

## CLM3490

### 3.0V~5.5V, High ESD-Protected 14Mbps, Full-Duplex RS485/RS422 Transceiver

#### Description

CLM3490 is a 3.0V~5.5V powered, full-duplex, low power dissipation RS-485 transceiver fully meeting the requirements of RS-485/RS-422 standard.

CLM3490 contains one driver and one receiver, both can transmit signals independently. The CLM3490 has a 1/8-unit-load. It allows up to 256 transceivers on the bus and error-free data transmission up to 14Mbps.

CLM3490 has a working voltage range of 3.0V~5.5V, with the functions of current-limiting protection, over-voltage protection, control port hot plug input, etc. CLM3490 has excellent ESD release capability, and HBM reaches  $\pm 15\text{kV}$ .

#### Features

- 3.0V~5.5V supply, full-duplex
- 1/8 unit load, allow up to 256 transceivers on the bus
- Driver short-circuit output protection
- Strong anti-noise ability
- Integrated transient voltage suppression function
- The data transmission rate up to 14Mbps in electric noise environment
- ESD protection for RS-485 I/O pins  $\pm 15\text{kV}$ , HBM

#### Applications

- 低功耗RS-485/RS-422收发器、电信、用于EMI敏感应用的收发器、工业控制局域网

#### Product appearance

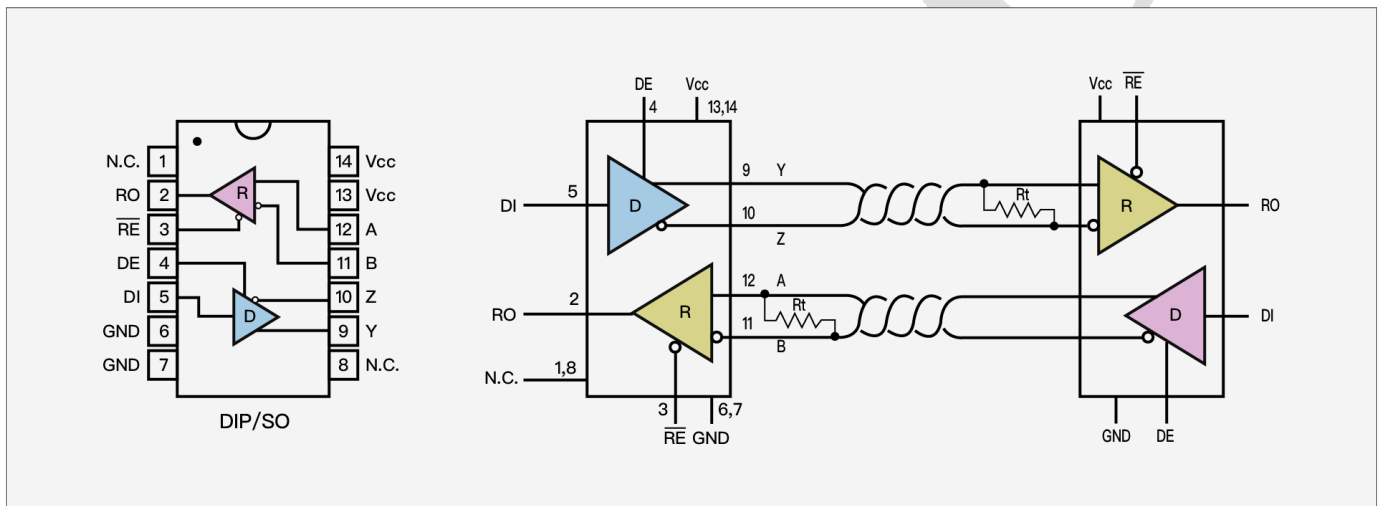


**CAUTION!** It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD. The components featured in this data sheet are not to be used in military or aerospace applications or environments.

## Ordering information

Part number	Description	Supplier Device Package	Package	Temperature Range	Packaging Quantity
CLM3490CSA+	Full-Duplex RS485/RS422 Transceiver	SOIC-8	Tube	0°C ~ 70°C	1000PCS
CLM3490ECSA+	Full-Duplex RS485/RS422 Transceiver	SOIC-8	Tube	0°C ~ 70°C	1000PCS
CLM3490ESA+	Full-Duplex RS485/RS422 Transceiver	SOIC-8	Tube	-40°C ~ 85°C	1000PCS
CLM3490EESA+	Full-Duplex RS485/RS422 Transceiver	SOIC-8	Tube	-40°C ~ 85°C	1000PCS
CLM3490EPA+	Full-Duplex RS485/RS422 Transceiver	DIP-8	Tube	-40°C ~ 85°C	1000PCS
CLM3490EEPA+	Full-Duplex RS485/RS422 Transceiver	DIP-8	Tube	-40°C ~ 85°C	1000PCS

## Functional Block



CLM3490框图

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# Abbreviation Listing

ADR	Address 地址
AL	Application Layer 应用层
BD	Bidirectional 双向
BGA	Ball Grid Array 球阵列封装
BHE	Bus High Enable 总线高电平使能
CMD	Command 命令
CS	Chip Select 片选
DC	Distributed Clock 集成分布时钟
DL	Data Link Layer 数据链接层
EMC	Electromagnetic Compatibility 电磁兼容性
EMI	Electromagnetic Interference 电磁干扰
EOF	End of Frame 帧结尾
EEPROM	Electrically Erasable Programmable read only memory 带电可擦可编程只读存储器
FMMU	Fieldbus Memory Management Unit 现场总线内存管理单元
GPI	General Purpose Input 通用数字量输入引脚
GPO	General Purpose Output 通用数字量输出引脚
I	Input 输入
I/O	Input or Output 输入或者输出
I2C	Inter-Integrated Circuit 集成电路总线
IRQ	Interrupt Request 中断请求
LDO	Low Drop-Out regulator 低压差线性稳压器
LVDS	Low Voltage Differential Signaling 低压差分信号
LI-	LVDS RX- 低压差分信号负接收端
LI+	LVDS RX+ 低压差分信号正接收端
LO-	LVDS TX- 低压差分信号负发射端
LO+	LVDS TX+ 低压差分信号正发射端
LED	Light Emitting Diode 发光二极管
MAC	Media Access Controller 介质访问控制
MDIO	Management Data Input / Output 管理数据输入/输出
MI	(PHY) Management Interface 以太网物理层接口器件管理接口
MII	Media Independent Interface 介质无关接口
MISO	Master In – Slave Out 主站输入-从站输出

MOSI	Master Out – Slave In 主站输出-从站输入
n.a.	not available 未使用
n.c.	not connected 未连接
O	Output 输出
PD	Pull-down 下拉
PDI	Process Data Interface 过程数据接口 Physical Device Interface 物理设备接口
PLL	Phase Locked Loop 锁相回路
PU	Pull-up 上拉
PHY	Physical 以太网物理层器件
QFN	Quad Flat package No leads 方形扁平无引脚封装
RD	Read 读
SII	Slave Information Interface 从站信息接口
SM	SyncManager 同步管理器
SOF	Start of Frame 帧起始
SPI	Serial Peripheral Interface 串行外设接口
TA	Transfer Acknowledge 传输应答
TFBGA	Thin-profile Fine-pitch BGA 薄型球栅阵列封装
TS	Transfer Start 传输周期启动
UI	Unused Input (PDI: PD, 其它: GND)未使用的输入引脚
WD	Watchdog 看门狗
WPD	Weak Pull-down 弱下拉, 只够配置信号
WPU	Weak Pull-up 弱上拉, 只够配置信号
WR	Write 写

## 1.PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	VCC	Positive Supply.
2	RO	Receiver Output. If $A-B \geq +200\text{mV}$ , RO will be high; If $A-B \leq -200\text{mV}$ , RO will be low.
3	DI	Driver Input. A low on DI forces output Y low and output Z high. A high on DI forces output Y high and output Z low.
4	GND	Ground.
5	Y	Non-inverting Driver Output.
6	Z	Inverting Driver Output.
7	B	Inverting Receiver Input.
8	A	Non-inverting Receiver Input.

## 2.LIMITING VALUES

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	VCC	+7	V
Driver Input Voltage	DI	-0.3~VCC+0.3	V
Receiver Input Voltage	A, B	-8~13	V
Receiver Output Voltage	RO	-0.3~VCC+0.3	V
Ambient Temperature Ranges	$T_{amb}$	-40~125	°C
Storage Temperature Range	$T_{stg}$	-60~150	°C
Lead Temperature		300	°C
Continuous Power Dissipation	SOP8	400	mW
	DIP8	700	mW

The maximum limit parameters mean that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conducive to the normal operation of the device. The continuous operation of the device at the maximum allowable rating may affect the reliability of the device. The reference point for all voltages is ground.

### 3.DRIVER DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Differential Driver Output (No load)	$V_{OD1}$	VCC=5V		5		V
Differential Driver Output	$V_{OD2}$	Fig 2, RL=54Ω	1.5		VCC	V
		Fig 2, RL=100Ω	1.5		VCC	
Change in Magnitude of Driver Differential Output Voltage (NOTE1)	$\Delta V_{OD}$	Fig 2, RL=54Ω			0.2	V
Driver Common-Mode Output Voltage	$V_{OC}$	Fig 2, RL=54Ω			3	V
Change in Magnitude of Common-Mode Output Voltage (NOTE1)	$\Delta V_{OC}$	Fig 2, RL=54Ω			0.2	V
Input High Voltage	$V_{IH}$	DI	2.0			V
Input Low Voltage	$V_{IL}$	DI			0.8	V
Logic Input Current	$I_{IN1}$	DI	-2		2	μA
Output short-circuit current, short-circuit to high	$I_{OSD1}$	short-circuit to 0V~12V	35		250	mA
Output short-circuit current, short-circuit to low	$I_{OSD2}$	short-circuit to -7V~0V	-250		-35	mA

(Unless otherwise noted, VCC=3V~5V,  $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 125^{\circ}\text{C}$ , typical values are at VCC=+3.3V,  $T_{\text{amb}}=25^{\circ}\text{C}$ ). NOTE1:  $\Delta V_{OD}$  and  $\Delta V_{OC}$  are the changes in  $V_{OD}$  and  $V_{OC}$ , respectively, when the DI input changes state.

### 4.RECEIVER DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Input current (A, B)	$I_{IN2}$	VCC=0 or 3.3V $V_{IN}=12\text{V}$			125	μA
		VCC=0 or 3.3V $V_{IN}=-7\text{V}$	-100			μA
Positive input threshold voltage	$V_{IT+}$	$-7\text{V} \leq V_{\text{CM}} \leq 12\text{V}$			+200	mV

(Unless otherwise noted, VCC=3V~5V,  $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 125^{\circ}\text{C}$ , typical values are at VCC=+3.3V,  $T_{\text{amb}}=25^{\circ}\text{C}$ ).

## 5.SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Supply Current	$I_{CC}$	DI=0 or VCC		240	400	$\mu A$

## 6.ESD PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
A, B, Y, Z		HBM		$\pm 15$		kV
Other ports		HBM		$\pm 6$		kV

## 7.DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Driver Propagation Delay, Low-to-High Level	$t_{PLH}$	$R_L=54\Omega, C_L=100pF$		15	35	ns
Driver Propagation Delay, High-to-Low Level	$t_{PHL}$	$R_L=54\Omega, C_L=100pF$		15	35	ns
$ t_{PLH} - t_{PHL} $	$t_{SKEW1}$			7	10	ns
Differential output delay / Transition time	$t_{DD}, t_{TD}$	$R_L=54\Omega, C_L=100pF$		10	25	ns

## 8.RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Receiver Propagation						
Delay, Low-to-High	$t_{RPLH}$		20	60	90	ns
Level		$V_{ID} \geq 2.0V;$				
Receiver Propagation		Rising and falling				
Delay, High-to-Low	$t_{RPHL}$	edge time	20	60	90	ns
Level		$V_{ID} \leq 15ns$				
$ t_{RPLH} - t_{RPHL} $	$t_{SKEW2}$			7	10	ns

## 9.FUNCTION TABLE

Driver Function

Receiver Function

INPUT	OUTPUT		INPUT	OUTPUT
DI	Y	Z	A-B	RO
1	H	L	$\geq +200mV$	H
0	L	H	$\leq -200mV$	L
-	-	-	Open/Short	H
-	-	-	$\leq +200mV$ & $\geq -200mV$	?

(1) H=High level; L=Low level; ? = uncertain.

### 10. TEST CIRCUIT

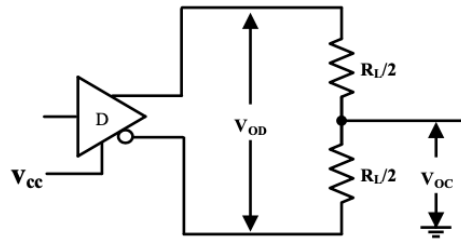


Fig 2 Driver DC test load

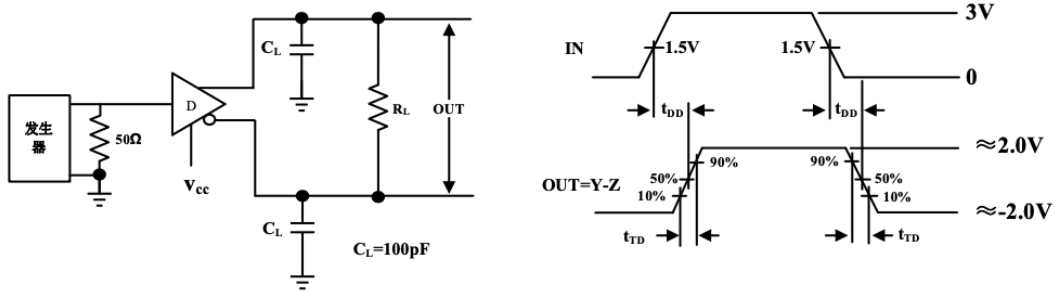


Fig 3 Driver differential output delay and transition times

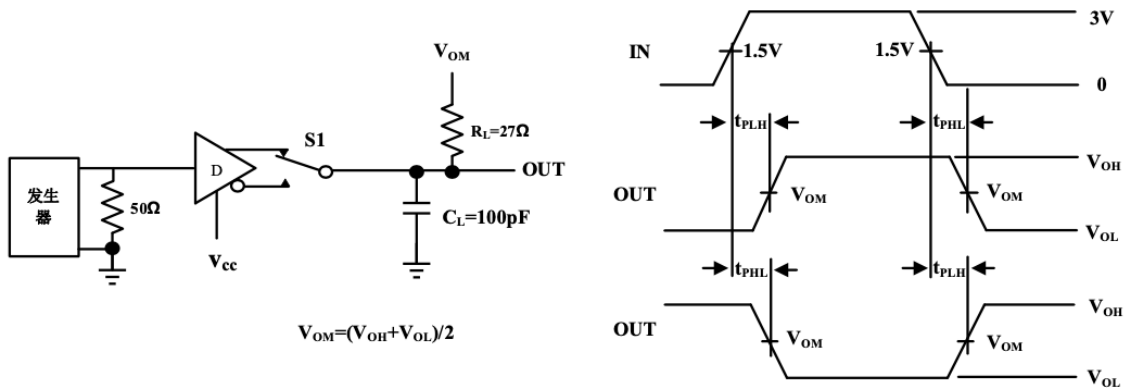


Fig 4 Driver propagation times

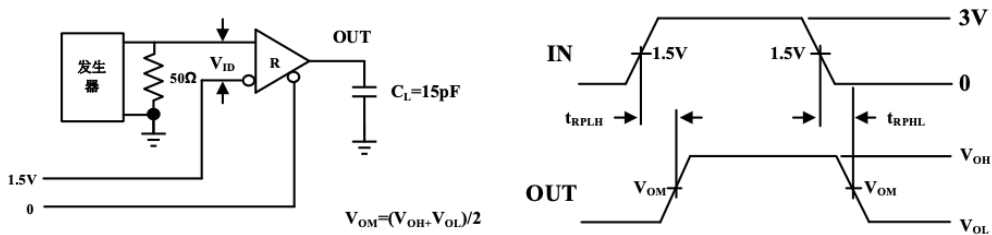


Fig 5 Receiver propagation delay

## 11.ADDITIONAL DESCRIPTION

### 11.1.Sketch

CLM3490 is a full-duplex high-speed transceiver for RS-485/RS-422 communication, which includes a driver and a receiver. It has failure safety, over-voltage protection and over-current protection. CLM3490 realizes error-free data transmission up to 14Mbps.

### 11.2.Allowing up to 256 transceivers on the bus

The input impedance of the standard RS485 receiver is 12k $\Omega$  (1 unit load), and the standard driver can drive up to 32 unit loads. The receiver of CLM3490 transceiver has 1/8 unit load input impedance (96k $\Omega$ ), which allows up to 256 transceivers to be connected on the same communication bus in parallel. These devices can be combined arbitrarily or with other RS485 transceivers. Any combination of these devices and/or other RS-485 transceivers with a total of 32 unit loads or less can be connected to the line.

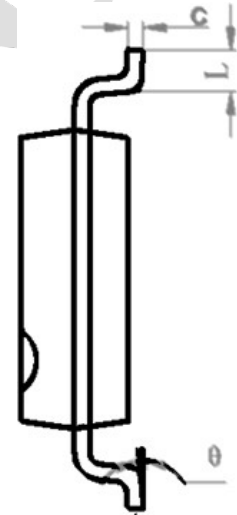
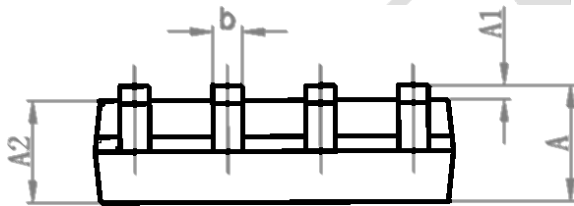
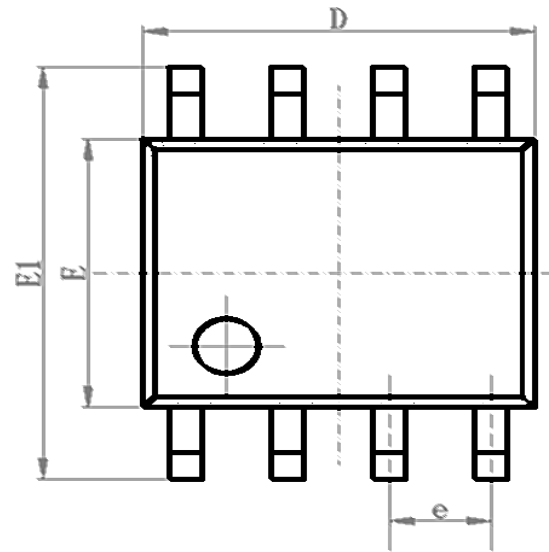
### 11.3.Driver output protection

By means of over-current and over-voltage protection mechanism, it can prevent excessive output current and power dissipation caused by faults or by bus contention, and fast short-circuit protection can be provided in the whole common mode voltage range (refer to typical working characteristics).

## 12.SOP8 DIMENSIONS

PACKAGE SIZE

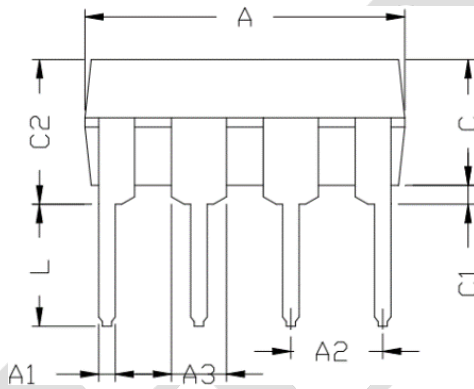
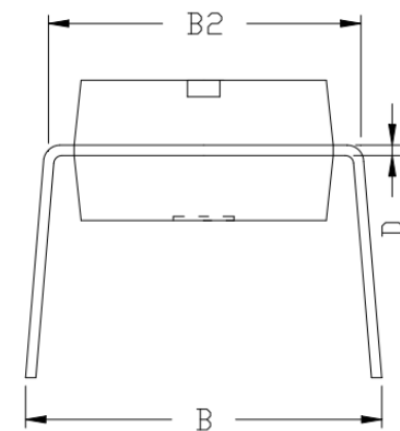
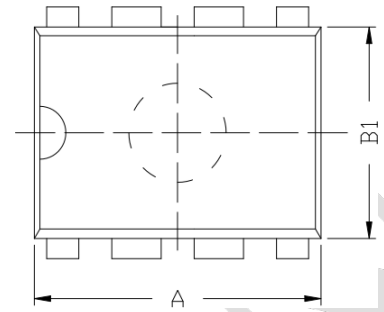
SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
b	0.38	-	0.51
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e		1.27BSC	
L	0.40	0.60	0.80
c	0.20	-	0.25
$\theta$	0°	-	8°



### 13.DIP8 DIMENSIONS

**PACKAGE SIZE**

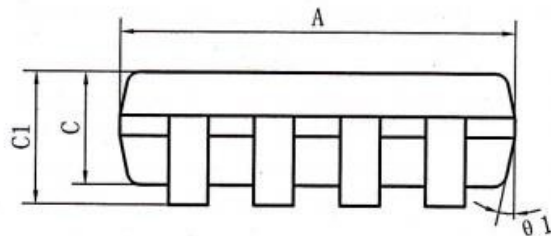
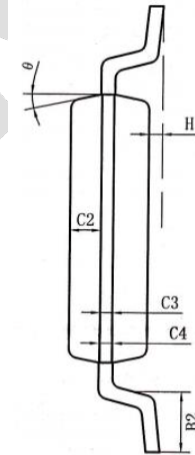
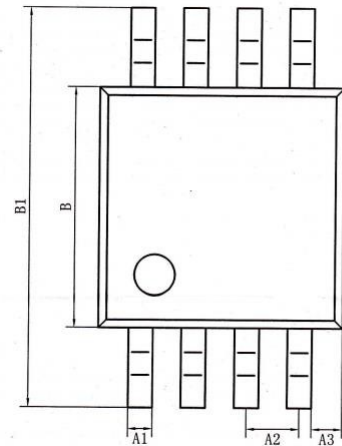
SYMBOL	MIN/mm	TYP/mm	MAX/mm
A	9.00	9.20	9.40
A1	0.33	0.45	0.51
A2	2.54TYP		
A3	1.525TYP		
B	8.40	8.70	9.10
B1	6.20	6.40	6.60
B2	7.32	7.62	7.92
C	3.20	3.40	3.60
C1	0.50	0.60	0.80
C2	3.71	4.00	4.31
D	0.20	0.28	0.36
L	3.00	3.30	3.60



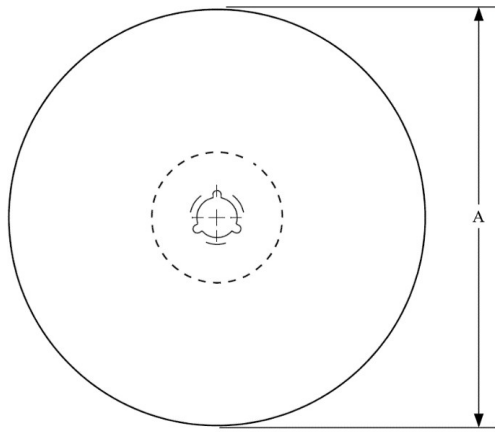
14.MSOP8/8 $\mu$ MAX/VSSOP8 DIMENSIONS

PACKAGE SIZE

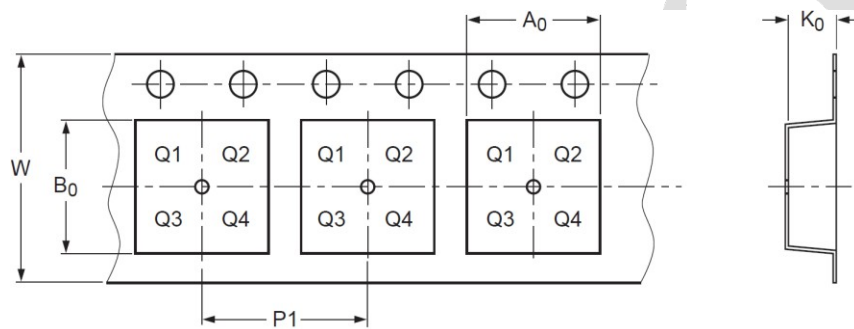
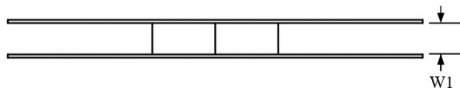
SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	2.90	3.0	3.10
A1	0.28		0.35
A2	0.65TYP		
A3	0.375TYP		
B	2.90	3.0	3.10
B1	4.70		5.10
B2	0.45		0.75
C	0.75		0.95
C1			1.10
C2	0.328 TYP		
C3	0.152		
C4	0.15		0.23
H	0.00		0.09
$\theta$	12°TYP		



## 15. TAPE AND REEL INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

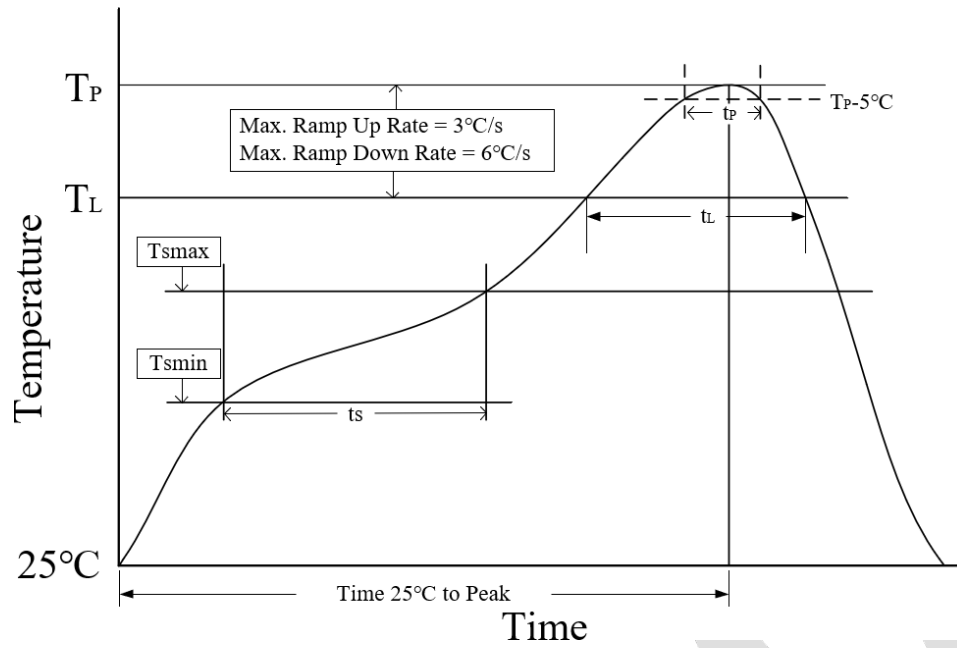


Direction of Feed

PIN1 is in quadrant 1

Package Type	Reel Diameter A (mm)	Tape width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
SOP8	330	12.5±0.20	6.50±0.1	5.30±0.10	2.05±0.1	8.00±0.1	12.00±0.1
MSOP8	330	12.5±0.20	5.33±0.10	3.40±0.10	1.53±0.10	8.00±0.10	12.00 <sup>+0.30</sup> -0.10

## 16.REFLOW SOLDERING



Parameter	Lead-free soldering conditions
Ave ramp up rate ( $T_L$ to $T_P$ )	3 °C/second max
Preheat time $t_s$ ( $T_{smin}=150\text{ °C}$ to $T_{smax}=200\text{ °C}$ )	60-120 seconds
Melting time $t_L$ ( $T_L=217\text{ °C}$ )	60-150 seconds
Peak temp $T_P$	260-265 °C
5°C below peak temperature $t_p$	30 seconds
Ave cooling rate ( $T_P$ to $T_L$ )	6 °C/second max
Normal temperature 25°C to peak temperature $T_P$ time	8 minutes max

## 17.Contact Information

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