# 5V ECL 3-Bit Scannable Registered Bus Transceiver

The MC100E337 is a 3-bit registered bus transceiver with scan. The bus outputs (BUS0–BUS2) are specified for driving a 25  $\Omega$  bus; the receive outputs (Q0 – Q2) are specified for 50  $\Omega$  The bus outputs feature a normal HIGH level (V $_{OH}$ ) and a cutoff LOW level – when LOW, the outputs go to – 2.0 V and the output emitter-follower is "off", presenting a high impedance to the bus. The bus outputs also feature edge slow-down capacitors.

Both drive and receive sides feature the same logic, including a loopback path to hold data. The HOLD/LOAD function is controlled by Transmit Enable (TEN) and Receive Enable (REN) on the transmit and receive sides respectively, with a HIGH selecting LOAD. Note that the implementation of the E337 Receive Enable differs from that of the E336.

A synchronous bus enable (SBUSEN) is provided for normal, non-scan operation. The asynchronous bus disable  $(\overline{ABUSDIS})$  disables the bus immediately for scan mode.

The SYNCEN input is provided for flexibility when re-enabling the bus after disabling with ABUSDIS, allowing either synchronous or asynchronous re-enabling. An alternative use is asynchronous-only operation with ABUSDIS, in which case SYNCEN is tied LOW, or left open. SYNCEN is implemented as an overriding SET control (active-LOW) to the enable flip-flop.

Scan mode is selected by a HIGH at the SCAN input. Scan input data is shifted in through S IN and output data appears at the Q2 output.

All registers are clocked on the positive transition of CLK. Additional lead-frame grounding is provided through the Ground pins (GND) which should be connected to 0V. The GND pins are not electrically connected to the chip.

The 100 Series contains temperature compensation.

- Scannable Version of E336
- 25  $\Omega$  Cutoff Bus Outputs
- 50 Ω Receiver Outputs
- Scannable Registers
- Sync. and Async. Bus Enables
- Non-inverting Data Path
- 1500 ps Max. Clock to Bus (Data Transmit)
- 1000 ps Max. Clock to Q (Data Receive)
- Bus Outputs Feature Internal Edge Slow-Down Capacitors
- Additional Package Ground Pins
- PECL Mode Operating Range:  $V_{CC} = 4.2 \text{ V}$  to 5.7 V with  $V_{EE} = 0 \text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0 \text{ V}$  with  $V_{EE} = -4.2 \text{ V}$  to -5.7 V
- Internal Input Pulldown Resistors
- ESD Protection: > 1 KV HBM, > 75 V MM
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- For Additional Information, see Application Note AND8003/D

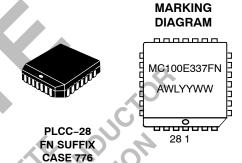
   Flammability Potings LH, 04 and a V, 0 @ 1/8"
- Flammability Rating: UL 94 code V-0 @ 1/8", Oxygen Index 28 to 34
- Transistor Count = 471 devices

Moisture Sensitivity Level 1



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= Assembly Location

WL = Wafer Lot

YY = Year

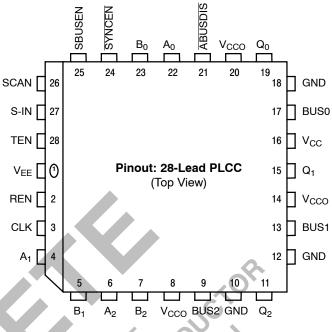
WW = Work Week

## **ORDERING INFORMATION**

Device	Package	Shipping
MC100E337FN	PLCC-28	37 Units/Rail
MC100E337FNR2	PLCC-28	500 Units/Reel

## **PIN DESCRIPTION**

PIN	FUNCTION
A <sub>0</sub> – A <sub>2</sub>	ECL Data Inputs A
B <sub>0</sub> – B <sub>2</sub>	ECL Data Inputs B
S-IN	ECL Serial (Scan) Data Input
TEN, REN	HOLD/LOAD Controls
SCAN	ECL Scan Control
ABUSDIS	ECL Asynchronous Bus Disable
SBUSEN	ECL Synchronous Bus Enable
SYNCEN	ECL Synchronous Enable Control
CLK	ECL Clock
BUS0 - BUS2	ECL 25Ω Cutoff Bus Outputs
Q <sub>0</sub> – Q <sub>2</sub>	ECL Receive Data Outputs (Q2 serves as SCAN_OUT in scan mode)
V <sub>CC</sub> , V <sub>CCO</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply
GND	Ground



\* 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

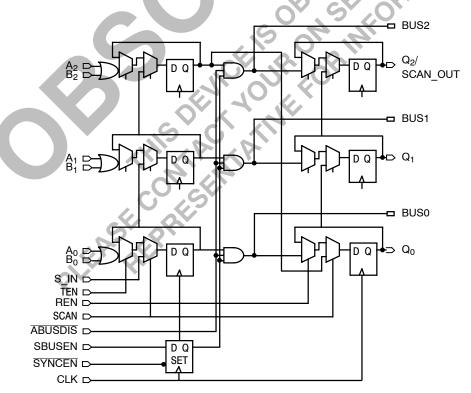


Figure 2. Logic Diagram

## MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		8	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		-8	V
VI	PECL Mode Input Voltage	V <sub>EE</sub> = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub>	6	V
	NECL Mode Input Voltage	$V_{CC} = 0 V$	$V_{I} \ge V_{EE}$	-6	V
l <sub>out</sub>	Output Current	Continuous Surge		50 100	mA mA
TA	Operating Temperature Range			0 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
$\theta_{\sf JA}$	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	28 PLCC 28 PLCC	63.5 43.5	°C/W
$\theta_{JC}$	Thermal Resistance (Junction-to-Case)	std bd	28 PLCC	22 to 26	°C/W
V <sub>EE</sub>	PECL Operating Range			4.2 to 5.7	V
	NECL Operating Range			−5.7 to −4.2	V
T <sub>sol</sub>	Wave Solder	< 2 to 3 sec @ 248°C		265	°C

<sup>1.</sup> Maximum Ratings are those values beyond which device damage may occur.

			0°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
I <sub>EE</sub>	Power Supply Current		145	174		145	174		167	200	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 3)	3975	4050	4120	3975	4050	4120	3975	4050	4120	mV
V <sub>OL</sub>	Output LOW Voltage (Note 3)	3190	3295	3380	3190	3255	3380	3190	3260	3380	mV
V <sub>IH</sub>	Input HIGH Voltage	3835	4050	4120	3835	4120	4120	3835	4120	4120	mV
V <sub>IL</sub>	Input LOW Voltage	3190	3300	3525	3190	3525	3525	3190	3525	3525	mV
V <sub>CUT</sub>	Cut-off Output Voltage (Note 3)	2.9	CY	2.97	2.9		2.97	2.9		2.97	V
I <sub>IH</sub>	Input HIGH Current			150	20		150			150	μΑ
I <sub>IL</sub>	Input LOW Current	0.5	0.3	7 /	0.5	0.25		0.5	0.2		μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The Devices are designed to filest the body specifications shown that advertable, after the file body exactly circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.
 Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary +0.46 V / -0.8 V.
 Outputs are terminated through a 50 Ω resistor to V<sub>CC</sub> - 2.10 V.

## 100E SERIES NECL DC CHARACTERISTICS $V_{CCx} = 0.0 \text{ V}$ ; $V_{EE} = -5.0 \text{ V}$ (Note 4)

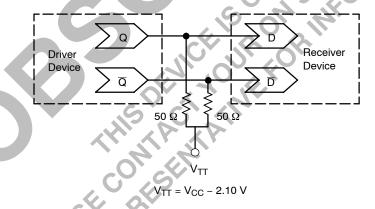
		,65	0°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
I <sub>EE</sub>	Power Supply Current		145	174		145	174		167	200	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 5)	-1025	-950	-880	-1025	-950	-880	-1025	-950	-880	mV
$V_{OL}$	Output LOW Voltage (Note 5)	-1810	-1705	-1620	-1810	-1745	-1620	-1810	-1740	-1620	mV
V <sub>IH</sub>	Input HIGH Voltage	-1165	-950	-880	-1165	-880	-880	-1165	-880	-880	mV
V <sub>IL</sub>	Input LOW Voltage	-1810	-1700	-1475	-1810	-1475	-1475	-1810	-1475	-1475	mV
V <sub>CUT</sub>	Cut-off Output Voltage (Note 5)	2.9		2.97	2.9		2.97	2.9		2.97	V
I <sub>IH</sub>	Input HIGH Current			150			150			150	μΑ
I <sub>IL</sub>	Input LOW Current	0.5	0.3		0.5	0.25		0.5	0.2		μΑ

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.
4. Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary +0.46 V / -0.8 V.
5. Outputs are terminated through a 50 Ω resistor to V<sub>CC</sub> - 2.10 V.

AC CHARACTERISTICS  $V_{CCx} = 5.0 \text{ V}$ ;  $V_{EE} = 0.0 \text{ V}$  or  $V_{CCx} = 0.0 \text{ V}$ ;  $V_{EE} = -5.0 \text{ V}$  (Note 6)

			0°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
f <sub>MAX</sub>	Maximum Toggle Frequency		TBD			TBD			TBD		GHz
t <sub>PLH</sub>	Propagation Delay to Output										ps
$t_{PHL}$	Clk to Q	450		1000	450		1000	450		1000	
	Clk to BUS	800		1800	800		1800	800		1800	
	ABUSDIS	500		1500	500		1500	500		1500	
	SYNCEN	800		1800	800		1800	800		1800	
ts	Setup Time										ps
	BUS	350			350			350			
	SBUSEN	100			100			100			
	Data, S-IN	400			400			400			
	TEN, REN, SCAN	550			550			550			
t <sub>h</sub>	Hold Time										ps
	BUS	350			350			350			
	SBUSEN	500			500			500			
	Data, S-IN	350			350			350			
	TEN, REN, SCAN	200			200			200			
t <sub>PW</sub>	Minimum Pulse Width								VO.		ps
	CLk	400			400			400			
t <sub>JITTER</sub>	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
t <sub>r</sub>	Rise/Fall Times							0	4		ps
t <sub>f</sub>	20 - 80% (Qn)	300		800	300		800	300	D,	800	
	20 - 80% (BUSn Rise)	500		1000	500		1000	500		1000	
	20 - 80% (BUSn Fall)	300		800	300	<b>*</b>	800	300		800	

<sup>6. 100</sup> Series: V<sub>EE</sub> can vary +0.46 V / -0.8 V.



Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020 – Termination of ECL Logic Devices.)

## **Resource Reference of Application Notes**

AN1404 ECLinPS Circuit Performance at Non-Standard VIH Levels

AN1405 - ECL Clock Distribution Techniques AN1406 Designing with PECL (ECL at +5.0 V)

AN1503 ECLinPS I/O SPICE Modeling Kit

AN1504 Metastability and the ECLinPS Family AN1568 Interfacing Between LVDS and ECL

AN1596 ECLinPS Lite Translator ELT Family SPICE I/O Model Kit

AN1650 Using Wire-OR Ties in ECLinPS Designs

AN1672 The ECL Translator Guide

AND8001 **Odd Number Counters Design** 

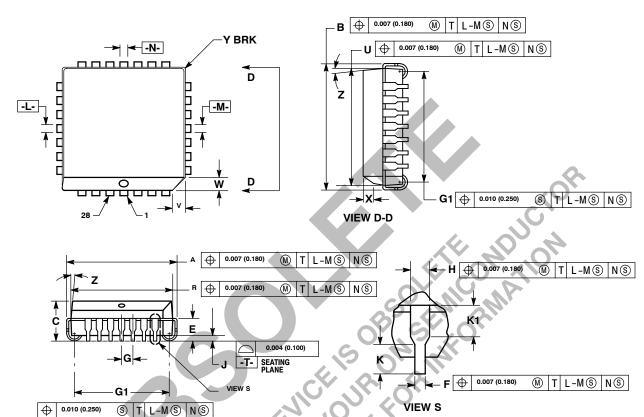
AND8002 Marking and Date Codes

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## PACKAGE DIMENSIONS

## PLCC-28 **FN SUFFIX**

PLASTIC PLCC PACKAGE CASE 776-02 ISSUE E



### NOTES

- TES:
  DATUMS -L-, -M-, AND -N- DETERMINED
  WHERE TOP OF LEAD SHOULDER EXITS
  PLASTIC BODY AT MOLD PARTING LINE.
  DIM G1, TRUE POSITION TO BE MEASURED
  AT DATUM -T., SEATING PLANE.
  DIM R AND U DO NOT INCLUDE MOLD FLASH.
  ALLOWABLE MOLD FLASH IS 0.010 (0:250)
  PER SIDE. PER SIDE.
  DIMENSIONING AND TOLERANCING PER ANSI
- DIMENSIONING AND TOLERANCING PER ANS Y14.5M, 1982.
  CONTROLLING DIMENSION: INCH.
  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 ROTTOM OF THE BETWEEN THE TOP AND BOTTOM OF THE
- PLASTIC BODY.

  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).

	INC	HES	MILLIN	METERS
DIM	MIN	MAX	MIN	MAX
Α	0.485	0.495	12.32	12.57
В	0.485	0.495	12.32	12.57
С	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	0.05	0 BSC	1.27	BSC
Н	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
٧	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
Х	0.042	0.056	1.07	1.42
Υ	_	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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