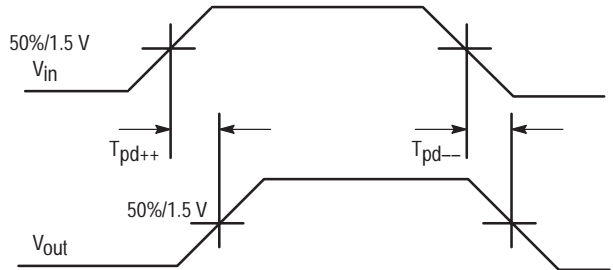
TTL



**WAVEFORMS: Rise and Fall Times
PECL/TTL**

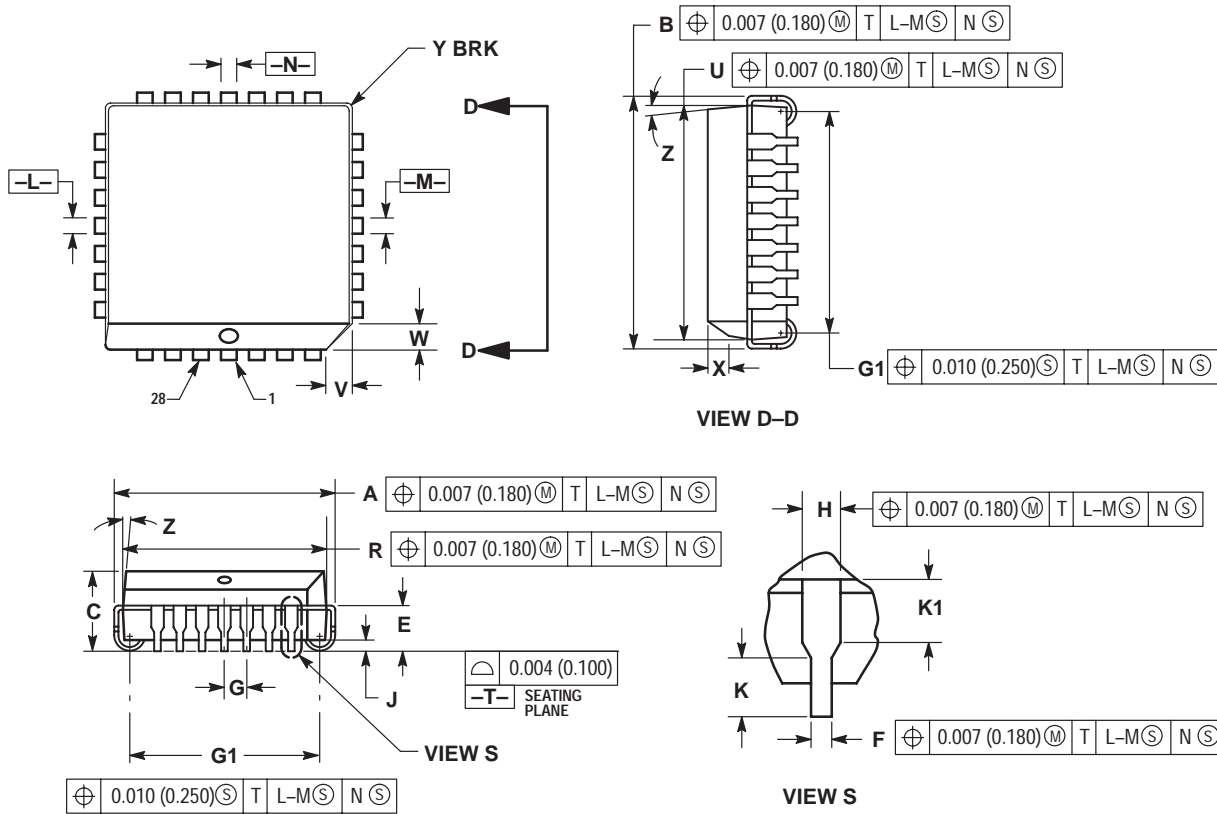


**Propagation Delay — Single Ended
PECL/TTL**



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).

| 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° | |
| G1 | 0.410 | 0.430 | 10.42 | 10.92 |
| K1 | 0.040 | --- | 1.02 | --- |

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