DESCRIPTION

The AL238 is a 3-8 Line decoder /demultiplexer, is designed for 2V to 5.5V V_{CC} operation.

The AL238 features three enable inputs (E3, $\overline{E}2$ and $\overline{E}1$), three binary weighted address inputs (A0, A1 and A2) and eight outputs (Y0 to Y7). Among all enable inputs, one is active high output enable (E3) and two are active low output enables ($\overline{E}2$ and $\overline{E}1$). When the outputs are gated by any of the strobe inputs, they are all forced into the low state. When the outputs are not disabled by the strobe inputs, only the selected output is high while all others are low.

AL238 operates over an ambient temperature range of -40°C to +125°C.

The AL238 is available in SOP16, TSSOP16 packages.

FEATURES

- Wide Supply Voltage from 2.0V to 5.5V
- Low Power Consumption: 16μA (Max).
- I/O Port or Memory Selector
- Three Enable Inputs to Simplify Cascading
- Balanced Propagation Delay and Transition Times
- Operating Temperature Range: -40°C ~ +125°C
- Input Accept Voltage to 5.5V

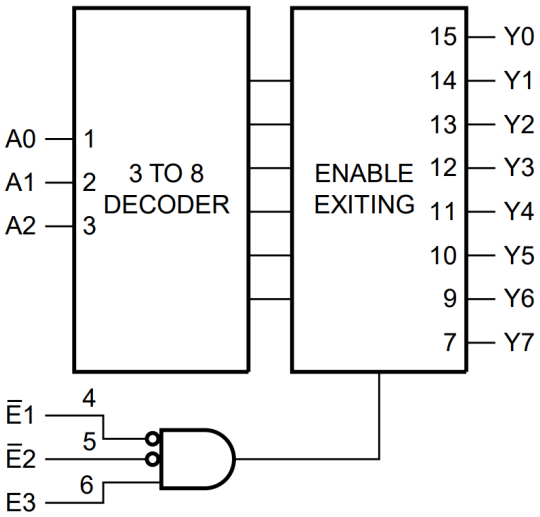
APPLICATION

- LED Displays
- Servers
- White Goods
- Power Infrastructure
- Factory Automation\

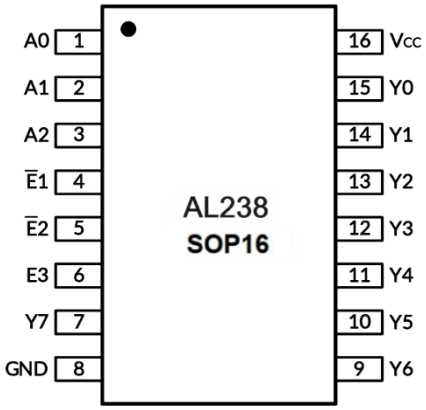
ORDERING INFORMATION

Package Type	Part Number	
SOP16 SPQ: 4,000pcs/Reel	M16	AL238M16R
		AL238M16VR
TSSOP16 SPQ: 4,000pcs/Reel	TMX16	AL238TMX16R
		AL238TMX16VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

LOGIC SYMBOL

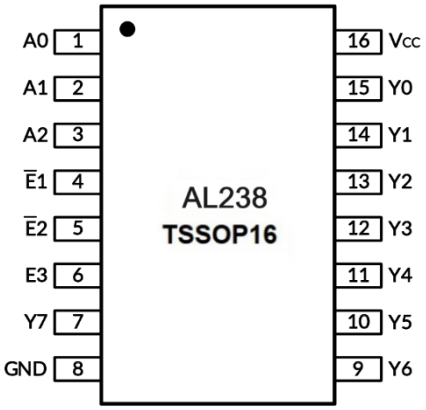


PIN DESCRIPTION



SOP16, M16

Top View



TSSOP16, TMX16

Top View

PIN#		Symbol	I/O Type*	Function
SOP16	TSSOP16			
1	1	AO	I	Address Input
2	2	A1	I	Address Input
3	3	A2	I	Address Input
4	4	$\overline{E}1$	I	Enable Input (Active LOW)
5	5	$\overline{E}2$	I	Enable Input (Active LOW)
6	6	E3	I	Enable Input (Active HIGH)
7	7	Y7	O	Output
8	8	GND	-	Ground
9	9	Y6	O	Output
10	10	Y5	O	Output
11	11	Y4	O	Output
12	12	Y3	O	Output
13	13	Y2	O	Output
14	14	Y1	O	Output
15	15	Y0	O	Output
16	16	V_{CC}	-	Power Supply

*I=Input, O=Output

FUNCTION TABLE

Enable Inputs			Address Inputs			Outputs							
E3	$\bar{E}2$	$\bar{E}1$	A2	A1	A0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	X	X	X	L	L	L	L	L	L	L	L
L	X	X	X	X	X	L	L	L	L	L	L	L	L
X	H	X	X	X	X	L	L	L	L	L	L	L	L
H	L	L	L	L	L	H	L	L	L	L	L	L	L
H	L	L	L	L	H	L	H	L	L	L	L	L	L
H	L	L	L	H	L	L	L	H	L	L	L	L	L
H	L	L	L	H	H	L	L	L	H	L	L	L	L
H	L	L	H	L	L	L	L	L	L	H	L	L	L
H	L	L	H	L	H	L	L	L	L	L	H	L	L
H	L	L	H	H	L	L	L	L	L	L	L	H	L
H	L	L	H	H	H	L	L	L	L	L	L	L	H

H: High Voltage Level
L: Low Voltage Level
X: Don't care

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted) (1) (2)

V_{CC}, Supply Voltage Range		-0.5V ~ + 7V
I_{IK}, Input Clamp Current	For V_O < 0.5V or V_O > V_{CC} +0.5V	±20mA
I_{OK}, Output Clamp Current	For V_O < 0.5V or V_O >V_{CC} +0.5V	±20mA
I_O, Output source or sink current per output pin	For V_O > 0.5V or V_O < V_{CC} +0.5V	±25mA
I_O, Continuous Current through V_{CC} or GND		±50mA
θ_{JA}, Package Thermal Impedance (3)	SOP16	150°C/W
	TSSOP16	45°C/W
T_J, Junction Temperature (4)		-65℃ ~ +150℃
T_{STG}, Storage Temperature		-65℃ ~ +150℃
$V_{(ESD)}$, Electrostatic Discharge	Human-Body Model (HBM)	±2000V
	Charged-Device Model (CDM)	±1000V
	Machine Model (MM)	±200V

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(2) The package thermal impedance is calculated in accordance with JESD-51.

(3) The maximum power dissipation is a function of TJ(MAX), $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$. All numbers apply for packages soldered directly onto a PCB.

RECOMMENDED OPERATING CONFITIONS

T_A=25°C, unless otherwise noted. (1)

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V_{CC}	-	2	-	5.5	V
Input Voltage	V_I	-	0	-	V_{CC}	V
Output Voltage	V_O	-	0	-	V_{CC}	V
Input Rise and Fall Time	t_t	V_{CC} = 2 V	-	-	1000	ns/V
		V_{CC} = 4.5V	-	-	500	
		V_{CC} =5.5V	-	-	400	
Operating Temperature	T_A	-	-40	-	125	°C

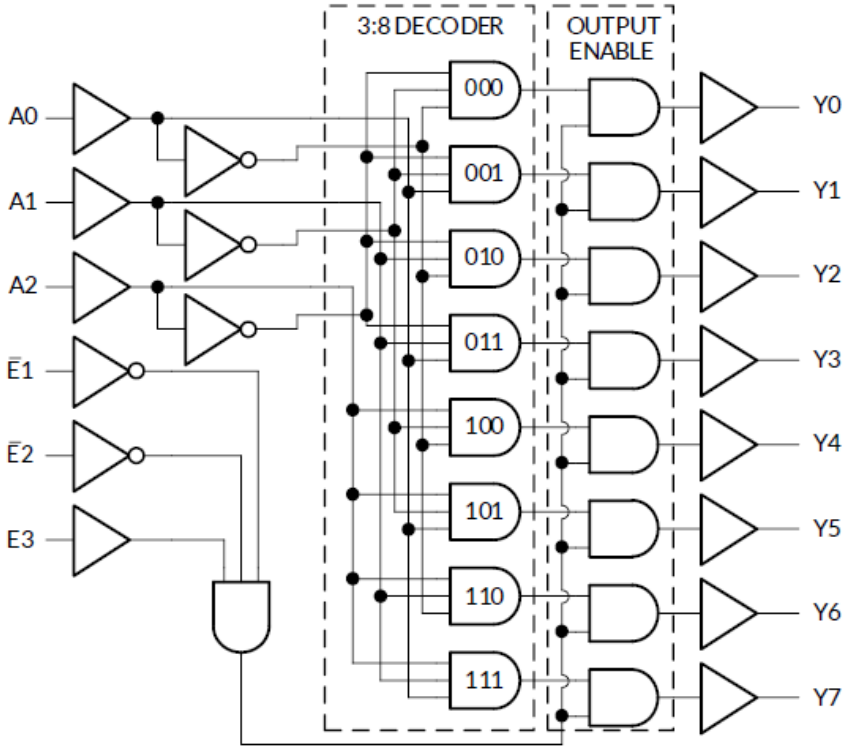
(1) All unused inputs of the device must be held at VCC or GND to ensure proper device operation.

ELECTRICAL CHARACTERISTICS

At recommended operating conditions: voltages are referenced to GND (ground=0V)
T_A=25°C, V_I = V_{IH} or V_{IL}, unless otherwise noted.

Symbol	Parameter	Test Condition	Vcc	25°C			-40°C~+85°C		-40°C~+125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V_{IH}	High-level input voltage		2	1.50	-	-	1.50	-	1.50	-	V
			4.5	3.15	-	-	3.15	-	3.15	-	
			5.5	3.85	-	-	3.85	-	3.85	-	
V_{IL}	Low-level input voltage		2	-	0.50	0.50	-	0.50	-	0.50	V
			4.5	-	1.35	1.35	-	1.35	-	1.35	
			5.5	-	1.65	1.65	-	1.65	-	1.65	
V_{OH}	High-level output voltage	I_{OH}= -20μA	2	1.90	-	-	1.90	-	1.90	-	V
		I_{OH}= -20μA	4.5	4.40	-	-	4.40	-	4.40	-	
		I_{OH}= -20μA	5.5	5.40	-	-	5.40	-	5.40	-	
		I_{OH}= -4mA	4.5	3.98	-	-	3.84	-	3.70	-	
		I_{OH}= -5.2mA	5.5	4.95	-	-	4.81	-	4.67	-	
V_{oL}	Low-level output voltage	I_{OL}= 20μA	2		0.10	0.10	-	0.10	±0.10	0.10	V
		I_{OL}= 20μA	4.5		0.10	0.10		0.10	-	0.10	
		I_{OL}= 20μA	5.5		0.10	0.10		0.10	-	0.10	
		I_{OL}= 4mA	4.5		0.26	0.26		0.33	-	0.40	
		I_{OL}= 5.2mA	5.5		0.26			0.33	-	0.40	
I_I	Input leakage current	V_I=V_{CC} or GND	5.5		±0.1			±1	-	±1	μA
I_{CC}	Supply current	V_I=V_{CC} or GND	5.5		1			8	-	16	μA
SWITCHING CHARACTERISTICS											
t_{pd}	Propagation delay	C_L=50pF	2	-	-	51	-	54	-	54	ns
			4.5	-	11	16	-	18	-	18	
			5.5	-	-	14	-	16	-	16	
	Strobe $\overline{E}1$, $\overline{E}2$, E3 to Output	C_L=50pF	2	-	-	46	-	49	-	49	ns
			4.5	-	-	14	-	15	-	15	
			5.5	-	-	12	-	13	-	13	
t_t	Transition time	C_L=50pF	2	-	-	39	-	41	-	41	ns
			4.5	-	-	14	-	16	-	16	
			5.5	-	-	12	-	13	-	13	
C_{PD}	Power dissipation capacitance	C_L=15pF	5	-	67	-	-	-	-	-	pF
C_i	Input capacitance		-	-	-	10	-	10	-	10	pF

BLOCK DIAGRAM



The AL238 is 3-to-8 decoders/demultiplexers. The three address input pins, A0, $\overline{A}1$, and $\overline{A}2$, select which output is active. The selected output is pulled LOW, while the remaining outputs are all HIGH. The conditions at the binary weighted inputs at the three enable inputs select one of eight output lines. The three enable input pins, E3, $\overline{E}2$ and $\overline{E}1$. One active high enable and two active low enable pins are available, and any enable pin can be deactivated to force all outputs high. All three enable pins must be active for the output to be enabled.

Power Supply Recommendations

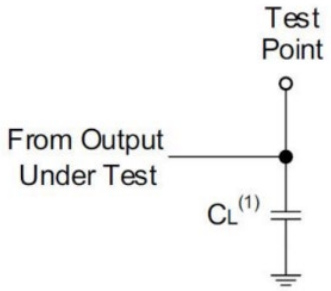
The power supply pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1uF capacitor is recommended and if there are multiple VCC terminals then 0.01uF or 0.022uF capacitors are recommended for each power terminal. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1μF and 1μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible.

PARAMETER MEASUREMENT INFORMATION

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, ZO = 50 Ω, tt < 6 ns.

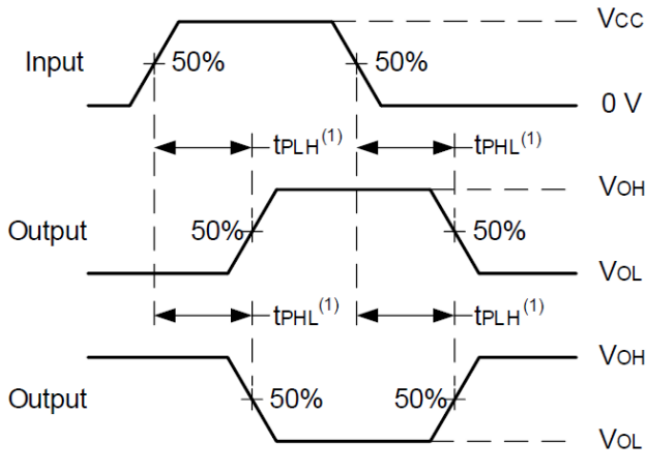
For clock inputs, fmax is measured when the input duty Cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



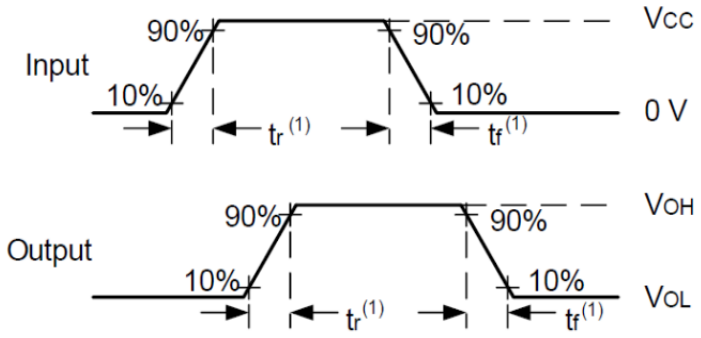
C_L includes probe and test-fixture capacitance

Fig 1. Load Circuit for Push-Pull Output



The greater between t_{PLH} and t_{PHL} is the same as t_{pd}.

Fig 2. Voltage Waveforms, Propagation Delays for Standard CMOS Inputs

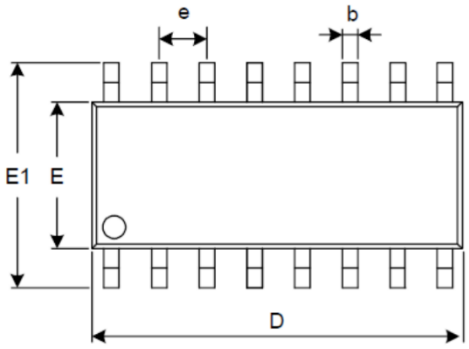


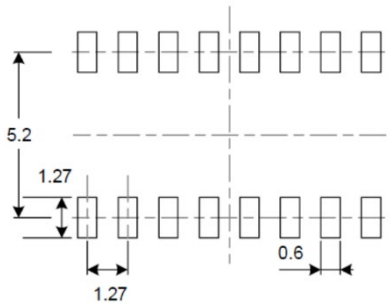
The greater between tr and t_f is the same as t_t.

Fig 3. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Inputs

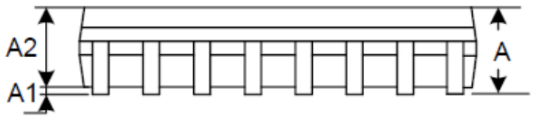
PACKAGE INFORMATION

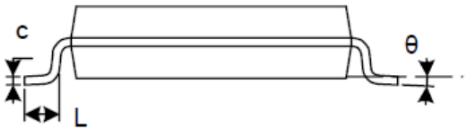
Dimension in SOP16 (Unit: mm)





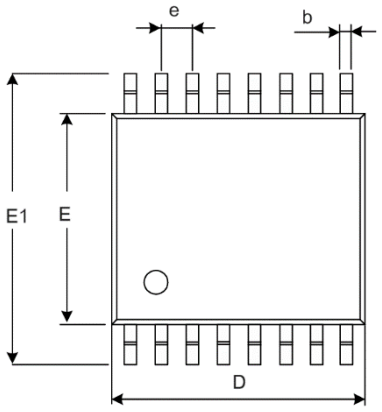
RECOMMENDED LAND PATTERN

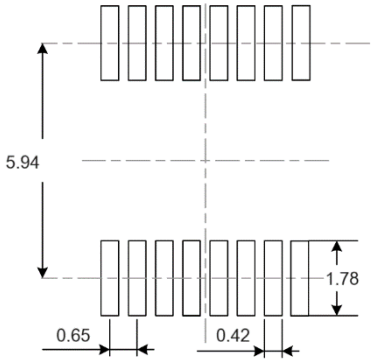




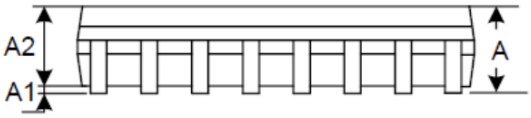
Symbol	Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	9.800	10.200
E	3.800	4.000
E1	5.800	6.200
e	1.270 BSC.	
L	0.400	1.270
θ	0°	8°

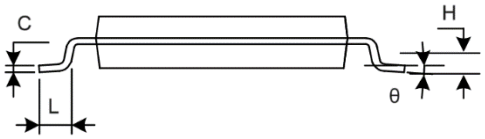
Dimension in TSSOP16 (Unit: mm)





RECOMMENDED LAND PATTERN





Symbol	Millimeters	
	Min	Max
A	-	1.200
A1	0.050	0.150
A2	0.800	1.050
b	0.190	0.300
c	0.090	0.200
D	4.860	5.100
E	4.300	4.500
E1	6.200	6.600
e	0.650 BSC.	
L	0.500	0.700
H	0.250 TYP.	
θ	1°	7°

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