74ALVCH16245

LOW VOLTAGE CMOS 16-BIT TRANSCEIVER (3-STATE) WITH 3.6V TOLERANT INPUTS AND OUTPUTS

- 3.6V TOLERANT INPUTS AND OUTPUTS
- HIGH SPEED:
  t_{PD} = 3.0 ns (MAX.) at V_{CC} = 3.0 to 3.6V
  t_{PD} = 3.7 ns (MAX.) at V_{CC} = 2.3 to 2.7V
  t_{PD} = 6 ns (MAX.) at V_{CC} = 1.65V
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}|$ = I_{OL} = 24mA (MIN) at V_{CC} = 3.0V
  $|I_{OH}|$ = I_{OL} = 12mA (MIN) at V_{CC} = 2.3V
  $|I_{OH}|$ = I_{OL} = 4mA (MIN) at V_{CC} = 1.65V
- OPERATING VOLTAGE RANGE:
  V_{CC}(OPR) = 1.65V to 3.6V
- BUS HOLD PROVIDED ON DATA INPUTS
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 16245
- LATCH-UP PERFORMANCE EXCEEDS 300mA (JESD 17)
- ESD PERFORMANCE:
 HBM > 2000V (MIL STD 883 method 3015);
  MM > 200V

DESCRIPTION

The 74ALVCH16245 is a low voltage CMOS 16 BIT BUS TRANSCEIVER fabricated with sub-micron silicon gate and five-layer metal wiring C^2MOS technology. It is ideal for low power and very high speed 1.65 to 3.6V applications; it can be interfaced to 3.6V signal environment for both inputs and outputs.

This IC is intended for two-way asynchronous communication between data busses; the direction of data transmission is determined by DIR input. The enable input $\overline{G}$ can be used to disable the device so that the busses are effectively isolated.

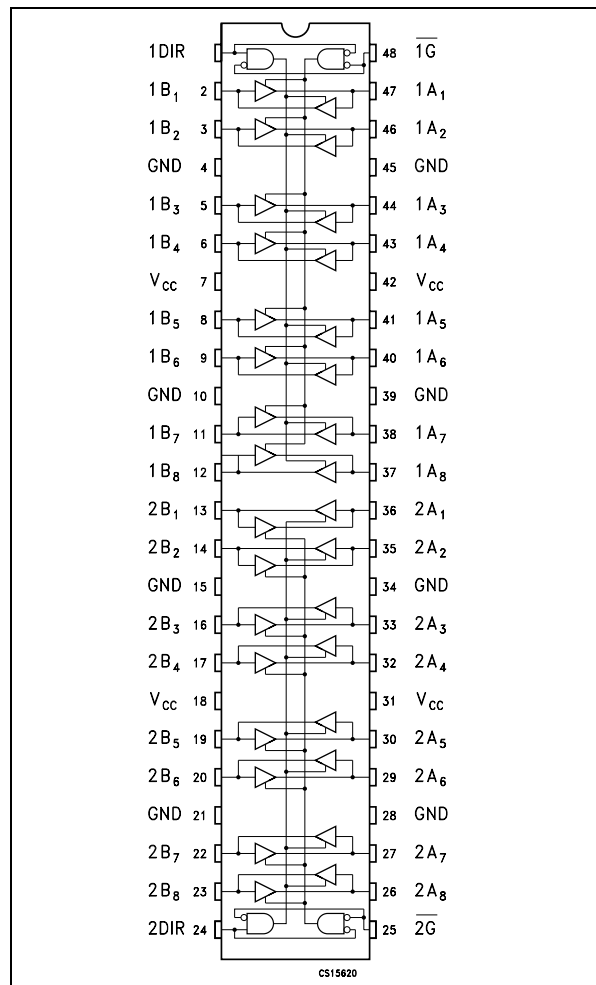Bus hold on data inputs is provided in order to eliminate the need for external pull-up or pull-down resistor.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.
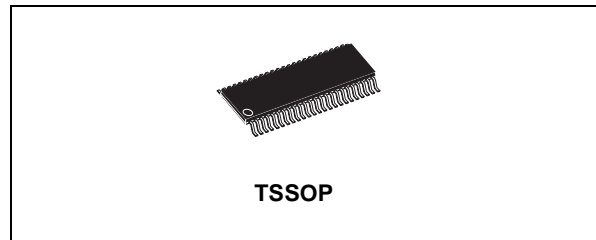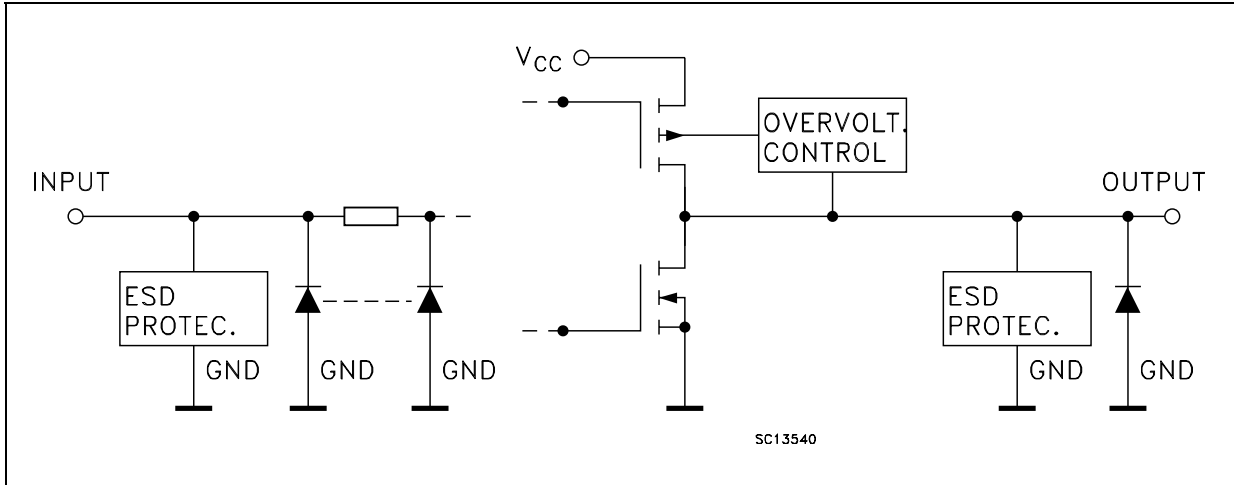

TSSOP

ORDER CODES

PACKAGE	TUBE	T & R
TSSOP		74ALVCH16245TTR

PIN CONNECTION

INPUT AND OUTPUT EQUIVALENT CIRCUIT

SC13540

PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	1DIR	Directional Control
2, 3, 5, 6, 8, 9, 11, 12	1B1 to 1B8	Data Inputs/Outputs
13, 14, 16, 17, 19, 20, 22, 23	2B1 to 2B8	Data Inputs/Outputs
24	2DIR	Directional Control
25	2$\overline{G}$	Output Enable Input
36, 35, 33, 32, 30, 29, 27, 26	2A1 to 2A8	Data Inputs/Outputs
47, 46, 44, 43, 41, 40, 38, 38	1A1 to 1A8	Data Inputs/Outputs
48	1$\overline{G}$	Output Enable Input
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive Supply Voltage

TRUTH TABLE

INPUTS		FUNCTION		OUTPUT
$\overline{G}$	DIR	A BUS	B BUS	Yn
L	L	OUTPUT	INPUT	A = B
L	H	INPUT	OUTPUT	B = A
H	X	Z	Z	Z

Z : High Impedance
X : Don't Care

IEC LOGIC SYMBOLS

LC13561
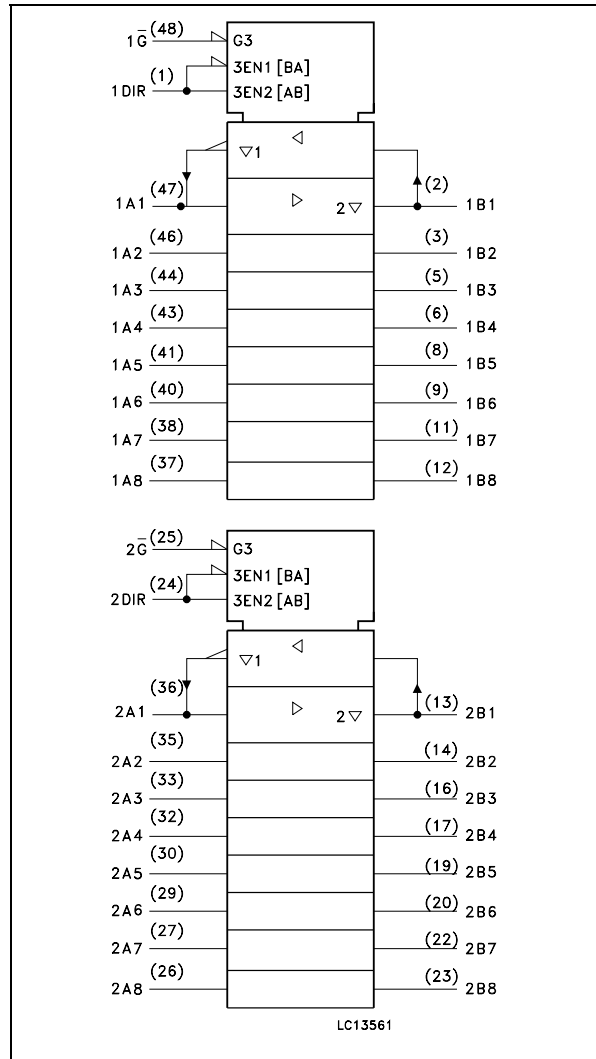
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +4.6	V
V_I	DC Input Voltage	-0.5 to +4.6	V
V_O	DC Output Voltage (OFF State)	-0.5 to +4.6	V
V_O	DC Output Voltage (High or Low State) (note 1)	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	- 50	mA
I_{OK}	DC Output Diode Current (note 2)	- 50	mA
I_O	DC Output Current	$\pm$ 50	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Supply Pin	$\pm$ 100	mA
P_D	Power Dissipation	400	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied
1) I_O absolute maximum rating must be observed
2) V_O < GND, V_O > V_{CC}

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	1.65 to 3.6	V
V_I	Input Voltage	-0.3 to 3.6	V
V_O	Output Voltage (OFF State)	0 to 3.6	V
V_O	Output Voltage (High or Low State)	0 to V_{CC}	V
I_{OH}, I_{OL}	High or Low Level Output Current (V_{CC} = 3.0 to 3.6V)	$\pm$ 24	mA
I_{OH}, I_{OL}	High or Low Level Output Current (V_{CC} = 2.3 to 2.7V)	$\pm$ 12	mA
I_{OH}, I_{OL}	High or Low Level Output Current (V_{CC} = 1.65V)	$\pm$ 4	mA
T_{op}	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time (note 1)	0 to 10	ns/V

1) V_{IN} from 0.8V to 2V at V_{CC} = 3.0V

DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value				Unit
		V_{CC} (V)		-40 to 85 °C		-55 to 125 °C		
				Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	1.65 to 1.95		0.65 Vcc		0.65 Vcc		V
		2.3 to 2.7		1.7		1.7		
		2.7 to 3.6		2.0		2.0		
V_{IL}	Low Level Input Voltage	1.65 to 1.95			0.35 Vcc		0.35 Vcc	
		2.3 to 2.7			0.7		0.7	
		2.7 to 3.6			0.8		0.8	
V_{OH}	High Level Output Voltage	1.65 to 3.6	I_O=-100 µA	V_{CC}-0.2		V_{CC}-0.2		V
		1.65	I_O=-4 mA	1.2		1.2		
		2.3	I_O=-6 mA	2.0		2.0		
		2.3	I_O=-12 mA	1.7		1.7		
		2.7	I_O=-12 mA	2.2		2.2		
		3.0	I_O=-12 mA	2.4		2.4		
		3.0	I_O=-24 mA	2.0		2.0		
V_{OL}	Low Level Output Voltage	1.65 to 3.6	I_O=100 µA		0.2		0.2	V
		1.65	I_O=4 mA		0.45		0.45	
		2.3	I_O=6 mA		0.4		0.4	
		2.3	I_O=12 mA		0.7		0.7	
		2.7	I_O=12 mA		0.4		0.4	
		3.0	I_O=24 mA		0.55		0.55	
I_I	Input Leakage Current	3.6	V_I = 0 or 3.6V		± 5		± 5	µA
I_{IHOLD}	Input Hold Current	1.65	V_I =0.58 V	+ 25		+ 25		µA
		1.65	V_I =1.07 V	- 25		- 25		
		2.3	V_I =0.7 V	+ 45		+ 45		
		2.3	V_I =1.7 V	- 45		- 45		
		3.0	V_I =0.8 V	+ 75		+ 75		
		3.0	V_I =2 V	- 75		- 75		
		3.6	V_I = 0 to 3.6V		± 500		± 500	
I_{off}	Power Off Leakage Current	0	V_I or V_O = 3.6V		10		20	µA
I_{OZ}	High Impedance Output Leakage Current	3.6	V_I = V_{IH} or V_{IL} V_O = 0 to V_{CC}		± 5		± 10	µA
I_{CC}	Quiescent Supply Current	3.6	V_I = V_{CC} or GND I_O= 0		20		40	µA
ΔI_{CC}	I_{CC} incr. per Input	3.0 to 3.6	V_{IH} = V_{CC} - 0.6V		500		750	µA

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition				Value				Unit
		V_{CC} (V)	C_L (pF)	R_L (Ω)	$t_s = t_r$ (ns)	-40 to 85 °C		-55 to 125 °C		
						Min.	Max.	Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time	1.65 to 1.95	30	1000	2.0	1	6	1	6	ns
		2.3 to 2.7	30	500	2.0	1	3.7	1	3.7	
		2.7	50	500	2.5	1	3.6	1	3.6	
		3.0 to 3.6	50	500	2.5	1	3.0	1	3.0	
t_{PZL} t_{PZH}	Output Enable Time	1.65 to 1.95	30	1000	2.0	1	7.1	1	7.1	
		2.3 to 2.7	30	500	2.0	1	5.7	1	5.7	
		2.7	50	500	2.5	1	5.4	1	5.4	
		3.0 to 3.6	50	500	2.5	1	4.4	1	4.4	
t_{PLZ} t_{PHZ}	Output Disable Time	1.65 to 1.95	30	1000	2.0	1	7.0	1	7.0	
		2.3 to 2.7	30	500	2.0	1	5.2	1	5.2	
		2.7	50	500	2.5	1	4.6	1	4.6	
		3.0 to 3.6	50	500	2.5	1	4.1	1	4.1	

1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW ($t_{OSLH} = | t_{PLHm} - t_{PLHn}|$, $t_{OSHL} = | t_{PHLm} - t_{PHLn}|$)
2) Parameter guaranteed by design

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value			Unit
		V_{CC} (V)		T_A = 25 °C			
				Min.	Typ.	Max.	
C_{IN}	Input Capacitance Control Inputs	3.3	$V_{IN} = V_{CC}$ or GND		4		pF
$C_{I/O}$	Input Capacitance A or B ports	3.3	$V_{IN} = V_{CC}$ or GND		8		pF
C_{PD}	Power Dissipation Capacitance Output enabled (note 1)	3.3	f_{IN} = 10MHz C_L=50pF V_{IN} = 0 or V_{CC}		29		pF
		2.5			22		
C_{PD}	Power Dissipation Capacitance Output disabled (note 1)	3.3			5		
		2.5			4		

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/16$ (per circuit)

TEST CIRCUIT
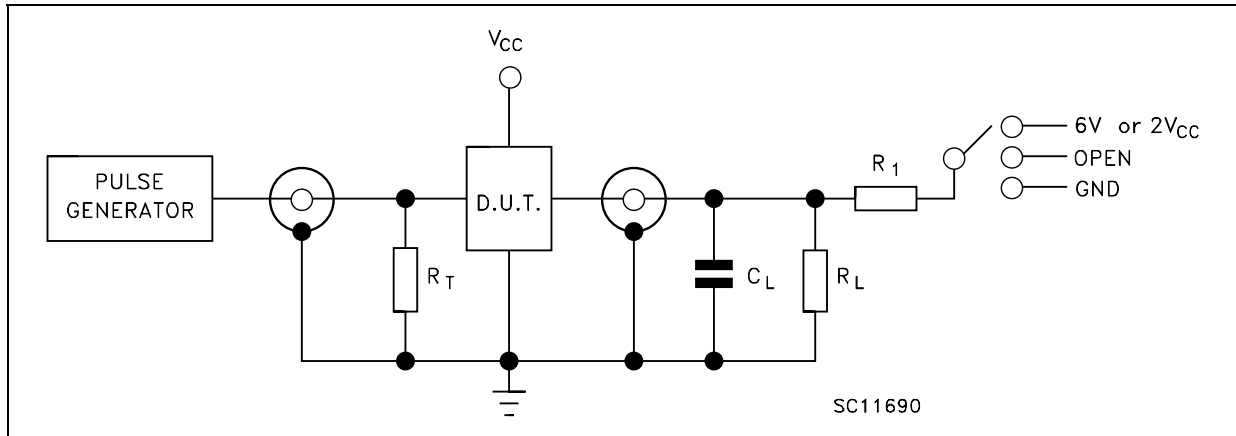
| TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ} (V_{CC} = 3.0 to 3.6V)	6V
t_{PZL}, t_{PLZ} (V_{CC} = 2.3 to 2.7V)	$2V_{CC}$
t_{PZH}, t_{PHZ}	GND

R_T = Z_{OUT} of pulse generator (typically 50Ω)

TEST CIRCUIT AND WAVEFORM SYMBOL VALUE

Symbol	V_{CC}			
	3.0 to 3.6V	**2.7V**	**2.3 to 2.7V**	**1.65 to 1.95V**
V_{IH}	2.7V	2.7V	V_{CC}	V_{CC}
V_M	1.5V	1.5V	$V_{CC}/2$	$V_{CC}/2$
V_X	V_{OL} +0.3V	V_{OL} +0.3V	V_{OL} +0.15V	V_{OL} +0.15V
V_Y	V_{OH} -0.3V	V_{OH} -0.3V	V_{OH} -0.15V	V_{OH} -0.15V
C_L	50pF	50pF	30pF	30pF
$R_L=R_1$	500Ω	500Ω	500Ω	1000Ω
$t_r = t_r$	<2.5ns	<2.5ns	<2.0ns	<2.0ns

WAVEFORM 1: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)

CS07550
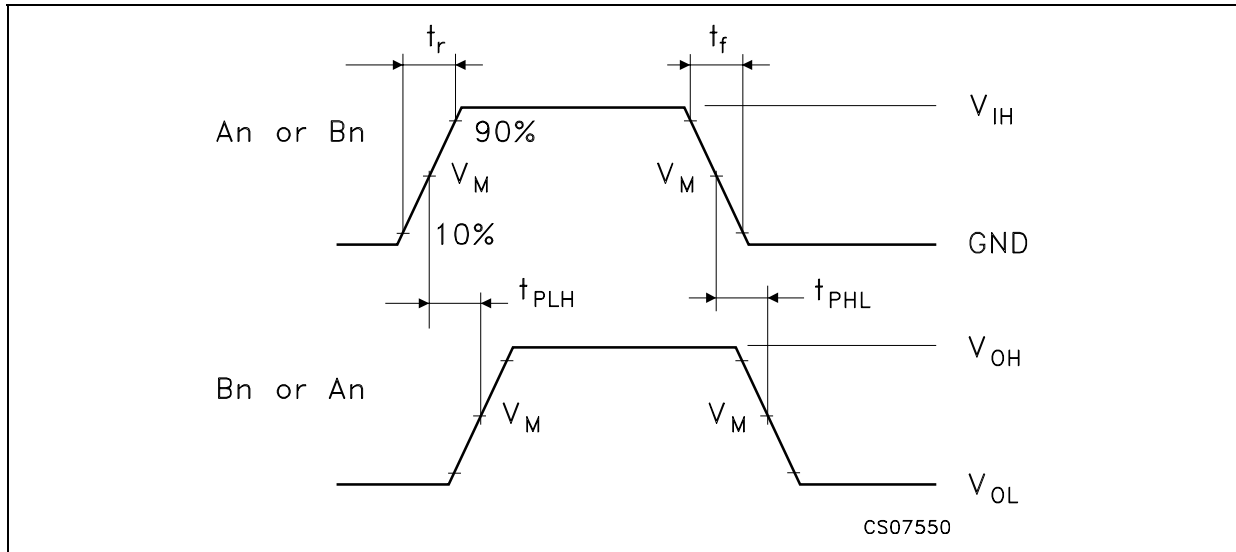
WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)
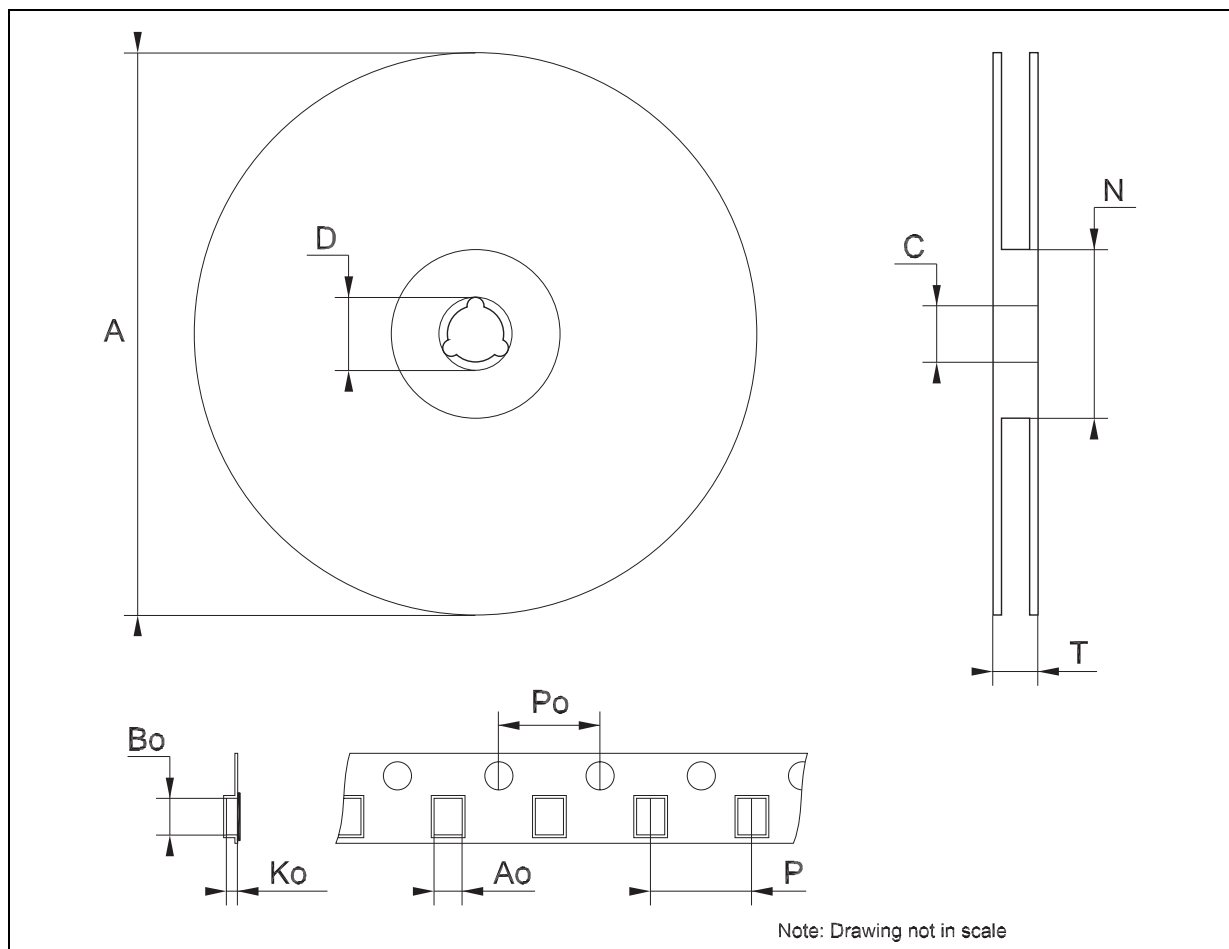

CS07560
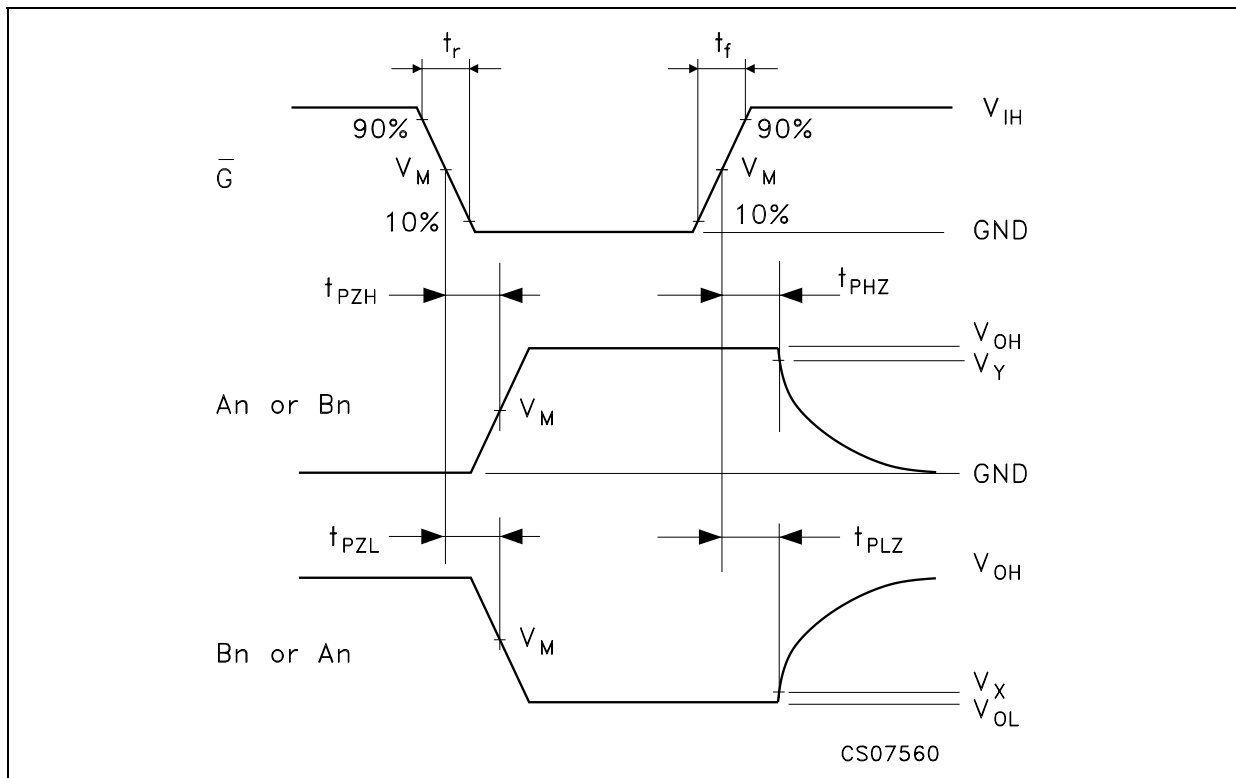
TSSOP48 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002		0.006
A2		0.9			0.035	
b	0.17		0.27	0.0067		0.011
c	0.09		0.20	0.0035		0.0079
D	12.4		12.6	0.488		0.496
E		8.1 BSC			0.318 BSC	
E1	6.0		6.2	0.236		0.244
e		0.5 BSC			0.0197 BSC	
K	0˚		8˚	0˚		8˚
L	0.50		0.75	0.020		0.030

PIN 1 IDENTIFICATION

7065588C
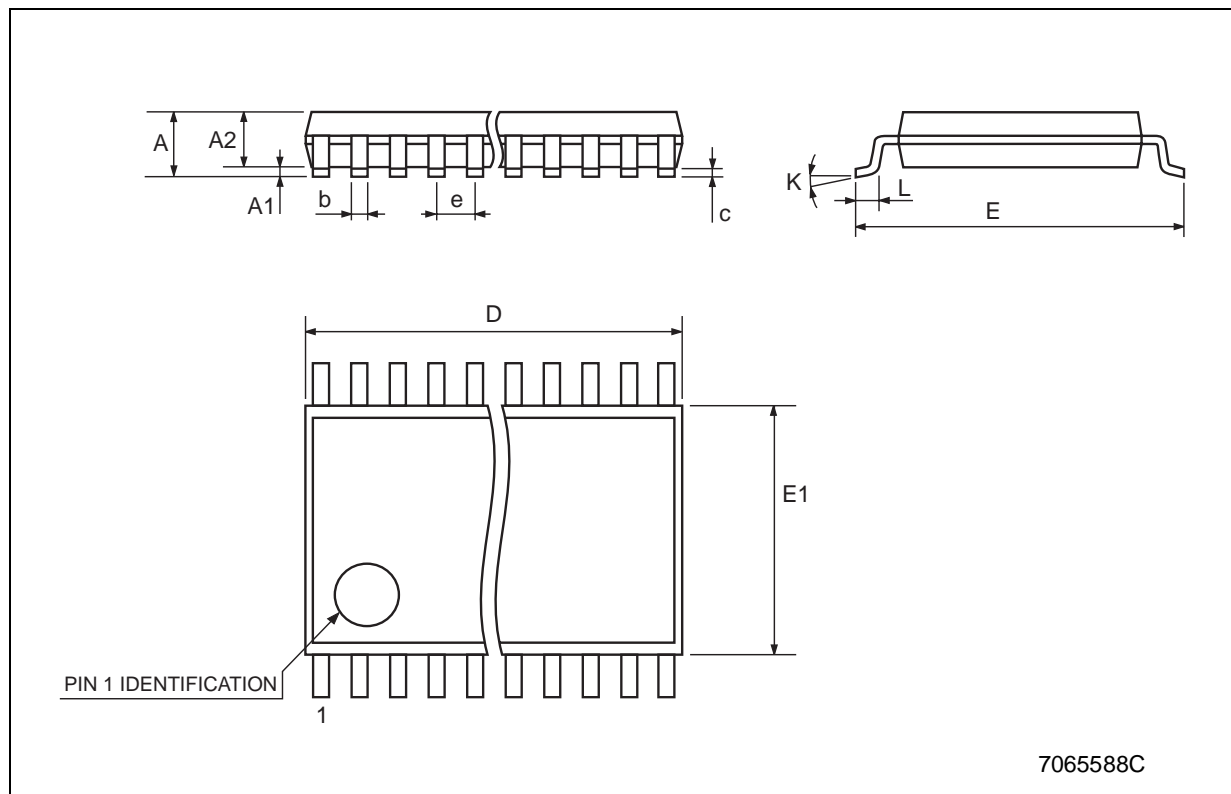
Tape & Reel TSSOP48 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			30.4			1.197
Ao	8.7		8.9	0.343		0.350
Bo	13.1		13.3	0.516		0.524
Ko	1.5		1.7	0.059		0.067
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476

Note: Drawing not in scale