Am29833A/Am29853A/Am29855A

Parity Bus Transceivers

DISTINCTIVE CHARACTERISTICS

- High-speed bidirectional bus transceivers for processor organized devices
  - T-R delay = 6 ns typical
  - R_i-Parity delay = 9 ns typical
- Error flag with open-collector output
- Generates odd parity for all-zero protection
- 200-mV minimum input hysteresis (Commercial) on input data ports
- High drive capability:
  - 48 mA Commercial I_{OL}
  - 32 mA Military I_{OL}
- Higher speed, lower power versions of the Am29833 & Am29853
- Am29855A adds new functionality

GENERAL DESCRIPTION

The Am29833A, Am29853A, and Am29855A are high-performance parity bus transceivers designed for two-way communications. Each device can be used as an 8-bit transceiver, as well as a 9-bit parity checker/generator. In the transmit mode, data is read at the R port and output at the T port with a parity bit. In the receive mode, data and parity are read at the T port, and the data is output at the R port along with an $\overline{ERR}$ flag showing the result of the parity test.

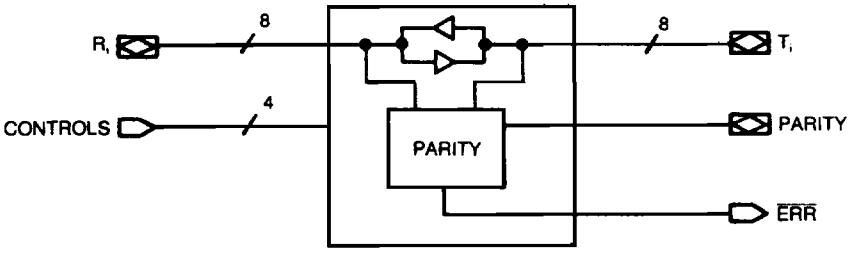
In the Am29833A, the error flag is clocked and stored in a register which is read at the open-collector $\overline{ERR}$ output. The $\overline{CLR}$ input is used to clear the error flag register. In the Am29853A, a latch replaces this register, and the $\overline{EN}$ and $\overline{CLR}$ controls are used to pass, store, sample or clear the error flag output. When both output enables are disabled in the Am29853A and Am29833A, the parity logic defaults to the transmit mode, so that the $\overline{ERR}$ pin reflects the parity of the R port. The Am29855A, a variation of the Am29853A, is designed so that when both output enables are HIGH, the $\overline{ERR}$ pin retains its current state.

The output enables, $\overline{OER}$ and $\overline{OET}$, are used to force the port outputs to the high-impedance state so that other devices can drive bus lines directly. In addition, the user can force a parity error by enabling both $\overline{OER}$ and $\overline{OET}$ simultaneously. This transmission of inverted parity gives the designer more system diagnostic capability.

Each of these devices is produced with AMD's proprietary IMOX* bipolar process, and features typical propagation delays of 6 ns, as well as high-capacitive drive capability. Package option s include DIPs, PLCCs, LCCs, SOICs, and Flatpacks.

SIMPLIFIED BLOCK DIAGRAM

Parity Transceivers



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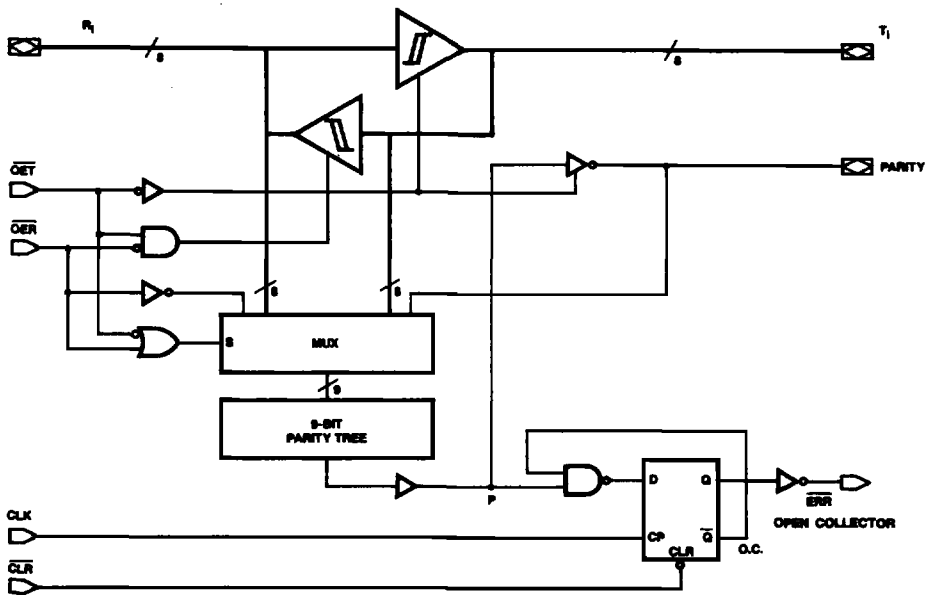
BLOCK DIAGRAMS*

Am29833A



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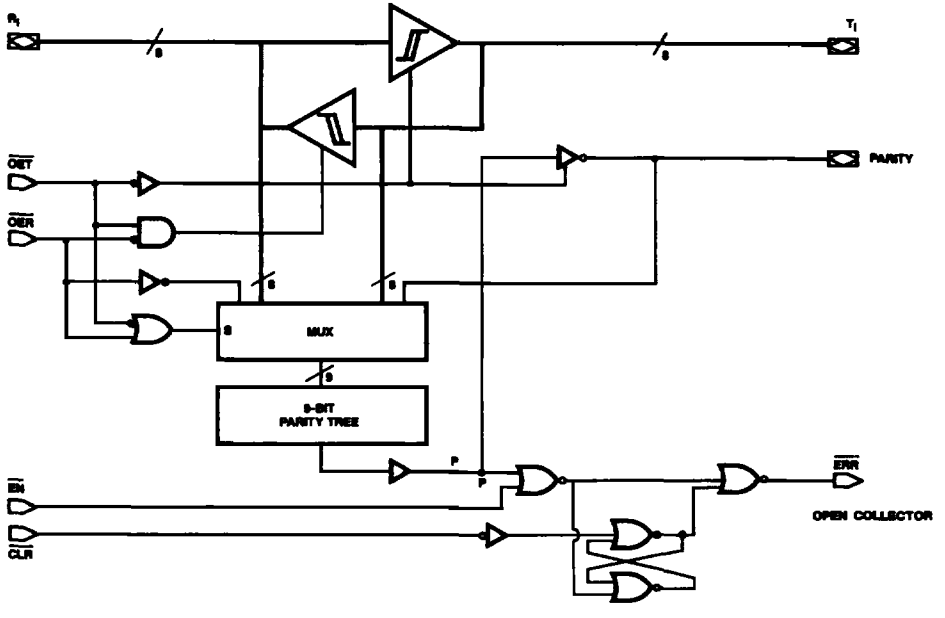
Am29853A



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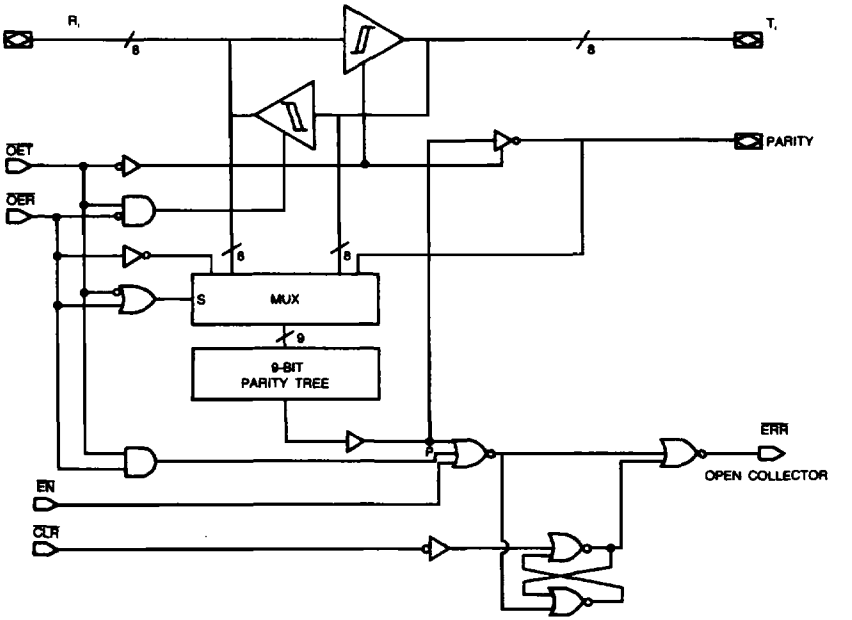
*See following page for additional Block Diagrams.

BLOCK DIAGRAMS (Cont'd.)

Am29855A



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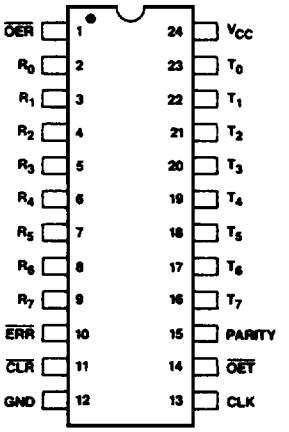
CONNECTION DIAGRAMS
Top View

Am29833

DIPs*



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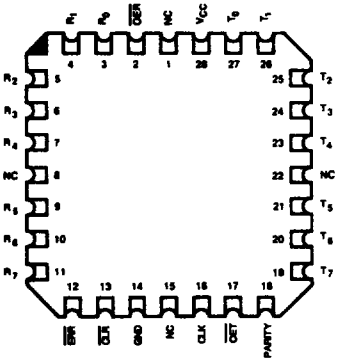
LCC**



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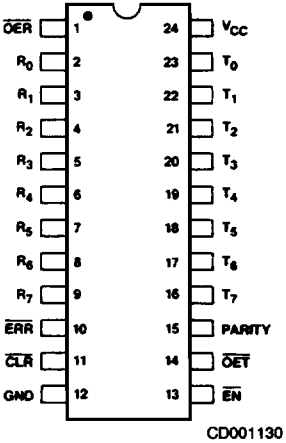
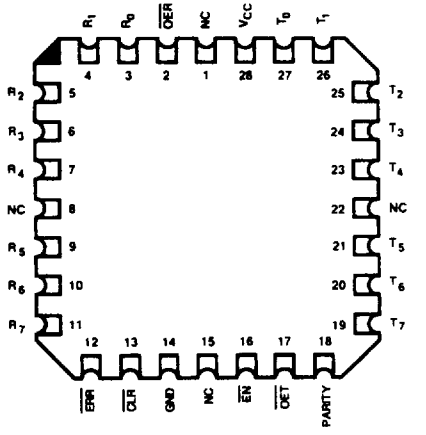
Am29853/Am29855

DIPs*



CD001130

LCC**



CD001399

*Also available in 24-Pin Flatpack and Small Outline packages; pinout identical to DIPs.
**Also available in 28-Pin PLCC; pinout identical to LCC.

FUNCTION TABLES

Am29833A (Register Option)

Inputs								Outputs				
$\overline{OET}$	$\overline{OER}$	$\overline{CLR}$	CLK	R_I	Sum of H's of R_I	T_I	Sum of H's (T_I + Parity)	R_I	T_I	Parity	$\overline{ERR}$	Function
L	H	X	X	H	ODD	NA	NA	NA	H	L	NA	Transmit mode: transmits data from R port to T port, generating parity. Recieve path is disabled.
L	H	X	X	H	EVEN	NA	NA	NA	H	H	NA	
L	H	X	X	L	ODD	NA	NA	NA	L	L	NA	
L	H	X	X	L	EVEN	NA	NA	NA	L	H	NA	
H	L	H	↑	NA	NA	H	ODD	H	NA	NA	H	Receive mode: transmits data from T port to R port with parity test resulting in error flag. Transmit path is disabled.
H	L	H	↑	NA	NA	H	EVEN	H	NA	NA	L	
H	L	H	↑	NA	NA	L	ODD	L	NA	NA	H	
H	L	H	↑	NA	NA	L	EVEN	L	NA	NA	L	
X	X	L	X	X	X	X	X	X	X	X	H	Clear error flag register.
H	H	H	X	X	X	X	X	Z	Z	Z	*	Both transmitting and receiving paths are disabled.
H	H	L	X	X	X	X	X	Z	Z	Z	H	
H	H	H	↑	L	ODD	X	X	Z	Z	Z	H	Parity logic defaults to transmit mode. Forced-error checking.
H	H	H	↑	H	EVEN	X	X	Z	Z	Z	L	
L	L	X	X	H	ODD	NA	NA	NA	H	H	NA	
L	L	X	X	H	EVEN	NA	NA	NA	H	L	NA	
L	L	X	X	L	ODD	NA	NA	NA	L	H	NA	
L	L	X	X	L	EVEN	NA	NA	NA	L	L	NA	

H = HIGH
L = LOW
↑ = LOW-to-HIGH Transition of Clock
X = Don't Care
Z = High Impedance
NA = Not Applicable
* = Store the Error State of the Last Receive Cycle
ODD = Odd Number
Even = Even Number
i = 0, 1, 2, 3, 4, 5, 6, 7

TRUTH TABLE

Error Flag Output

Am29833A

Inputs		Internal to Device	Outputs Pre-state	Output	
CLR	CLK	Point "P"	$\overline{ERR}_{n-1}$	$\overline{ERR}$	Function
H	↑	H	H	H	Sample (1's Capture)
H	↑	X	L	L	
H	↑	L	X	L	
L	X	X	X	H	Clear

Note: $\overline{OET}$ is HIGH and $\overline{OER}$ is LOW.

FUNCTION TABLES (Cont'd.)

Am29853A (Latch Option)

Inputs								Outputs				
$\overline{OET}$	$\overline{OER}$	$\overline{CLR}$	$\overline{EN}$	R_i	Sum of H's of R_i	T_i	Sum of H's (T_i + Parity)	R_i	T_i	Parity	$\overline{ERR}$	Function
L	H	X	X	H	ODD	NA	NA	NA	H	L	NA	Transmit mode: transmits data from R port to T port, generating parity. Receive path is disabled.
L	H	X	X	H	EVEN	NA	NA	NA	H	H	NA	
L	H	X	X	L	ODD	NA	NA	NA	L	L	NA	
L	H	X	X	L	EVEN	NA	NA	NA	L	H	NA	
H	L	L	L	NA	NA	H	ODD	H	NA	NA	H	Receive mode: transmits data from T port to R port with parity test resulting in error flag. Transmit path is disabled.
H	L	L	L	NA	NA	H	EVEN	H	NA	NA	L	
H	L	L	L	NA	NA	L	ODD	L	NA	NA	H	
H	L	L	L	NA	NA	L	EVEN	L	NA	NA	L	
H	L	H	L	NA	NA	H	ODD	H	NA	NA	H	Receive mode: transmits data from T port to R port, passes parity test resulting in error flag. Transmit path is disabled.
H	L	H	L	NA	NA	H	EVEN	H	NA	NA	L	
H	L	H	L	NA	NA	L	ODD	L	NA	NA	H	
H	L	H	L	NA	NA	L	EVEN	L	NA	NA	L	
H	L	H	H	NA	NA	X	X	X	NA	NA	*	Store the state of error flag latch.
X	X	L	H	X	X	X	X	X	NA	NA	H	Clear error flag latch.
H	H	H	H	X	X	X	X	Z	Z	Z	*	Both transmitting and receiving paths are disabled. Parity logic defaults to transmit mode
H	H	L	H	X	X	X	X	Z	Z	Z	H	
H	H	X	L	L	ODD	X	X	Z	Z	Z	H	
H	H	X	L	H	EVEN	X	X	Z	Z	Z	L	
L	L	X	X	H	ODD	NA	NA	NA	H	H	NA	Forced-error checking.
L	L	X	X	H	EVEN	NA	NA	NA	H	L	NA	
L	L	X	X	L	ODD	NA	NA	NA	L	H	NA	
L	L	X	X	L	EVEN	NA	NA	NA	L	L	NA	

Am29855A (Latch Option)

Inputs								Outputs				
$\overline{OET}$	$\overline{OER}$	$\overline{CLR}$	$\overline{EN}$	R_i	Sum of H's of R_i	T_i	Sum of L's (T_i + Parity)	R_i	T_i	Parity	$\overline{ERR}$	Function
L	H	X	X	H	ODD	NA	NA	NA	H	L	*	Transmit mode: transmits data from R port to T port, generating parity. Receive path is disabled.
L	H	X	X	H	EVEN	NA	NA	NA	H	H	*	
L	H	X	X	L	ODD	NA	NA	NA	L	L	*	
L	H	X	X	L	EVEN	NA	NA	NA	L	H	*	
H	L	L	L	NA	NA	H	ODD	H	NA	NA	H	Receive mode: transmits data from T port to R port with parity test resulting in error flag. Transmit path is disabled.
H	L	L	L	NA	NA	H	EVEN	H	NA	NA	L	
H	L	L	L	NA	NA	L	ODD	L	NA	NA	H	
H	L	L	L	NA	NA	L	EVEN	L	NA	NA	L	
H	L	H	L	NA	NA	H	ODD	H	NA	NA	*	Receive mode: transmits data from T port to R port, passes parity test resulting in error flag. Transmit path is disabled.
H	L	H	L	NA	NA	H	EVEN	H	NA	NA	L	
H	L	H	L	NA	NA	L	ODD	L	NA	NA	*	
H	L	H	L	NA	NA	L	EVEN	L	NA	NA	L	
H	L	H	H	NA	NA	X	X	X	NA	NA	*	Store the state of error flag latch.
X	X	L	H	X	X	X	X	X	NA	NA	H	Clear error flag latch.
H	H	H	H	X	X	X	X	Z	Z	Z	*	Both transmitting and receiving paths are disabled.
H	H	L	H	X	X	X	X	Z	Z	Z	H	
L	L	X	X	H	ODD	NA	NA	NA	H	H	*	Forced-error checking.
L	L	X	X	H	EVEN	NA	NA	NA	H	L	*	
L	L	X	X	L	ODD	NA	NA	NA	L	H	*	
L	L	X	X	L	EVEN	NA	NA	NA	L	L	*	

H = HIGH
L = LOW
↑ = LOW-to-HIGH transition of clock
X = Don't Care

Z = High impedance
NA = Not applicable
* = Store the Error state of the last Receive cycle

Odd = Odd number
Even = Even number
i = 0, 1, 2, 3, 4, 5, 6, 7

TRUTH TABLE
Error Flag Output

Am29853A/Am29855A

Inputs		Internal to Device	Outputs Pre-state	Output	
$\overline{EN}$	$\overline{CLR}$	Point "P"	$\overline{ERR}_{n-1}$	$\overline{ERR}$	Function
L	L	L	X	L	Pass
L	L	H	X	H	
L	H	L	X	L	Sample (1's Capture)
L	H	X	L	L	
L	H	H	H	H	
H	L	X	X	H	Clear
H	H	X	L	L	Store
H	H	X	H	H	

Note: $\overline{OET}$ is HIGH and $\overline{OER}$ is LOW.

ORDERING INFORMATION
Standard Products

AMD products are available in several packages and operating ranges. The order number (Valid Combination) is formed by a combination of: **a. Device Number**
b. Speed Option (if applicable)
c. Package Type
d. Temperature Range
e. Optional Processing

AM29833A P C B

e. OPTIONAL PROCESSING
Blank = Standard processing
B = Burn-in

d. TEMPERATURE RANGE
C = Commercial (0 to +70°C)
E = Extended Military (−55 to +125°C)

c. PACKAGE TYPE
P = 24-Pin Slim Plastic DIP (PD3024)
D = 24-Pin Slim Ceramic DIP (CD3024)
S = 24-Pin Plastic Small Outline Package (SO 024)
J = 28-Pin Plastic Leaded Chip Carrier (PL 028)
L = 28-Pin Ceramic Leadless Chip Carrier (CL 028)

b. SPEED OPTION
Not Applicable

a. DEVICE NUMBER/DESCRIPTION
Am29833A Parity Transceiver, Register Option
Am29853A Parity Transceiver, Latch Option
Am29855A Parity Transceiver, Latch Option (New Functionality)

Valid Combinations	
AM29833A	PC, PCB, DC, DCB, DE, SC, JC, LC
AM29853A	
AM29855A	

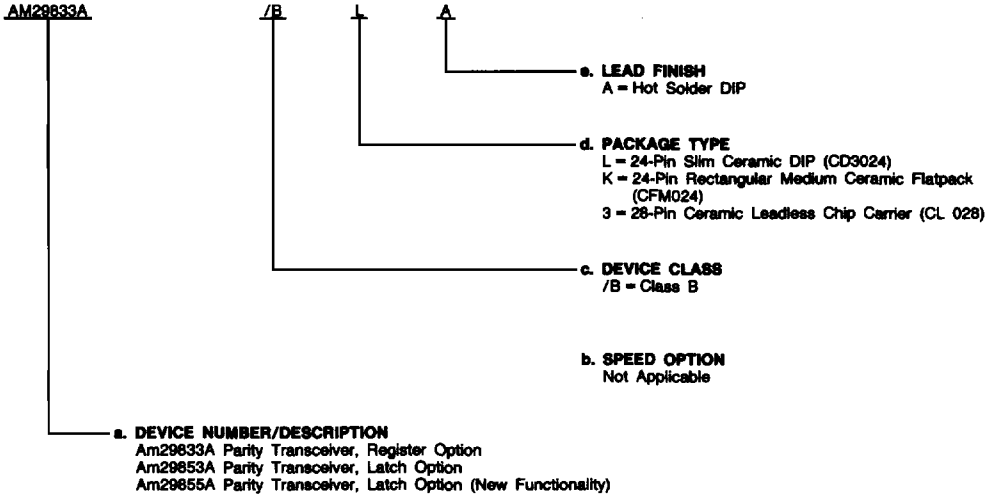
Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations, to check on newly released valid combinations, and to obtain additional data on AMD's standard military grade products.

ORDERING INFORMATION (Cont'd.)

APL Products

AMD products for Aerospace and Defense applications are available in several packages and operating ranges. APL (Approved Products List) products are fully compliant with MIL-STD-883C requirements. The order number (Valid Combination) for APL products is formed by a combination of: **a. Device Number**
b. Speed Option (if applicable)
c. Device Class
d. Package Type
e. Lead Finish



Valid Combinations	
AM29833A	/BLA, /BKA, /B3A
AM29853A	
AM29855A	

Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations or to check for newly released valid combinations.

Group A Tests

Group A tests consist of Subgroups
1, 2, 3, 7, 8, 9, 10, 11.

PIN DESCRIPTION

Am29833A, Am29853A/Am29855A

$\overline{OER}$ Output Enable-Receive (Input, Active LOW)
When LOW in conjunction with $\overline{OET}$ HIGH, the devices are in the Receive mode (R_i are outputs, T_i and Parity are inputs).

$\overline{OET}$ Output Enable-Transmit (Input, Active LOW)
When LOW in conjunction with $\overline{OER}$ HIGH, the devices are in the Transmit mode (R_i are inputs, T_i and Parity are outputs).

R_i Receive Port (Input/Output, Three-State)
R_i are the 8-bit data inputs in the Transmit mode, and the outputs in the Receive mode.

T_i Transmit Port (Input/Output, Three-State)
T_i are the 8-bit data outputs in the Transmit mode, and the inputs in the Receive mode.

Parity Parity Flag (Input/Output, Three-State)
In the Transmit mode, the Parity signal is an active output used to generate odd parity. In the Receive mode, the T_i and Parity inputs are combined and checked for odd parity. When both output enables are HIGH, the Parity Flag is in the high impedance state. When both output enables are LOW, the Parity bit forces a parity error.

Am29833A Only

$\overline{ERR}$ Error Flag (Output, Open Collector)
In the Receive mode, the parity of the T_i bits is calculated and compared to the Parity input. $\overline{ERR}$ goes LOW when the comparison indicates a parity error. $\overline{ERR}$ stays LOW until the register is cleared.

$\overline{CLR}$ Clear (Input, Active LOW)
When $\overline{CLR}$ goes LOW, the Error Flag Register is cleared ($\overline{ERR}$ goes HIGH).

CLK Clock (Input, Positive Edge-Triggered)
This pin is the clock input for the Error Flag register.

Am29853A/Am29855A Only

$\overline{ERR}$ Error Flag (Output, Open Collector)
In the Receive mode, the parity of the T_i bits is calculated and compared to the Parity input. $\overline{ERR}$ goes LOW when the comparison indicates a parity error. $\overline{ERR}$ stays LOW until the latch is cleared. In the Am29855A, the error flag will retain its previous state when $\overline{OET}$ and $\overline{OER}$ are HIGH.

$\overline{CLR}$ Clear (Input, Active LOW)
When $\overline{CLR}$ goes LOW and $\overline{EN}$ is HIGH, the Error Flag latch is cleared ($\overline{ERR}$ goes HIGH).

$\overline{EN}$ Latch Enable (Input, Active LOW)
This pin is the latch enable for the Error Flag latch.

ABSOLUTE MAXIMUM RATINGS

Storage Temperature ..... −65 to +150°C
Ambient Temperature with
Power Applied ..... −55 to +125°C
Supply Voltage to Ground Potential
Continuous ..... −0.5 V to +7.0 V
DC Voltage Applied to Output
for High Output State ..... −0.5 V to +5.5 V
DC Input Voltage ..... −1.5 V to +6.0 V
DC Output Current, into Outputs ..... 100 mA
DC Input Current ..... −30 mA to +5.0 mA

Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

OPERATING RANGES

Commercial (C) Devices
Temperature (T_A) ..... 0 to +70°C
Supply Voltage (V_{CC}) ..... +4.5 V to +5.5 V

Military (M) Devices
Temperature (T_C) ..... −55 to +125°C
Supply Voltage (V_{CC}) ..... +4.5 V to +5.5 V

Operating ranges define those limits between which the functionality of the device is guaranteed.

DC CHARACTERISTICS over operating range unless otherwise specified (for APL Products, Group A, Subgroups 1, 2, 3 are tested unless otherwise noted)

Parameter Symbol	Parameter Description	Test Conditions			Min.	Max.	Units
V_{OH}	Output HIGH Voltage (Except $\overline{ERR}$)	V_{CC} = 4.5 V, V_{IN} = V_{IH} or V_{IL}		I_{OH} = −15 mA	2.4		V
				I_{OH} = −24 mA	2.0		
V_{OL}	Output LOW Voltage	V_{CC} = 4.5 V, V_{IN} = V_{IH} or V_{IL}	$\overline{ERR}$	I_{OL} = 48 mA		0.5	V
			All Other Outputs	I_{OL} = 32 mA MIL		0.5	
				I_{OL} = 48 mA COM'L		0.5	
V_{IH}	Input HIGH Voltage	Guaranteed Input Logical HIGH Voltage for All Inputs (Note 1)			2.0		V
V_{IL}	Input LOW Voltage	Guaranteed Input Logical LOW Voltage for All Inputs (Note 1)		COM'L		0.8	V
				MIL		0.7	
V_I	Input Clamp Voltage	V_{CC} = 4.5 V, I_{IN} = −18 mA				−1.2	V
V_{HYST}	Hysteresis for Inputs R_I, T_I			COM'L	200		mV
				MIL	150		
I_{ZL}	I/O Port LOW Current	V_{CC} = 5.5 V, V_{IN} = 0.4 V				−550	µA
I_{IL}	Input LOW Current	V_{CC} = 5.5 V, V_{IN} = 0.4 V				−0.5	mA
I_{IH}	Input HIGH Current	V_{CC} = 5.5 V, V_{IN} = 2.7 V				50	µA
I_I	Input HIGH Current	V_{CC} = 5.5 V, V_{IN} = 5.5 V				100	µA
I_{ZH}	I/O Port HIGH Current	V_{CC} = 5.5 V, V_{IN} = 2.7 V				100	µA
I_{ZI}	I/O Port HIGH Current	V_{CC} = 5.5 V, V_{IN} = 5.5 V				150	µA
I_{SC}	Output Short-Circuit Current	V_{CC} = 5.5 V, V_{OUT} = 0.0 V (Note 2)			−75	−250	mA
I_{OFF}	Bus Leakage Current	V_{CC} = 0 V, V_{OUT} = 2.9 V				100	µA
I_{CC}	Power Supply Current	V_{CC} = 5.5 V, Outputs Unloaded		Ouputs LOW		180	mA
				Outputs HIGH		155	
				Outputs Hi-Z		170	

Notes: 1. Input thresholds are tested during DC parameter testing, and may be tested in combination with other DC parameters.
2. Not more than one output should be shorted at a time. Duration of the short-circuit test should not exceed one second.

SWITCHING CHARACTERISTICS over operating range unless otherwise specified (for APL Products, Group A, Subgroups 9, 10, 11 are tested unless otherwise noted)

Parameter Symbol	Parameter Description		Test Conditions*	COM'L Min.	COM'L Max.	MIL Min.	MIL Max.	Units
t_{PLH}	Propagation Delay R_i to T_i, T_i to R_i		C_L = 50 pF R_1 = 500 Ω R_2 = 500 Ω		10		14	ns
t_{PHL}					10		14	ns
t_{PLH}	Propagation Delay R_i to Parity				15		20	ns
t_{PHL}					15		20	ns
t_{ZH}	Output Enable Time $\overline{OER}$, $\overline{OET}$ to R_i, T_i and Parity			12		16		ns
t_{ZL}					12		16	ns
t_{HZ}	Output Disable Time $\overline{OER}$, $\overline{OET}$ to R_i, T_i and Parity			12		16		ns
t_{LZ}					12		16	ns
t_S	T_i, Parity to CLK Setup Time (Note 1)			12		16		ns
t_H	T_i, Parity to CLK Hold Time (Note 1)			0		0		ns
t_{REC}	Clear ($\overline{CLR}$ ⎍) to CLK Setup Time (Note 2)			15		20		ns
t_{PWH}	Clock Pulse Width (Note 1)	HIGH		7		9.5		ns
t_{PWL}		LOW		7		9.5		ns
t_{PWL}	Clear Pulse Width	LOW		7		9.5		ns
t_{PHL}	Propagation Delay CLK to $\overline{ERR}$ (Note 1)				12		16	ns
t_{PLH}	Propagation Delay $\overline{CLR}$ to $\overline{ERR}$				16		20	ns
t_{PLH}	Propagation-Delay T_i, Parity to $\overline{ERR}$ (PASS Mode Only) Am29853A/Am29855A				22		25	ns
t_{PHL}					18		20	ns
t_{PLH}	Propagation Delay $\overline{OER}$ to Parity				15		20	ns
t_{PHL}					15		20	ns

*See test circuit and waveforms.

Notes: 1. For Am29853A/Am29855A, replace CLK with $\overline{EN}$.
2. Not applicable to Am29853A/Am29855A.