

Am25LS2538

One-of-Eight Decoder
with Three-State Outputs and Polarity Control

DISTINCTIVE CHARACTERISTICS

- Three-state decoder outputs
- Buffered common output polarity control
- Inverting and non-inverting enable inputs
- A. C. parameters specified over operating temperature and power supply ranges

GENERAL DESCRIPTION

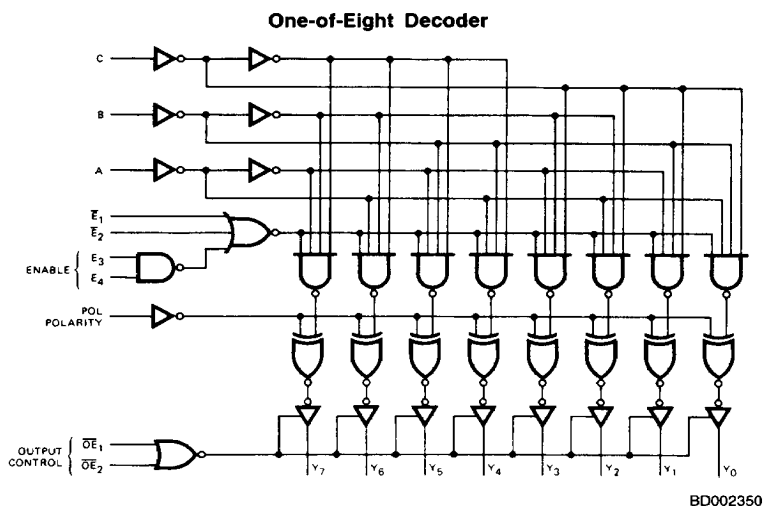
The Am25LS2538 is a three-line to eight-line decoder/demultiplexer fabricated using advanced Low-Power Schottky technology. The decoder has three buffered select inputs—A, B, and C—that are decoded to one-of-eight Y outputs. Two active-HIGH and two active-LOW enables can be used for gating the decoder or can be used with incoming data for demultiplexing applications.

A separate polarity (POL) input can be used to force the function active-HIGH or active-LOW at the output. Two separate active-LOW output enables ($\overline{OE}$) inputs are pro-

vided. If either $\overline{OE}$ input is HIGH, the output is in the high-impedance (off) state. When the POL input is LOW, the Y outputs are active-HIGH and when the POL input is HIGH, the Y outputs are active-LOW.

The device is packaged in a space saving (0.3-inch row spacing) 20-pin package. It also features Am25LS family improved switching specifications, higher noise margin, and twice the fan-out over the military temperature range when compared with Am54LS/74LS devices.

BLOCK DIAGRAM



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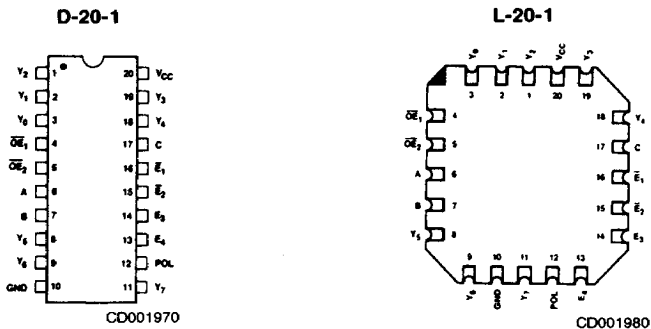
Refer to Page 13-1 for Essential Information on Military Devices

RELATED PRODUCTS

Part No.	Description
Am25LS2536	8-Bit Decoder
Am25LS2537	1-of-10 Decoder
Am25LS2539	Dual 1-of-4 Decoder
Am25LS2548	Chip Select Address Decoder
Am2921	1-of-8 Decoder
Am2924	3-to-8 Line Decoder/Demultiplexer

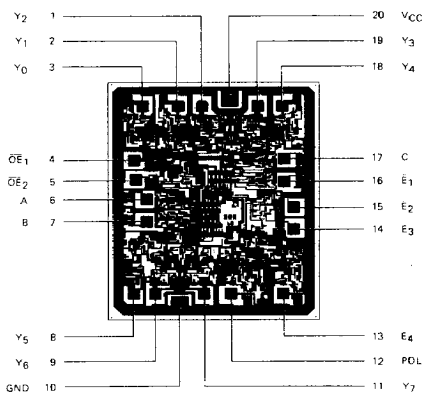
CONNECTION DIAGRAM

Top View



Note: Pin 1 is marked for orientation

METALLIZATION AND PAD LAYOUT



DIE SIZE 0.081" x 0.096"

ORDERING INFORMATION

AMD products are available in several packages and operating ranges. The order number is formed by a combination of the following: Device number, speed option (if applicable), package type, operating range and screening option (if desired).

Am25LS2538

D

C

B

Screening Option
Blank - Standard processing
B - Burn-in

Temperature (See Operating Range)
C - Commercial (0°C to +70°C)
M - Military (-55°C to +125°C)

Package

D - 20-pin Cerdip
F - 20-pin flatpak
L - 20-pin leadless chip carrier
P - 20-pin plastic DIP
X - Dice

Device type
1-of-8 Decoder

Valid Combinations

Am25LS2538	PC DC, DM FM LC, LM XC, XM
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Valid Combinations

Consult the AMD sales office in your area to determine if a device is currently available in the combination you wish.

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Refer to Page 13-1 for Essential Information on Military Devices

PIN DESCRIPTION

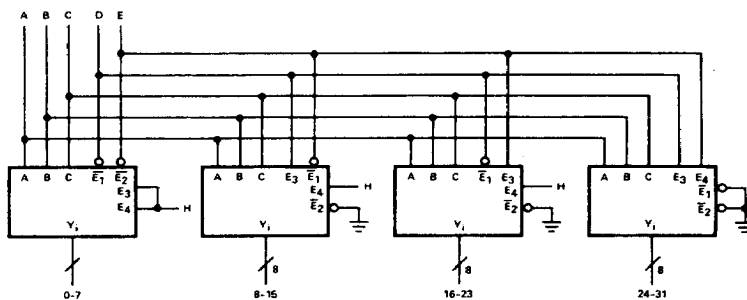
Pin No.	Name	I/O	Description
6, 7, 17	A, B, C	I	The three select inputs to the decoder/demultiplexer.
16, 15	$\bar{E}_1$, $\bar{E}_2$	I	The active LOW enable inputs. A HIGH on either the $\bar{E}_1$ or $\bar{E}_2$ input forces all decoded functions to be disabled.
14, 13	E_3 , E_4	I	The active HIGH enable inputs. A LOW on either the E_3 or E_4 input forces all the decoded functions to be inhibited.
12	POL	I	Polarity Control. A LOW on the polarity control input forces the output to the active-HIGH state while a HIGH on the polarity control input forces the Y outputs to the active-LOW state.
4, 5	$\bar{OE}_1$, $\bar{OE}_2$	I	Output Enable. When both the $\bar{OE}_1$ and $\bar{OE}_2$ inputs are LOW, the Y outputs are enabled. If either $\bar{OE}_1$ or $\bar{OE}_2$ input is HIGH, the Y outputs are in the high-impedance state.
	Y_i	O	The eight outputs for the decoder/demultiplexer.

FUNCTION TABLE

FUNCTION	INPUTS										OUTPUTS							
	$\bar{OE}_1$	$\bar{OE}_2$	E_1	E_2	E_3	E_4	POL	C	B	A	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7
High-Impedance	H	X	X	X	X	X	X	X	X	X	Z	Z	Z	Z	Z	Z	Z	Z
	X	H	X	X	X	X	X	X	X	X	Z	Z	Z	Z	Z	Z	Z	Z
Disable	L	L	H	X	X	X	L	X	X	X	L	L	L	L	L	L	L	L
	L	L	H	X	X	X	H	X	X	X	H	H	H	H	H	H	H	H
	L	L	X	H	X	X	L	X	X	X	L	L	L	L	L	L	L	L
	L	L	X	H	X	X	H	X	X	X	H	H	H	H	H	H	H	H
	L	L	X	X	L	X	L	X	X	X	L	L	L	L	L	L	L	L
	L	L	X	X	L	X	H	X	X	X	H	H	H	H	H	H	H	H
	L	L	X	X	X	L	L	X	X	X	L	L	L	L	L	L	L	L
	L	L	X	X	X	L	H	X	X	X	H	H	H	H	H	H	H	H
Active-HIGH Output	L	L	L	L	H	H	L	L	L	L	H	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	L	L	H	L	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	L	H	L	L	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	L	H	L	L	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	H	L	L	L	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	H	L	L	L	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	H	L	L	L	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	H	L	L	L	L	L	L	L	L	L	L
Active-LOW Output	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	L	L	L	H	H	H	H	H	H	H

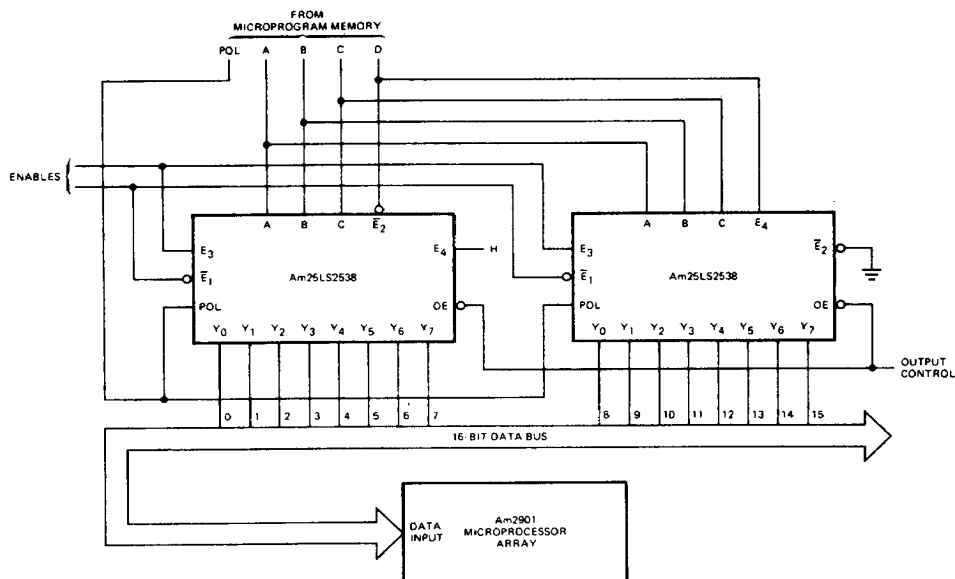
H = HIGH
 L = LOW
 X = Don't Care
 Z = High-Impedance

APPLICATIONS



AF001091

One-of-thirty-two decoder without additional decoding devices.
Can be used for I/O decoding in an Am9080A system.



AF001081

Two Am25LS2538s can be used to perform a one-of-sixteen-bit mask function or a one-of-sixteen-bit select function to perform bit manipulation in a microprocessor system.

Examples:

D	C	B	A	POL	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Function
0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Bit Select
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bit Select
0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	Bit Mask
1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	Bit Mask

03664B

ABSOLUTE MAXIMUM RATINGS

Storage Temperature -65°C to +150°C
 Ambient Temperature Under Bias -55°C to +125°C
 Supply Voltage to Ground Potential
 Continuous -0.5V to +7.0V
 DC Voltage Applied to Outputs For
 High Output State -0.5V to +V_{CC} max
 DC Input Voltage -0.5V to +7.0V
 DC Output Current, Into Outputs 30mA
 DC Input Current -30mA to +5.0mA

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 0°C to +70°C
 Supply Voltage +4.75V to +5.25V

Military (M) Devices

Temperature -55°C to +125°C
 Supply Voltage +4.5V to +5.5V

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

DC CHARACTERISTICS over operating range unless otherwise specified

Parameters	Description	Test Conditions (Note 2)		Min	Typ (Note 1)	Max	Units
V _{OH}	Output HIGH Voltage	V _{CC} = MIN V _{IN} = V _{IH} or V _{IL}	I _{OH} = -1.0mA (MIL)	2.4	3.4		Volts
			I _{OH} = -2.6mA (COM'L)	2.4	3.4		
V _{OL}	Output LOW Voltage (Note 5)	V _{CC} = MIN V _{IN} = V _{IH} or V _{IL}	I _{OL} = 4.0 mA			0.4	Volts
			I _{OL} = 8.0mA			0.45	
			I _{OL} = 12mA			0.5	
V _{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs		2.0			Volts
V _{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs.	MIL			0.7	Volts
			COM'L			0.8	
V _I	Input Clamp Voltage	V _{CC} = MIN, I _{IN} = -18mA				-1.5	Volts
I _{IL}	Input LOW Current	V _{CC} = MAX, V _{IN} = 0.4V				-0.36	mA
I _{IH}	Input HIGH Current	V _{CC} = MAX, V _{IN} = 2.7V				20	μA
I _I	Input HIGH Current	V _{CC} = MAX, V _{IN} = 7.0V				0.1	mA
I _{OZ}	Off-State (High-Impedance) Output Current	V _{CC} = MAX	V _O = 0.4V			-20	μA
			V _O = 2.4V			20	
I _{SC}	Output Short Circuit Current (Note 3)	V _{CC} = MAX		-15		-85	mA
I _{CC}	Power Supply Current (Note 4)	V _{CC} = MAX			21	34	mA

Notes: 1. Typical limits are at V_{CC} = 5.0V, 25°C ambient and maximum loading.

2. For conditions shown as MIN or MAX, use the appropriate value specified under Operating Ranges for the applicable device type.

3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

4. Test conditions: A = B = C = D = E₁ = E₂ = GND; E₃ = E₄ = POL = OE₁ = OE₂ = 4.5V.

5. V_{OL} is specified with total device I_{OL} = 60mA (max).

SWITCHING CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$)

Parameters	Description	Test Conditions	Min	Typ	Max	Units
t _{PLH}	A, B, C to Y _i	C _L = 15pF R _L = 2.0kΩ		20	30	ns
t _{PHL}				15	22	
t _{PLH}				19	28	
t _{PHL}	E ₁ , E ₂ to Y _i			20	30	ns
t _{PLH}	E ₃ , E ₄ to Y _i			21	31	
t _{PHL}				23	34	
t _{PLH}				16	24	ns
t _{PHL}	POL to Y _i			20	30	
t _{ZH}	OE ₁ , OE ₂ to Y _i			17	25	
t _{ZL}	OE ₁ , OE ₂ to Y _i	C _L = 5.0pF R _L = 2.0kΩ		14	21	
t _{HZ}				17	25	
t _{LZ}				20	30	ns

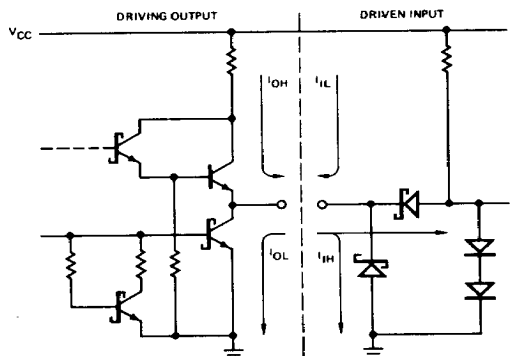
SWITCHING CHARACTERISTICS over operating range unless otherwise specified*

Parameters	Description	Test Conditions	COMMERCIAL		MILITARY		Units
			Am25LS2538		Am25LS2538		
			Min	Max	Min	Max	
t _{PLH}	A, B, C to Y _i	C _L = 50pF R _L = 2.0kΩ		36		42	ns
t _{PHL}				29		37	
t _{PLH}	E ₁ , E ₂ to Y _i			34		39	ns
t _{PHL}				38		45	
t _{PLH}	E ₃ , E ₄ to Y _i			38		45	ns
t _{PHL}				43		52	
t _{PLH}	POL to Y _i			29		34	ns
t _{PHL}				39		49	
t _{ZH}	OE ₁ , OE ₂ to Y _i			38		45	ns
t _{ZL}				23		25	
t _{HZ}	OE ₁ , OE ₂ to Y _i	C _L = 5.0pF R _L = 2.0kΩ		29		33	ns
t _{LZ}				33		36	

*AC performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

Am25LS2538

LOW-POWER SCHOTTKY INPUT/OUTPUT CURRENT INTERFACE CONDITIONS



IC000090

Note: Actual current flow direction shown.