

8-Bit Ripple Counter

The MC10E100E137 is a very high speed binary ripple counter. The two least significant bits were designed with very fast edge rate sensitive input logic. The more significant bits maintain standard ECLinPS™ output characteristics. This allows the counter to operate at very high frequencies.

- 1.8GHz Minimum Count Frequency
- Differential Clock Input and Data Output Pins
- V_{BB} Output for Single-Ended Use
- Internal 75k Ω Input Pulldown Resistors
- Synchronous and Asynchronous Enable Pins
- Asynchronous Master Reset
- Extended 100E V_{EE} Range of $-4.2V$ to $-5.46V$

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Both asynchronous and synchronous enables are used to maximize the device's flexibility for various applications. The asynchronous enable input, A_Start, when asserted enables the counter while overriding any synchronous enable signals. The EN1 and EN2 XORed enable inputs, EN1 and EN2, which are synchronous inputs. When only one synchronous enable is asserted, the counter becomes disabled on the next CLK transition; all outputs remain in the previous state poised for the other synchronous enable or A_Start to be asserted to re-enable the counter. Asserting both synchronous

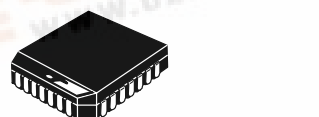
maximize the device's flexibility for various applications. The asynchronous enable input, `A_Start`, when asserted enables the counter while overriding any synchronous enable signals. The `EN1` and `EN2` are XORed enable inputs, `EN1` and `EN2`, which are synchronous with the clock input. When only one synchronous enable is asserted the counter becomes disabled on the next CLK transition; all outputs remain in their previous state poised for the other synchronous enable or `A_Start` becomes asserted to re-enable the counter. Asserting both synchronous enables causes the counter to become enabled on the next transition. If `EN1` (or `EN2`) and CLK edges are coincident, sufficient delay is inserted in the CLK path (to compensate for the XOR gate delay and the internal D-flip flop setup time) to insure that the synchronous enable signal is clocked correctly, hence, the counter is disabled.

supply as the voltage reference for the CLK input signal. If a signal is to be used the V_{BB} pin should be connected to the CLK pin bypassed to ground via a $0.01\mu F$ capacitor. V_{BB} can only source $0.5mA$, therefore it should be used as a switching reference for the CLK input only.

regulators and jeopardizing the stability of the device.

MC100E137

8-BIT RIPPLE COUNTER

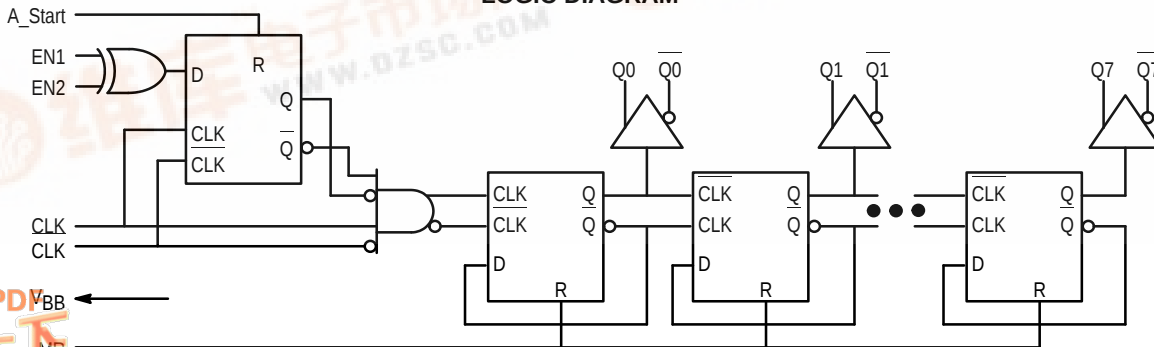


FN SUFFIX
PLASTIC PACKAGE
CASE 776-02

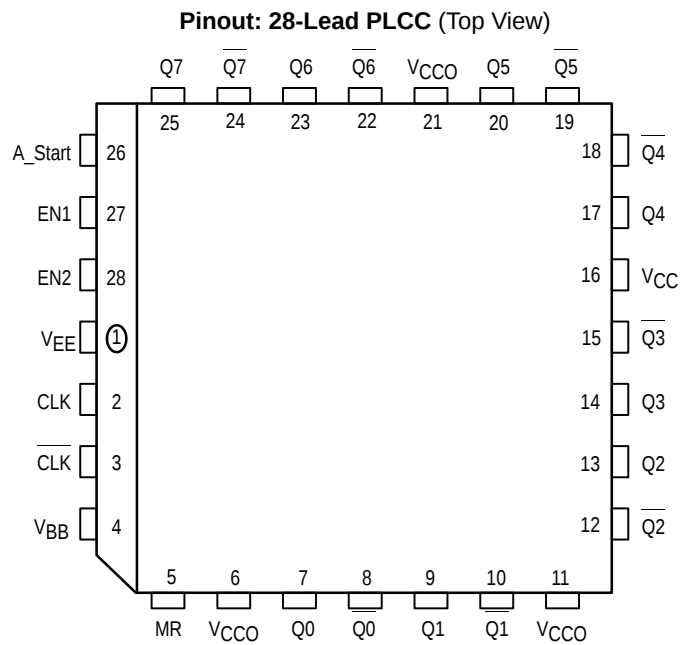
PIN NAMES

PIN	FUNCTION
CLK, $\overline{\text{CLK}}$	Differential Clock Inputs
Q0-Q7, $\overline{\text{Q0-Q7}}$	Differential Q Outputs
A_Start	Asynchronous Enable Input
EN1, EN2	Synchronous Enable Inputs
MR	Asynchronous Master Reset
V _{BB}	Switching Reference Output

LOGIC DIAGRAM



MC10E137 MC100E137



SEQUENTIAL TRUTH TABLE

Function	EN1	EN2	A_Start	MR	CLK	Q7	Q6	Q5	Q4	Q3	Q2	Q1	Q0
Reset	X	X	X	H	X	L	L	L	L	L	L	L	L
Count	L	L	L	L	Z	L	L	L	L	L	L	L	H
	L	L	L	L	Z	L	L	L	L	L	L	H	L
	L	L	L	L	Z	L	L	L	L	L	L	H	H
Stop	H	L	L	L	Z	L	L	L	L	L	L	H	H
	H	L	L	L	Z	L	L	L	L	L	L	H	H
Asynch Start	H	L	H	L	Z	L	L	L	L	L	H	L	L
	H	L	H	L	Z	L	L	L	L	L	H	L	H
	L	L	H	L	Z	L	L	L	L	L	H	H	L
Count	L	L	L	L	Z	L	L	L	L	L	H	H	H
	L	L	L	L	Z	L	L	L	L	H	L	L	L
	L	L	L	L	Z	L	L	L	L	H	L	L	H
Stop	L	H	L	L	Z	L	L	L	L	H	L	L	H
	L	H	L	L	Z	L	L	L	L	H	L	L	H
Synch Start	H	H	L	L	Z	L	L	L	L	H	L	H	L
	H	H	L	L	Z	L	L	L	L	H	L	H	H
	H	H	L	L	Z	L	L	L	L	H	H	L	L
Stop	H	L	L	L	Z	L	L	L	L	H	H	L	L
	H	L	L	L	Z	L	L	L	L	H	H	L	L
Count	L	L	L	L	Z	L	L	L	L	H	H	L	H
	L	L	L	L	Z	L	L	L	L	H	H	H	L
	L	L	L	L	Z	L	L	L	L	H	H	H	H
Reset	X	X	X	H	X	L	L	L	L	L	L	L	L

Z = Low to High Transition

DC CHARACTERISTICS ($V_{EE} = V_{EE(min)}$ to $V_{EE(max)}$; $V_{CC} = V_{CCO} = GND$)

Symbol	Characteristic	0°C			25°C			85°C			Unit	Condition
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
V_{BB}	Output Reference Voltage 10E 100E	-1.38 -1.38		-1.27 -1.27	-1.35 -1.38		-1.25 -1.26	-1.31 -1.38		-1.19 -1.26	V	
I_{IH}	Input HIGH Current			150			150			150	μA	
I_{EE}	Power Supply Current 10E 100E		121 121	145 145		121 121	145 145		121 139	145 167	mA	

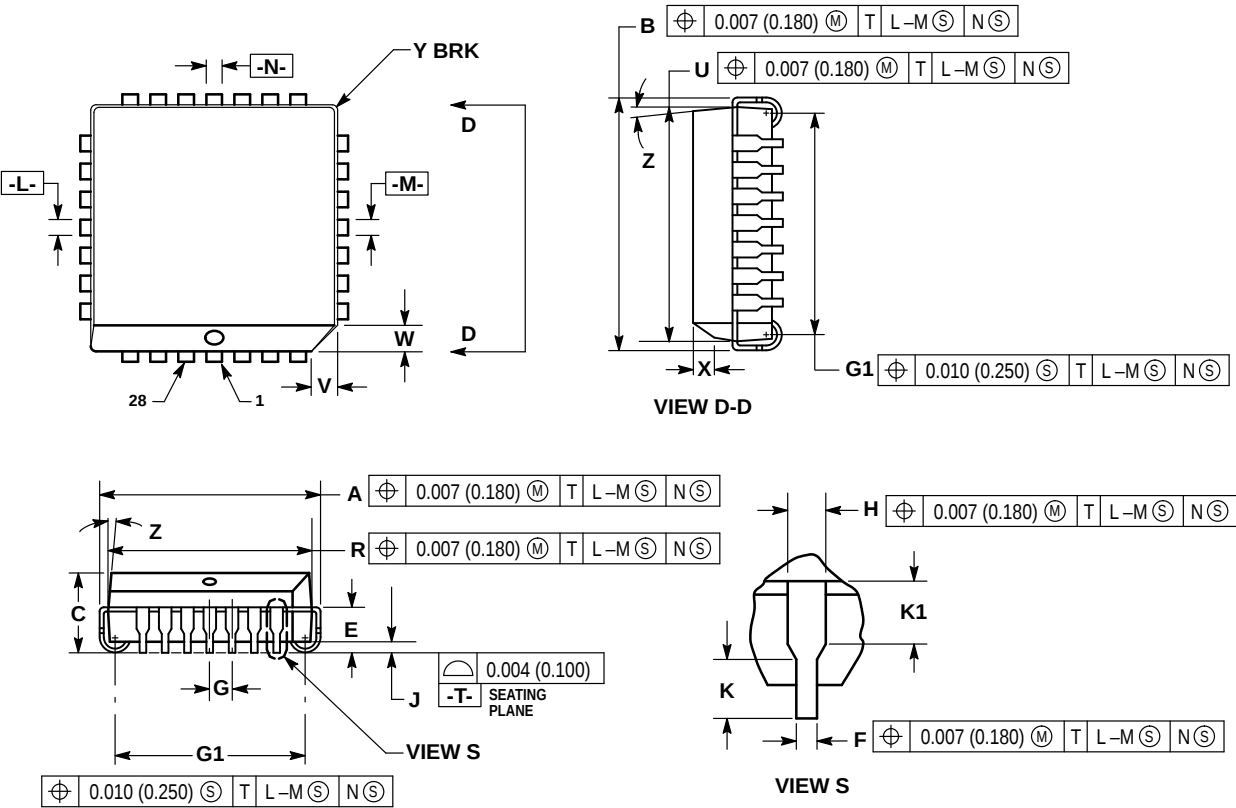
AC CHARACTERISTICS ($V_{EE} = V_{EE(min)}$ to $V_{EE(max)}$; $V_{CC} = V_{CCO} = GND$)

Symbol	Characteristic	0°C			25°C			85°C			Unit	Condition
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
f_{COUNT}	Maximum Count Frequency	1800	2200		1800	2200		1800	2200		MHz	
t_{PLH} t_{PHL}	Propagation Delay to Output CLK to Q0 CLK to Q1 CLK to Q2 CLK to Q3 CLK to Q4 CLK to Q5 CLK to Q6 CLK to Q7 A_Start to Q0 MR to Q0	1300 1600 1950 2275 2625 2950 3250 3575 950 700	1700 2025 2425 2750 3125 3450 3775 4075 1325 1000	2150 2500 2925 3350 3750 4150 4450 4800 1700 1300	1300 1600 1950 2275 2625 2950 3250 3575 950 700	1700 2050 2450 2775 3150 3475 3800 4125 1325 1000	2150 2500 2925 3350 3750 4150 4450 4800 1700 1300	1350 1650 2025 2350 2700 3050 3375 3700 950 700	1750 2100 2500 2850 3225 3550 3925 4250 1325 1000	2200 2550 3000 3425 3825 4250 4600 4950 1700 1300	ps	
t_s	Setup Time (EN1, EN2)	0	-150		0	-150		0	-150		ps	
t_h	Hold Time (EN1, EN2)	300	150		300	150		300	150		ps	
t_{RR}	Reset Recovery Time MR, A_Start	400	200		400	200		400	200		ps	
t_{PW}	Minimum Pulse Width CLK, MR, A_Start	400			400			400			ps	
V_{PP}	Minimum Input Swing (CLK)	0.25		1.0	0.25		1.0	0.25		1.0	V	Note 1
V_{CMR}	Com Mode Range (CLK)	-0.4		-2.0	-0.4		-2.0	-0.4		-2.0	V	
t_r t_f	Rise/Fall Times Q0, Q1 Q2 to Q7	150 275		400 600	150 275		400 600	150 275		400 600	ps	20%–80%

1. Minimum input swing for which AC parameters are guaranteed. Full DC ECL output swings will be generated with only 50mV input swings.

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. DIM G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
3. DIM 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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