

TC74LCX138F, TC74LCX138FN, TC74LCX138FT

LOW VOLTAGE 3-TO-8 LINE DECODER WITH 5V TOLERANT INPUTS AND OUTPUTS

The TC74LCX138 is a high performance CMOS 3-to-8 DECODER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The device is designed for low-voltage (3.3V) V_{CC} applications, but it could be used to interface to 5V supply environment for inputs.

When the device is enabled, 3 Binary Select inputs (A, B and C) determine which one of the outputs ($\bar{Y}0$ - $\bar{Y}7$) will go low.

When enable input G1 is held low or either $\bar{G}2A$ or $\bar{G}2B$ is held high, decoding function is inhibited and all outputs go high.

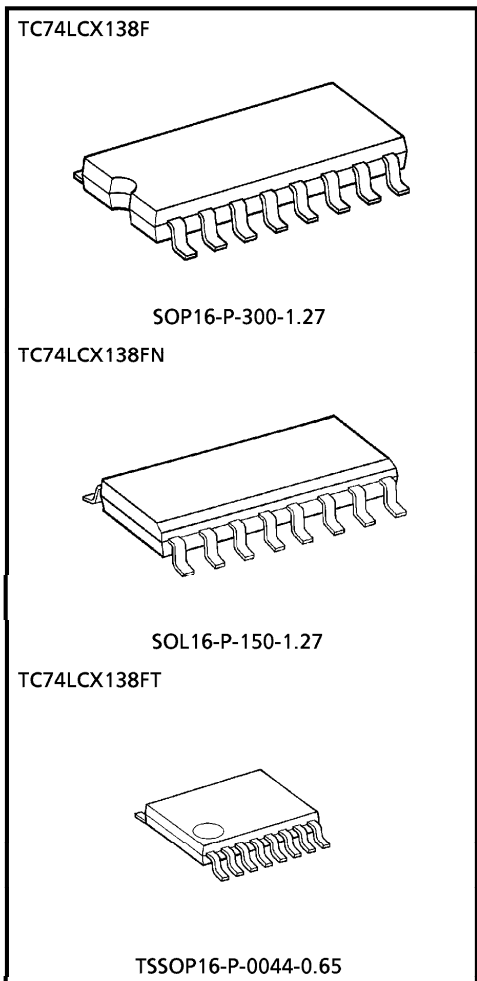
G1, $\bar{G}2A$, and $\bar{G}2B$ inputs are provided to ease cascade connection and for use as an address decoder for memory systems.

All inputs are equipped with protection circuits against static discharge.

FEATURES

- Low voltage operation : $V_{CC} = 2.0 \sim 3.6V$
- High speed operation : $t_{pd} = 6.0ns$ (Max.)
($V_{CC} = 3.0 \sim 3.6V$)
- Output current : $|I_{OH}| / I_{OL} = 24mA$ (Min.)
($V_{CC} = 3.0V$)
- Latch-up performance : $\pm 500mA$
- Available in JEDEC SOP, EIAJ SOP and TSSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 138 type.

(Note) The JEDEC SOP (FN) is not available in Japan.



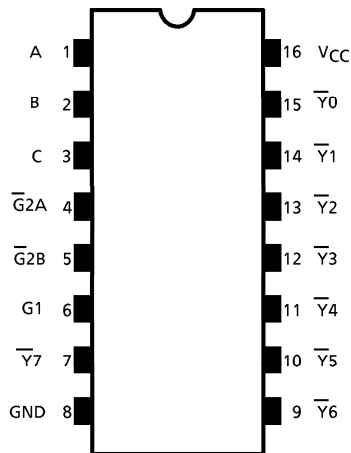
Weight

SOP16-P-300-1.27	: 0.18g (Typ.)
SOL16-P-150-1.27	: 0.12g (Typ.)
TSSOP16-P-0044-0.65	: 0.06g (Typ.)

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PIN ASSIGNMENT



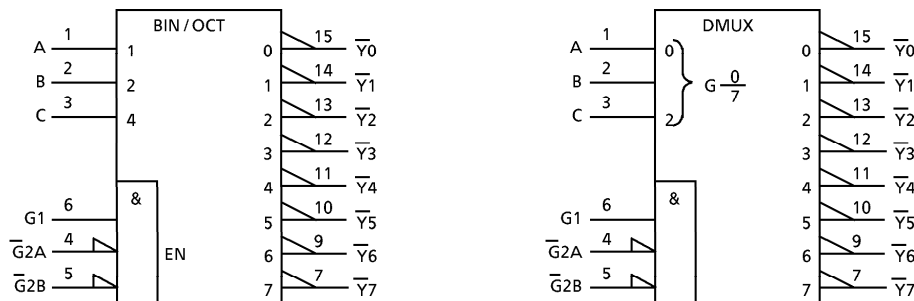
(TOP VIEW)

TRUTH TABLE

INPUTS						OUTPUTS								SELECTED OUTPUT
ENABLE			SELECT			$\bar{Y}0$	$\bar{Y}1$	$\bar{Y}2$	$\bar{Y}3$	$\bar{Y}4$	$\bar{Y}5$	$\bar{Y}6$	$\bar{Y}7$	
G1	$\bar{G}2A$	$\bar{G}2B$	C	B	A									
L	X	X	X	X	X	H	H	H	H	H	H	H	H	NONE
X	H	X	X	X	X	H	H	H	H	H	H	H	H	NONE
X	X	H	X	X	X	H	H	H	H	H	H	H	H	NONE
H	L	L	L	L	L	L	H	H	H	H	H	H	H	$\bar{Y}0$
H	L	L	L	L	H	H	L	H	H	H	H	H	H	$\bar{Y}1$
H	L	L	L	H	L	H	H	L	H	H	H	H	H	$\bar{Y}2$
H	L	L	L	H	H	H	H	H	L	H	H	H	H	$\bar{Y}3$
H	L	L	H	L	L	H	H	H	H	L	H	H	H	$\bar{Y}4$
H	L	L	H	L	H	H	H	H	H	H	L	H	H	$\bar{Y}5$
H	L	L	H	H	L	H	H	H	H	H	H	L	H	$\bar{Y}6$
H	L	L	H	H	H	H	H	H	H	H	H	H	L	$\bar{Y}7$

X : Don't Care

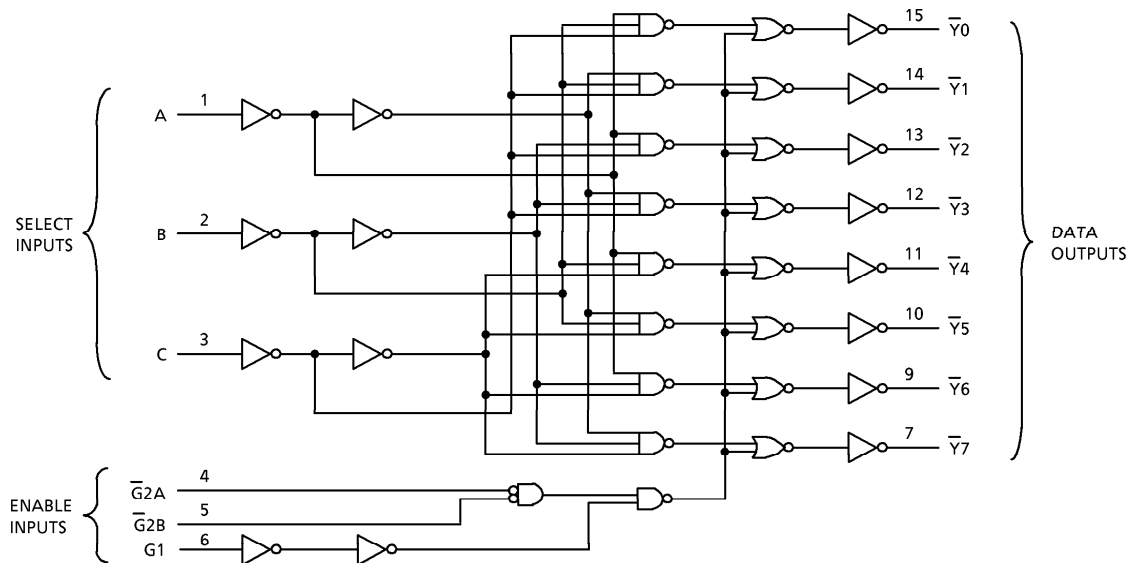
IEC LOGIC SYMBOL



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SYSTEM DIAGRAM



MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	-0.5~7.0	V
DC Input Voltage	V_{IN}	-0.5~7.0	V
DC Output Voltage	V_{OUT}	-0.5~7.0 (Note 1)	V
		-0.5~ $V_{CC} + 0.5$ (Note 2)	
Input Diode Current	I_{IK}	-50	mA
Output Diode Current	I_{OK}	±50 (Note 3)	mA
DC Output Current	I_{OUT}	±50	mA
Power Dissipation	P_D	180	mW
DC V_{CC} /Ground Current	I_{CC}/I_{GND}	±100	mA
Storage Temperature	T_{stg}	-65~150	°C

(Note 1) $V_{CC} = 0V$

(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.

(Note 3) $V_{OUT} < GND, V_{OUT} > V_{CC}$

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	2.0~3.6	V
		1.5~3.6 (Note 4)	
Input Voltage	V _{IN}	0~5.5	V
Output Voltage	V _{OUT}	0~5.5 (Note 5)	V
		0~V _{CC} (Note 6)	
Output Current	I _{OH} / I _{OL}	± 24 (Note 7)	mA
		± 12 (Note 8)	
Operating Temperature	T _{opr}	- 40~85	°C
Input Rise And Fall Time	dt / dv	0~10 (Note 9)	ns / V

- (Note 4) Data Retention Only
- (Note 5) V_{CC} = 0V
- (Note 6) High or Low State
- (Note 7) V_{CC} = 3.0~3.6V
- (Note 8) V_{CC} = 2.7~3.0V
- (Note 9) V_{IN} = 0.8~2.0V, V_{CC} = 3.0V

ELECTRICAL CHARACTERISTICS

DC characteristics (Ta = - 40~85°C)

PARAMETER		SYMBOL	TEST CONDITION	V _{CC} (V)	MIN.	MAX.	UNIT	
Input Voltage	"H" Level	V _{IH}		2.7~3.6	2.0	—	V	
	"L" Level	V _{IL}		2.7~3.6	—	0.8		
Output Voltage	"H" Level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = - 100μA	2.7~3.6	V _{CC} - 0.2	—	V
				I _{OH} = - 12mA	2.7	2.2	—	
				I _{OH} = - 18mA	3.0	2.4	—	
				I _{OH} = - 24mA	3.0	2.2	—	
	"L" Level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 100μA	2.7~3.6	—	0.2	
				I _{OL} = 12mA	2.7	—	0.4	
				I _{OL} = 16mA	3.0	—	0.4	
				I _{OL} = 24mA	3.0	—	0.55	
Input Leakage Current	I _{IN}	V _{IN} = 0~5.5V		2.7~3.6	—	± 5.0	μA	
Power Off Leakage Current	I _{OFF}	V _{IN} / V _{OUT} = 5.5V		0	—	10.0	μA	
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND		2.7~3.6	—	10.0	μA	
		V _{IN} / V _{OUT} = 3.6~5.5V		2.7~3.6	—	± 10.0		
Increase In I _{CC} Per Input	ΔI _{CC}	V _{IH} = V _{CC} - 0.6V		2.7~3.6	—	500	μA	

AC characteristics (Ta = -40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	MIN.	MAX.	UNIT
Propagation Delay Time (A, B, C- \bar{Y})	t _{pLH}	(Fig.1, 2)	2.7	—	7.0	ns
	t _{pHL}		3.3 ± 0.3	1.5	6.0	
Propagation Delay Time (G1- \bar{Y})	t _{pLH}	(Fig.1, 2)	2.7	—	8.0	ns
	t _{pHL}		3.3 ± 0.3	1.5	7.0	
Propagation Delay Time ($\bar{G}2$ - \bar{Y})	t _{pLH}	(Fig.1, 2)	2.7	—	7.0	ns
	t _{pHL}		3.3 ± 0.3	1.5	6.0	
Output To Output Skew	t _{osLH}	(Note 10)	2.7	—	—	ns
	t _{osHL}		3.3 ± 0.3	—	1.0	

(Note 10) Parameter guaranteed by design.
 (t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)

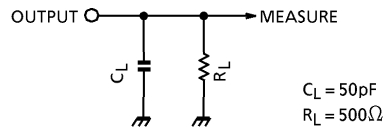
CAPACITIVE CHARACTERISTICS (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	TYP	UNIT
Input Capacitance	C _{IN}	—	3.3	7	pF
Output Capacitance	C _{OUT}		0	8	pF
Power Dissipation Capacitance	C _{PD}	f _{IN} = 10MHz (Note 11)	3.3	25	pF

(Note 11) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
 Average operating current can be obtained by the equation :
 $I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

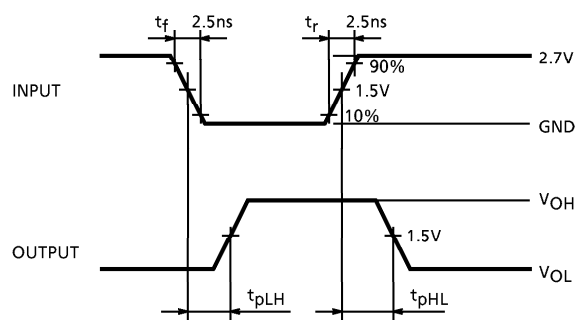
TEST CIRCUIT

Fig.1



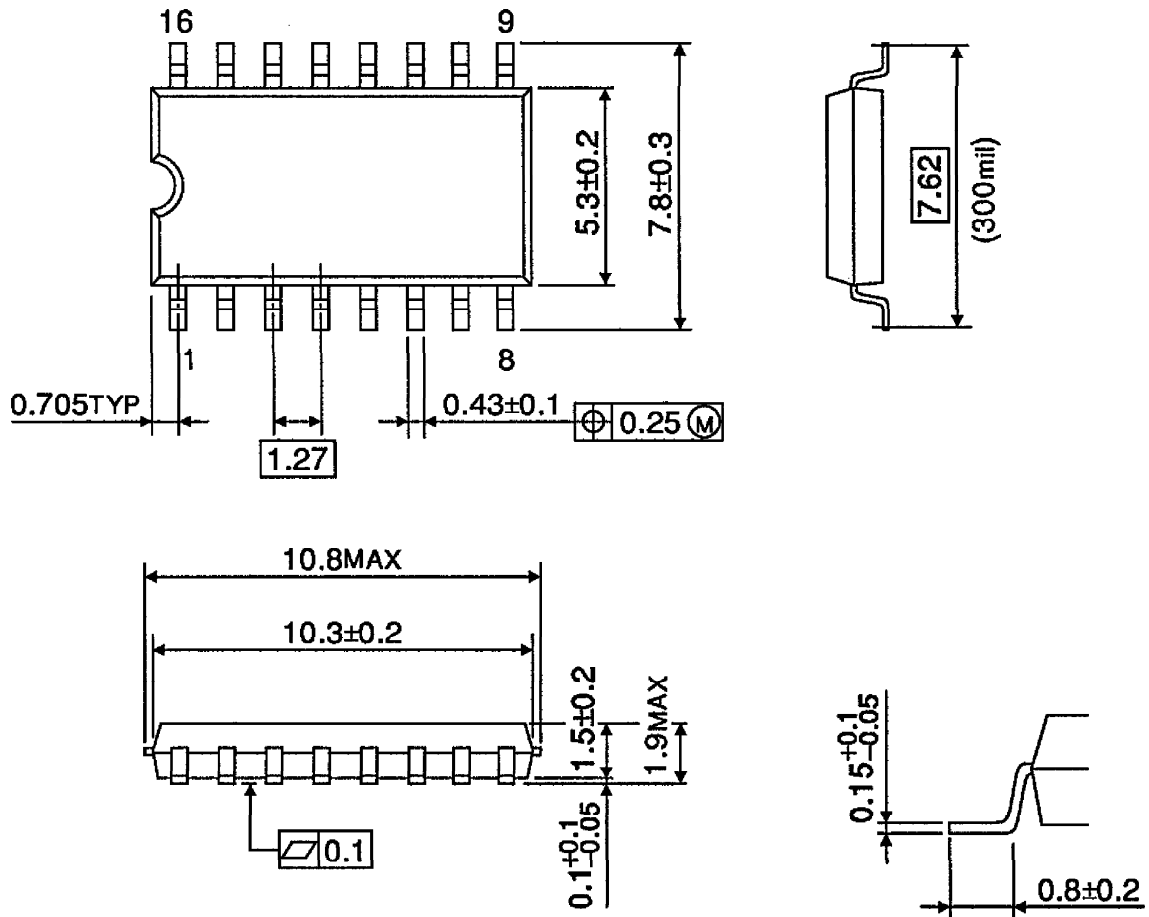
AC WAVEFORM

Fig.2 t_{pLH} , t_{pHL}



OUTLINE DRAWING
SOP16-P-300-1.27

Unit : mm

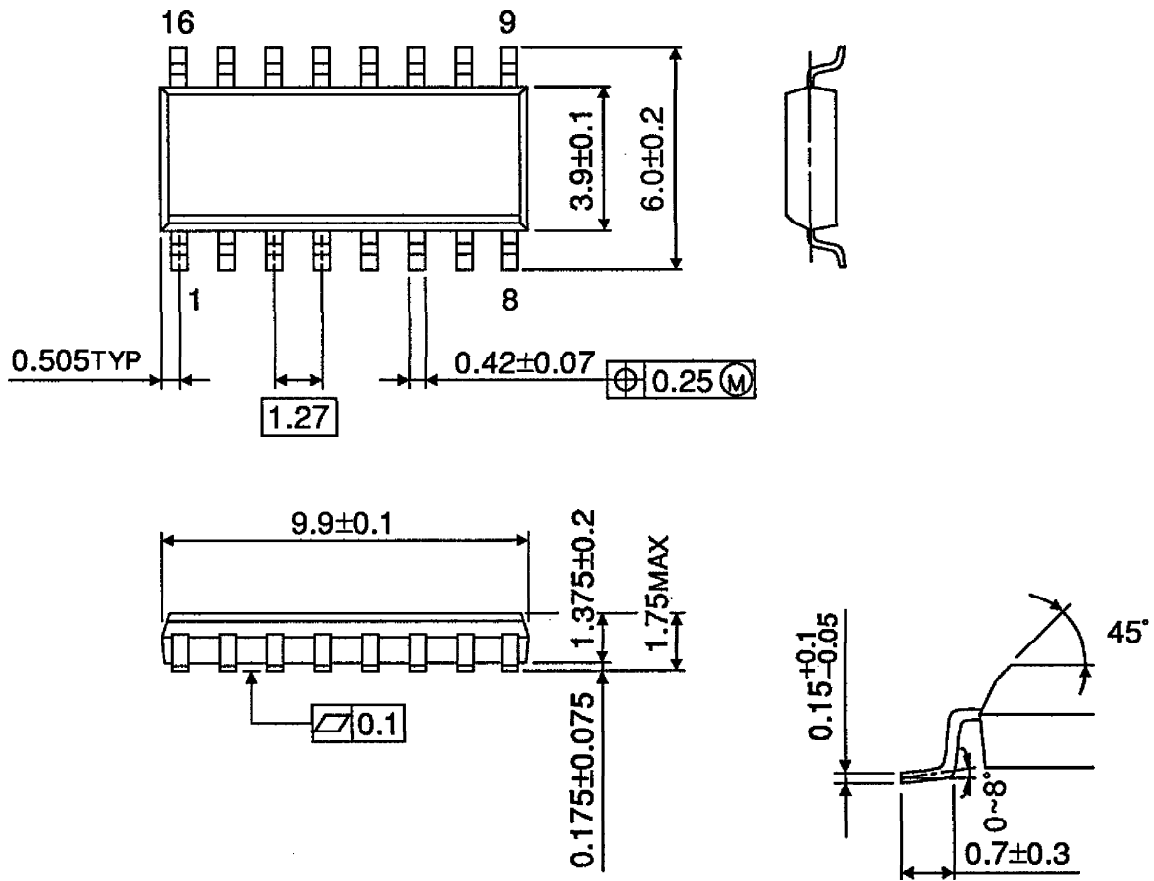


Weight : 0.18g (Typ.)

OUTLINE DRAWING
SOL16-P-150-1.27

Unit : mm

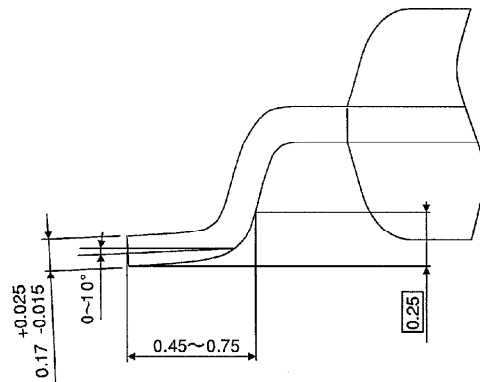
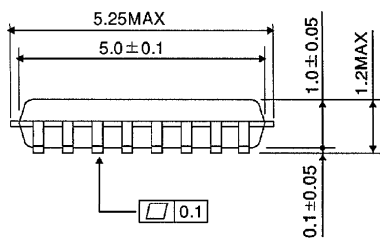
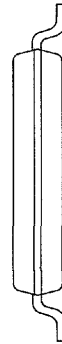
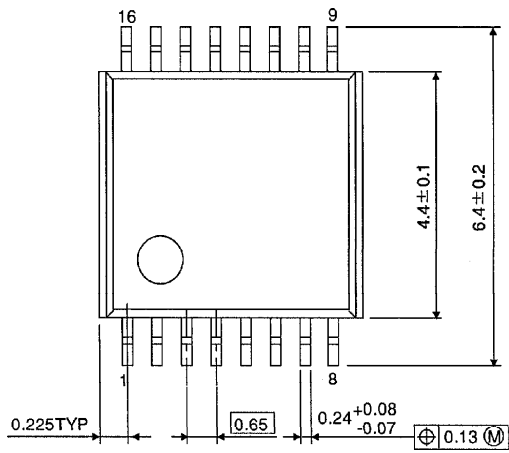
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

OUTLINE DRAWING
TSSOP16-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)