PEEL™ 153

AMI SEMICONDUCTORS

CMOS Programmable Electrically Erasable Logic Device

February 1993

Features

Advanced CMOS EEPROM Technology

Low Power Consumption

- 65mA + 1mA/MHz Max

High Performance

- tPD = 30ns Max, tOE = 30ns Max

EE Reprogrammability

- Superior programming
- Low-cost, "windowless" package
- Erases and programs in seconds

Development/Programmer Support

- Third-party software and programmers
- AMI PEEL Development Software with APEEL Logic Assembler

FPLA Architecture

- 8 Inputs and 10 I/Os
- Programmable-AND/OR arrays
- 42 Product Terms: 32 Logic Terms, 10 Control Terms
- 10 Sum Terms

Drop-In Replacement for PLS153

- Pin compatible
- JEDEC file compatible

Application Versatility

- Replaces random SSI/MSI logic
- Creates customized comparators, multiplexers, encoders, converters, etc.

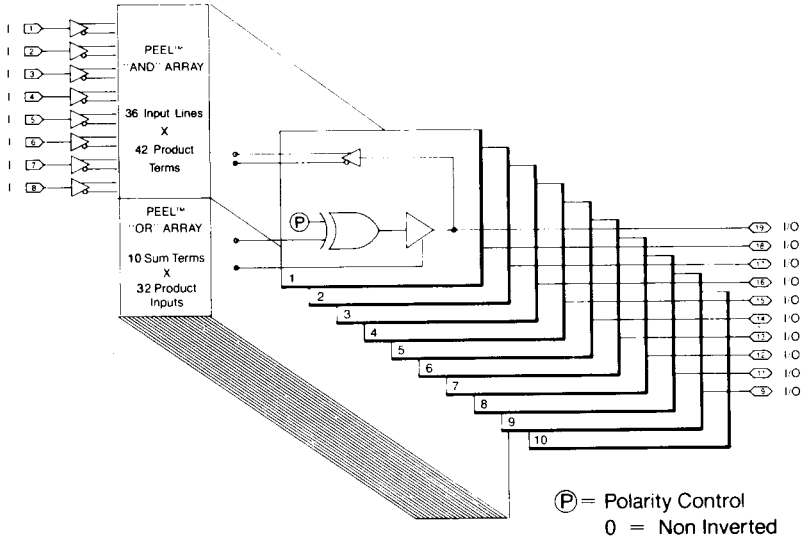
General Description

The AMI PEEL153 is a CMOS Programmable Electrically Erasable Logic device that provides a high-performance, low-power, reprogrammable, and architecturally enhanced alternative to conventional FPLAs. Designed in advanced CMOS EEPROM technology, the PEEL153 rivals speed parameters of comparable bipolar PLDs while providing a dramatic improvement in active power consumption. The EE reprogrammability of the PEEL153 reduces development and field retrofit costs and enhances testability to ensure 100% field programmability and function. PEEL technology allows for low-cost, "windowless" packaging in a ceramic or plastic 20-pin, 300-mil DIP.

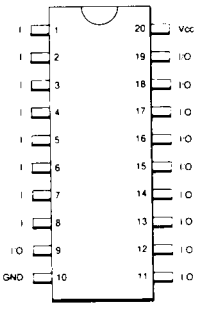
The PEEL153 provides both a programmable-AND array and a programmable OR array to offer drop-in compatibility with the bipolar PLS153. Applications for the PEEL153 cover a wide range of combinatorial functions, such as replacement of random SSI/MSI logic circuitry, priority encoders, comparators, parity generators, code converters, address decoders, and multiplexers. The PEEL153 is supported by popular development tools and programmers from third-party manufacturers, and by AMI's APEEL Logic Assembler.

Figure 28: PEEL153 Pin and Block Diagram

Block Diagram



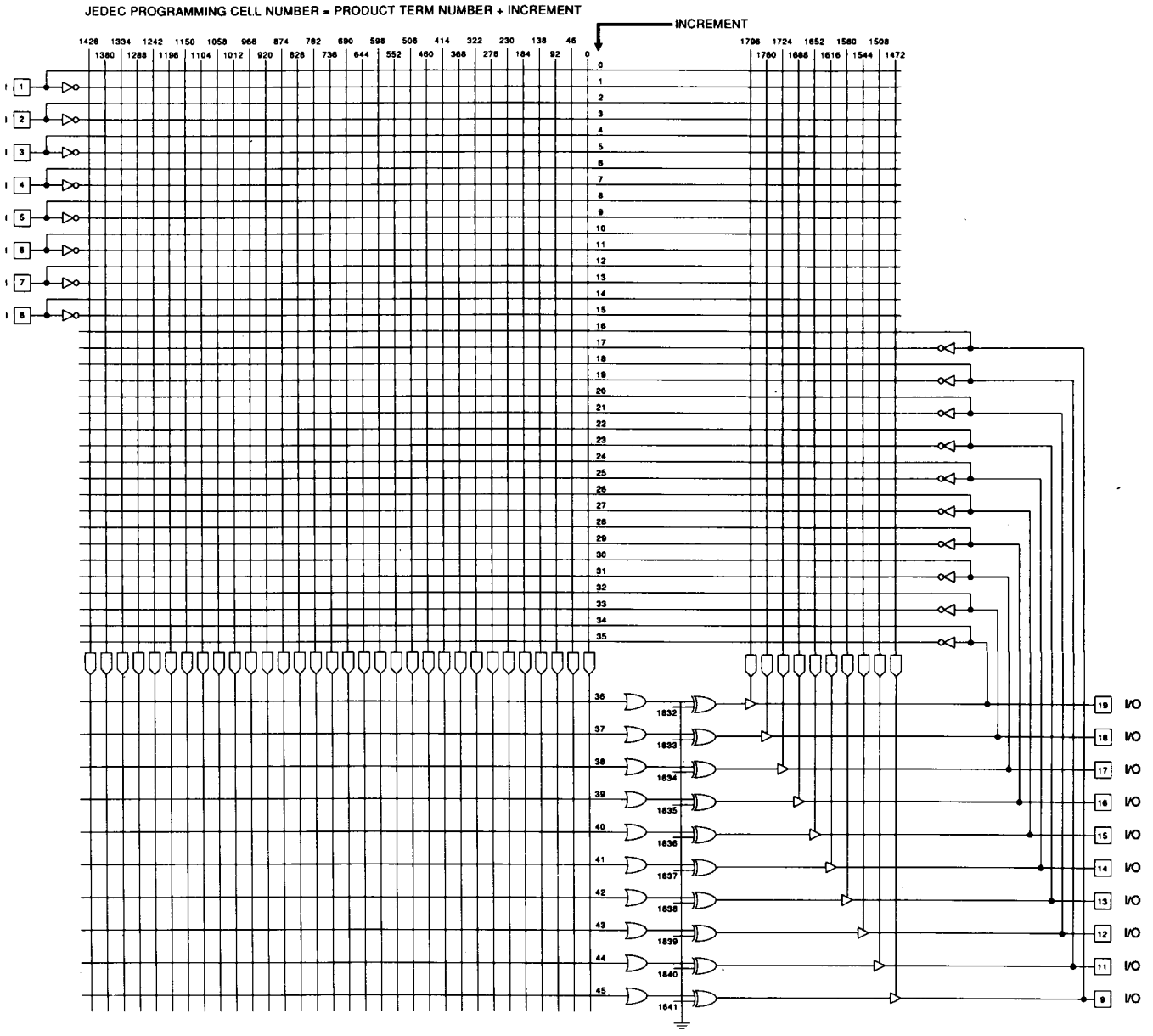
Pin Diagram



Pin Names

I = Input Only
I/O = Bi-Directional Input/Output
GND = Ground
Vcc = Power Supply (+5V)

Figure 29: PEEL153 Logic Array Diagram



Absolute Values

Absolute Maximum Ratings[8]

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
Vcc	Supply Voltage	Relative to GND	-0.5	7.0	V
Vi	Voltage applied to Input[4]	Relative to GND[1,10]	-0.5	Vcc +0.6	V
Vo	Voltage applied to Output	Relative to GND[1]	-0.5	Vcc +0.6	V
Io	Output Current	Per pin (Iol, Ioh)		+25	mA
Tst	Storage Temperature		-65	+150	C
Tlt	Lead Temperature	(soldering 10 seconds)		+300	C

Operating Ranges

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
Vcc	Supply Voltage	Commercial	4.75	5.25	V
		Industrial	4.5	5.5	V
Ta	Operating Temperature	Commerical	0	+70	C
		Industrial	-40	+85	C
Tr	Clock Rise Time[5]	Test points at 10% and 90% levels		250	ns
Tf	Clock Fall Time[5]	Test points at 10% and 90% levels		250	ns
Trvcc	Vcc Rise Time[5]	Test points at 10% and 90% levels		250	ms

DC Characteristics (Over Operating Range Specifications)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Iil	Input Leakage	Vin = GND to Vcc			±10	µA
Ioz	Output Leakage	I/O = High Impedance Vo = GND to Vcc			±10	µA
Vil	Input Low Voltage		-0.3		0.8	V
Vih	Input High Voltage		2.0		Vcc+0.3	V
Vol	Output Low Voltage TTL	Iol = +8.0mA[12]			0.45	V
Volc	Output Low Voltage CMOS	Iol = 10µA[12]			0.1	V
Voh	Output High Voltage TTL	Ioh = -4.0mA[12]	2.4			V
Vohc	Output High Voltage CMOS	Ioh = -10µA[12]	Vcc -0.1			v

Capacitance

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Cin[3,7]	Input Capacitance	Frequency = 1MHz		4	6	pF
Cout[3,7]	Output Capacitance	Frequency = 1MHz		8	12	pF
Cclk[3,7]	Clk Pin Capacitance	Frequency = 1MHz		8	13	pF

Electrical Characteristics (Over Operating Range Specifications)

SYMBOL	PARAMETER	UNITS	MIN	MAX
Iccs	Vcc Current Standby[9]	mA		65
Icca	Vcc Current Active[9]	mA		Iccs + 0.5 mA/MHz
tPD	Input[4] to combinatorial output	ns		30
tOD	Input[4] to output disable[11]	ns		30
tOE	Input[4] to output enable[11]	ns		30

NOTES:

1. Minimum DC input is -0.5V; however, inputs may undershoot to -2.0V for periods less than 30ns.
2. Voltage applied to input or output must not exceed Vcc+1.0V.
3. These measurements are periodically sample tested.
4. "Input" refers to an Input signal.
5. Test points assume signal transitions of 5ns or less from the 10% and 90% points, and timing reference levels of 1.5V (unless otherwise specified).
6. See AC test point/load circuit table for tOE and tOD testing.
7. Typical values and capacitance are measured at Vcc=5.0V and Ta = 25°C.
8. Exposure to absolute maximum ratings over extended periods of time may affect device reliability. Exceeding absolute maximum ratings may cause permanent damage.
9. I/O pins are open (no load).
10. Vin specified is not for program/verify operation. Contact AMI for information regarding PEEL program/verify specifications.
11. tOD and tOE are measured at Voh=-0.1V and Vol=+0.1V.
12. Contact factory for increased Iol requirements.

Figure 30: PEEL153 AC Switching Waveforms

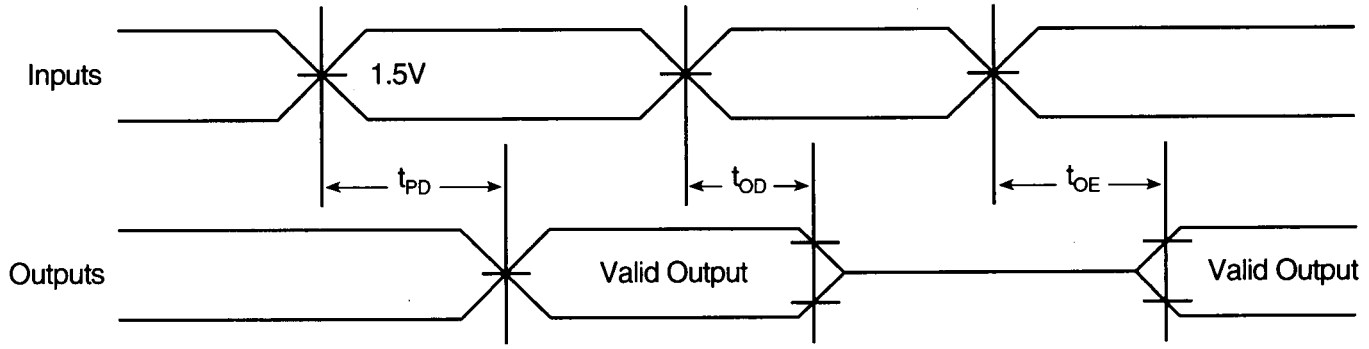


Figure 31: PEEL153 AC Test Loads