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

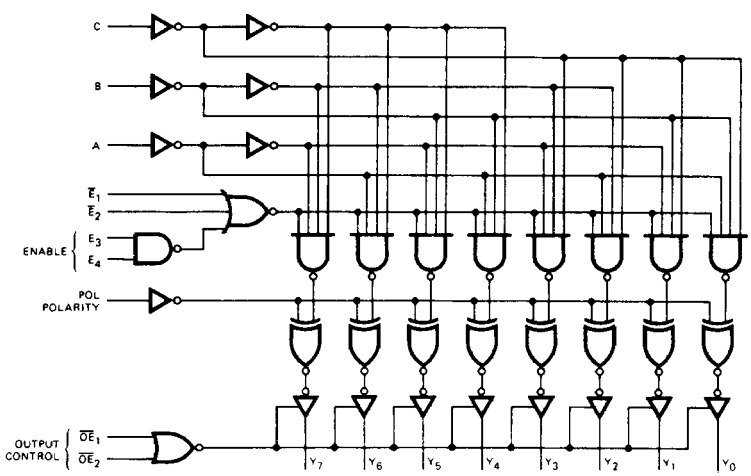
The Am25LS2538 is a three-line to eight-line decoder/demultiplexer fabricated using advanced Low-Power Schottky technology. The decoder has three buffered select inputs–A, B, and C–that are decoded to one-of-eight Y outputs. Two active-HIGH and two active-LOW enables can be used for gating the decoder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

One-of-Eight Decoder



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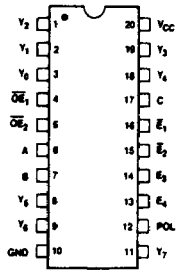
RELATED PRODUCTS

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

D-20-1



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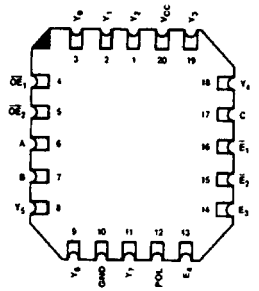

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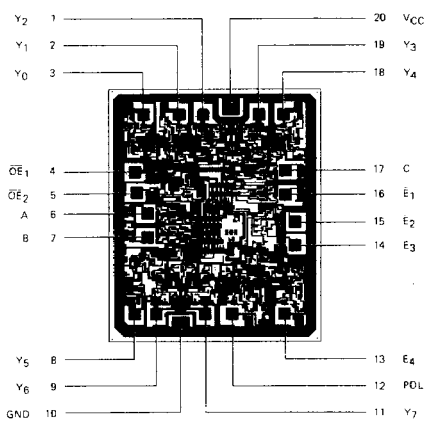
Note: Pin 1 is marked for orientation

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**

- B — Screening Option: Blank – Standard processing; B – Burn-in
- C — Temperature (See Operating Range): C – Commercial (0°C to +70°C); M – Military (–55°C to +125°C)
- D — Package: D– 20-pin CERDIP; F– 20-pin flatpak; L– 20-pin leadless chip carrier; P– 20-pin plastic DIP; X– Dice
- Am25LS2538 — Device type: 1-of-8 Decoder

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

Valid Combinations

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

PIN DESCRIPTION

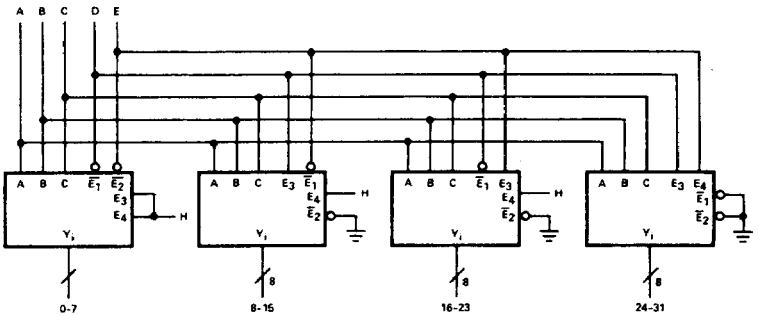
Pin No.	Name	I/O	Description
6, 7, 17	A, B, C	I	The three select inputs to the decoder/demultiplexer.
16, 15	$\overline{E}_1$, $\overline{E}_2$	I	The active LOW enable inputs. A HIGH on either the $\overline{E}_1$ or $\overline{E}_2$ input forces all decoded functions to be disabled.
14, 13	E_3, E_4	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	$\overline{OE}_1$, $\overline{OE}_2$	I	Output Enable. When both the $\overline{OE}_1$ and $\overline{OE}_2$ inputs are LOW, the Y outputs are enabled. If either $\overline{OE}_1$ or $\overline{OE}_2$ 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							
	$\overline{OE}_1$	$\overline{OE}_2$	$\overline{E}_1$	$\overline{E}_2$	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	H	L	L	L	L	L	L
	L	L	L	L	H	H	L	L	H	L	L	L	H	L	L	L	L	L
	L	L	L	L	H	H	L	L	H	H	L	L	L	H	L	L	L	L
	L	L	L	L	H	H	L	H	L	L	L	L	L	L	H	L	L	L
	L	L	L	L	H	H	L	H	L	H	L	L	L	L	L	H	L	L
	L	L	L	L	H	H	L	H	H	L	L	L	L	L	L	L	H	L
	L	L	L	L	H	H	L	H	H	H	L	L	L	L	L	L	L	H
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	H	H	L	H	H	H	H	H	H
	L	L	L	L	H	H	H	L	H	L	H	H	L	H	H	H	H	H
	L	L	L	L	H	H	H	L	H	H	H	H	H	L	H	H	H	H
	L	L	L	L	H	H	H	H	L	L	H	H	H	H	L	H	H	H
	L	L	L	L	H	H	H	H	L	H	H	H	H	H	H	L	H	H
	L	L	L	L	H	H	H	H	H	L	H	H	H	H	H	H	L	H
	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	L

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

APPLICATIONS



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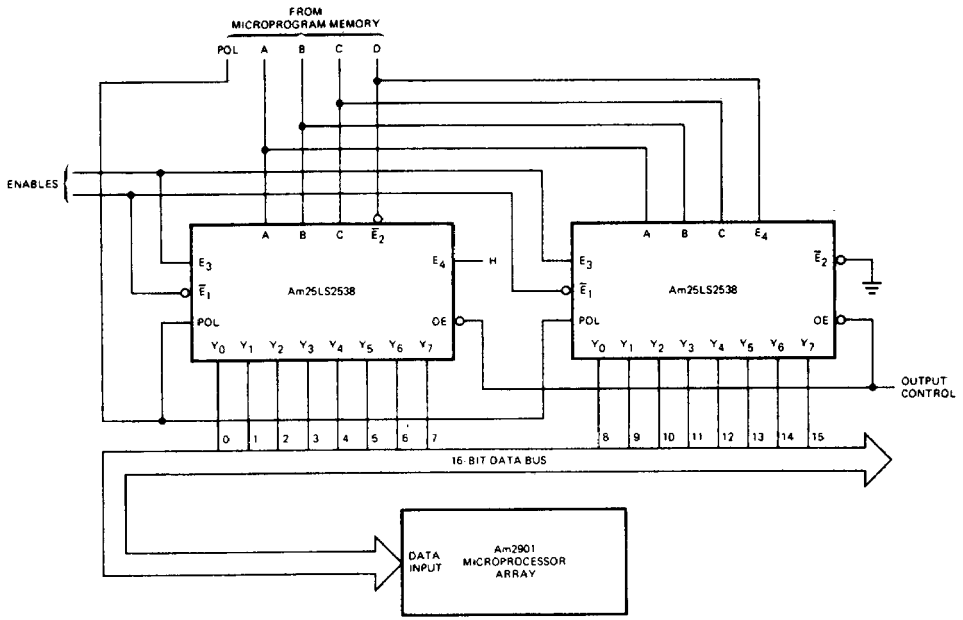
One-of-thirty-two decoder without additional decoding devices.
Can be used for I/O decoding in an Am9080A system.



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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	1	0	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	1	0	1	1	1	1	1	Bit Mask

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 = $\overline{E}_1$ = $\overline{E}_2$ = GND: E3 = E_4 = POL = $\overline{OE}_1$ = $\overline{OE}_2$ = 4.5V.
5. V_{OL} is specified with total device I_{OL} = 60mA (max).

SWITCHING CHARACTERISTICS (T_A = +25°C, V_{CC} = 5.0V)

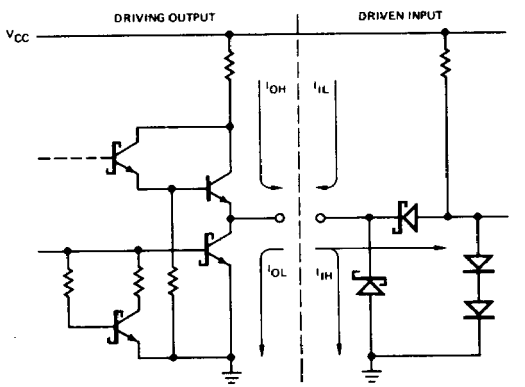
Parameters	Description	Test Conditions	Min	Typ	Max	Units
t_{PLH}	A, B, C to Y_i	C_L = 15pF, R_L = 2.0kΩ		20	30	ns
t_{PHL}				15	22	
t_{PLH}	$\overline{E}_1$, $\overline{E}_2$ to Y_i			19	28	ns
t_{PHL}				20	30	
t_{PLH}	E_3, E_4 to Y_i			21	31	ns
t_{PHL}				23	34	
t_{PLH}	POL to Y_i			16	24	ns
t_{PHL}				20	30	
t_{ZH}	$\overline{OE}_1$, $\overline{OE}_2$ to Y_i			17	25	ns
t_{ZL}				14	21	
t_{HZ}	$\overline{OE}_1$, $\overline{OE}_2$ to Y_i	C_L = 5.0pF, R_L = 2.0kΩ		17	25	ns
t_{LZ}				20	30	

SWITCHING CHARACTERISTICS over operating range unless otherwise specified*

Parameters	Description	Test Conditions	COMMERCIAL Am25LS2538 Min	COMMERCIAL Am25LS2538 Max	MILITARY Am25LS2538 Min	MILITARY Am25LS2538 Max	Units
t_{PLH}	A, B, C to Y_i	C_L = 50pF, R_L = 2.0kΩ		36		42	ns
t_{PHL}				29		37	
t_{PLH}	$\overline{E}_1$, $\overline{E}_2$ 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}	$\overline{OE}_1$, $\overline{OE}_2$ to Y_i			38		45	ns
t_{ZL}				23		25	
t_{HZ}	$\overline{OE}_1$, $\overline{OE}_2$ 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



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Note: Actual current flow direction shown.