



DM54147/DM74147, DM54148/DM74148 Priority Encoders

General Description

These TTL encoders feature priority decoding of the input data to ensure that only the highest-order data line is encoded. The DM54147 and DM74147 encode nine data lines to four-line (8-4-2-1) BCD. The implied decimal zero condition requires no input condition as zero is encoded when all nine data lines are at a high logic level. All inputs are buffered to represent one normalized Series 54/74 load. The DM54148 and DM74148 encode eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input E1 and enable output E0) has been provided to allow octal expansion without the need for external circuitry. For all types, data inputs and outputs are active at the low logic level.

Features

DM54147, DM74147

- Encodes 10-line decimal to 4-line BCD
- Applications include:
 - Keyboard encoding
 - Range selection

- Typical data delay 10 ns
 - Typical power dissipation 225 mW
- DM54148, DM74148**
- Encodes 8 data lines to 3-line binary (octal)
 - Applications include:
 - N-bit encoding
 - Code converters and generators
 - Typical data delay 10 ns
 - Typical power dissipation 190 mW

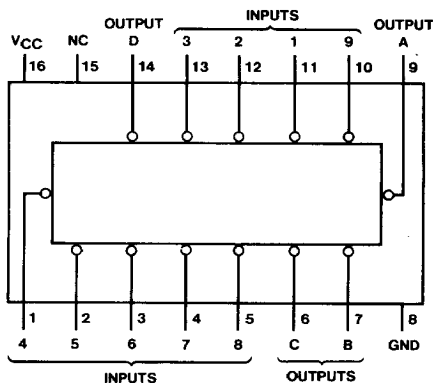
Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Storage Temperature Range	- 65°C to 150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device can not be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Connection Diagrams

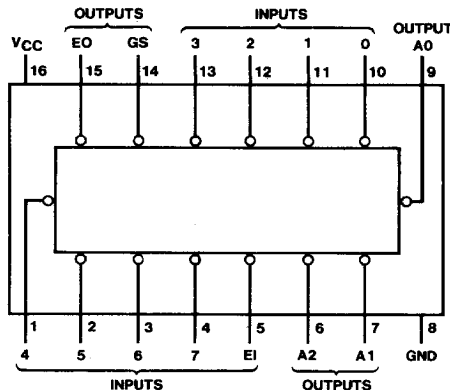
Dual-In-Line Package



54147 (J) 74147 (J,N)

TL/F/6545-1

Dual-In-Line Package



54148 (J) 74148 (J,N)

TL/F/6545-2

Recommended Operating Conditions

Sym	Parameter	DM54147			DM74147			Units
		Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High Level Input Voltage	2			2			V
V _{IL}	Low Level Input Voltage			0.8			0.8	V
I _{OH}	High Level Output Current			− 0.8			− 0.8	mA
I _{OL}	Low Level Output Current			16			16	mA
T _A	Free Air Operating Temperature	− 55		125	0		70	°C

Electrical Characteristics

over recommended operating free air temperature (unless otherwise noted)

Sym	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = − 12 mA			− 1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	2.4			V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min, V _{IL} = Max			0.4	V
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 5.5V			1	mA
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.4V			40	μA
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V			− 1.6	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54	− 35	− 85	mA
			DM74	− 35	− 85	
I _{CC1}	Supply Current	V _{CC} = Max (Note 3)		50	70	mA
I _{CC2}	Supply Current	V _{CC} = Max (Note 4)		42	62	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC1} is measured with input 7 grounded, other inputs and outputs open.

Note 4: I_{CC2} is measured with all inputs and all outputs open.

'147 Switching Characteristicsat $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Parameter	From (Input) To (Output)	Waveform	$R_L = 400\Omega$ $C_L = 15\text{ pF}$			Units
			Min	Typ	Max	
t_{PLH} Propagation Delay Time Low to High Level Output	0 thru 9 to Output	In-Phase Output		9	14	ns
t_{PHL} Propagation Delay Time High to Low Level Output	0 thru 9 to Output			7	11	ns
t_{PLH} Propagation Delay Time Low to High Level Output	0 thru 9 to Output	Out-of-Phase Output		13	19	ns
t_{PHL} Propagation Delay Time High to Low Level Output	0 thru 9 to A, B, C, D			12	19	ns

Recommended Operating Conditions

Sym	Parameter	DM54148			DM74148			Units
		Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High Level Input Voltage	2			2			V
V _{IL}	Low Level Input Voltage			0.8			0.8	V
I _{OH}	High Level Output Current			- 0.8			- 0.8	mA
I _{OL}	Low Level Output Current			16			16	mA
T _A	Free Air Operating Temperature	- 55		125	0		70	°C

'148 Electrical Characteristics

over recommended operating free air temperature (unless otherwise noted)

Sym	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = - 12 mA				- 1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min		2.4			V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min, V _{IL} = Max				0.4	V
I _I	Input Current@Max Input Voltage	V _{CC} = Max, V _I = 5.5V				1	mA
I _{IH}	High Level Input Current	V _{CC} = Max V _I = 2.4V	0 Input			40	μA
			Others			80	
I _{IL}	Low Level Input Current	V _{CC} = Max V _I = 0.4V	0 Input			- 1.6	mA
			Others			- 3.2	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54	- 35		- 85	mA
			DM74	- 35		- 85	
I _{CC1}	Supply Current	V _{CC} = Max (Note 3)			40	60	mA
I _{CC2}	Supply Current	V _{CC} = Max (Note 4)			35	55	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC1} is measured with inputs E1 and 7 grounded, other inputs and outputs open.

Note 4: I_{CC2} is measured with all inputs and all outputs open.

'148 Switching Characteristicsat $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Parameter	From (Input) To (Output)	Waveform	$R_L = 400\Omega$ $C_L = 15\text{ pF}$			Units
			Min	Typ	Max	
t_{PLH} Propagation Delay Time Low to High Level Output	0 thru 9 to A0, 1, 2	In-Phase Output		10	15	ns
t_{PHL} Propagation Delay Time High to Low Level Output	0 thru 9 to A0, 1, 2			9	14	ns
t_{PLH} Propagation Delay Time Low to High Level Output	0 thru 9 to A0, 1, 2	Out-of-Phase Output		13	19	ns
t_{PHL} Propagation Delay Time High to Low Level Output	0 thru 9 to A0, 1, 2			12	19	ns
t_{PLH} Propagation Delay Time Low to High Level Output	0 thru 7 to E0	Out-of-Phase Output		6	10	ns
t_{PHL} Propagation Delay Time High to Low Level Output	0 thru 7 to E0			14	25	ns
t_{PLH} Propagation Delay Time Low to High Level Output	0 thru 7 to GS	In-Phase Output		18	30	ns
t_{PHL} Propagation Delay Time High to Low Level Output	0 thru 7 to GS			14	25	ns
t_{PLH} Propagation Delay Time Low to High Level Output	E1 to A0, 1, 2	In-Phase Output		10	15	ns
t_{PHL} Propagation Delay Time High to Low Level Output	E1 to A0, 1, 2			10	15	ns
t_{PLH} Propagation Delay Time Low to High Level Output	E1 to GS	In-Phase Output		8	12	ns
t_{PHL} Propagation Delay Time High to Low Level Output	E1 to GS			10	15	ns
t_{PLH} Propagation Delay Time Low to High Level Output	E1 to E0	In-Phase Output		10	15	ns
t_{PHL} Propagation Delay Time High to Low Level Output	E1 to E0			17	30	ns

Function Tables

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Inputs									Outputs			
1	2	3	4	5	6	7	8	9	D	C	B	A
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	X	L	H	H	H	H	L	L	H
X	X	X	X	L	H	H	H	H	H	L	H	L
X	X	X	L	H	H	H	H	H	H	L	H	H
X	X	L	H	H	H	H	H	H	H	H	L	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

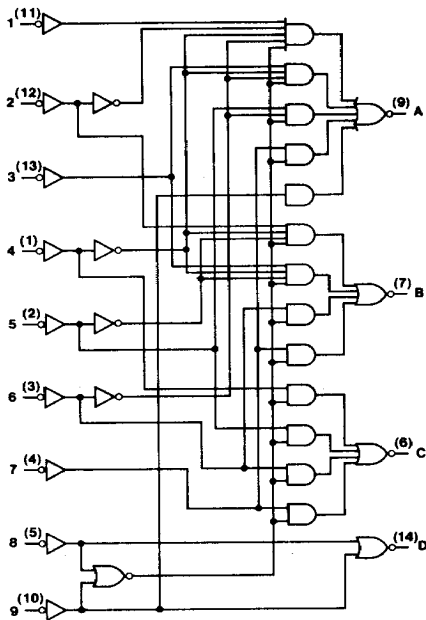
54148/74148

Inputs									Outputs				
E1	0	1	2	3	4	5	6	7	A2	A1	A0	GS	E0
H	X	X	X	X	X	X	X	X	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	X	L	H	L	L	H	L	H
L	X	X	X	X	X	L	H	H	L	H	L	L	H
L	X	X	X	X	L	H	H	H	L	H	H	L	H
L	X	X	X	L	H	H	H	H	H	L	L	L	H
L	X	X	L	H	H	H	H	H	H	L	H	L	H
L	X	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

H = High Logic Level, L = Low Logic Level, X = Don't care

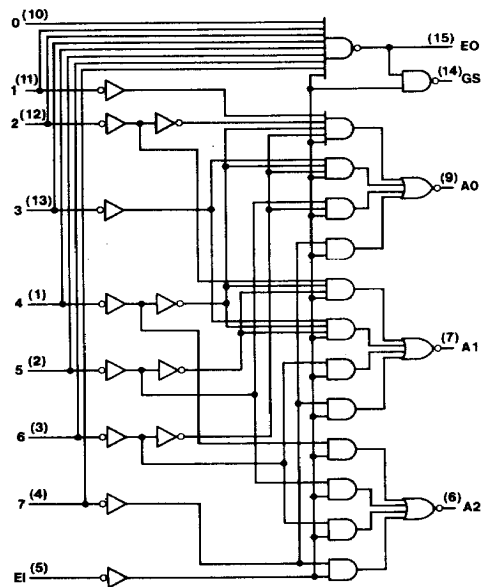
Logic Diagrams

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TL/F/6545-3

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TL/F/6545-4