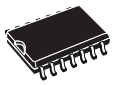
ST3293

RS-422 HIGH SPEED TRANSCEIVER WITH DIGITAL EMPHASIS

- FULL DUPLEX COMMUNICATIONS DEVICE RS-422
- PROGRAMMABLE EMPHASIS INCREASES THE DISTANCE AND DATA RATE
- HIGH SPEED: DATA RATE UP TO 25Mbps
- -7V TO 7V COMON-MODE INPUT VOLTAGE RANGE
- LVTTL LOGIC INPUT THRESHOLDS



SOP

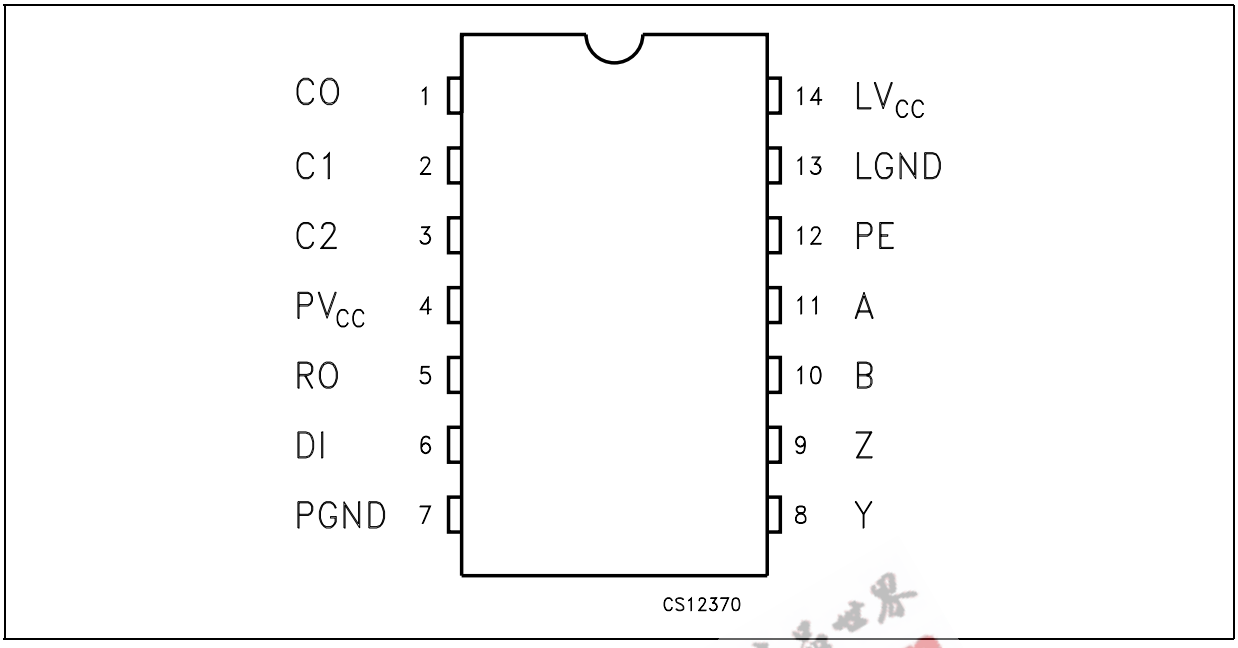
DESCRIPTION

The ST3293 is a high-speed RS-422 transceiver with an emphasis circuitry on the driver which allows reliable long distance communication at high data rate by reducing inter symbolic interference. The differential amplitude of the ST3293 is digitally programmable in 7 steps through 3 control pins. The emphasis reduces the inter symbolic interference by increasing the signal amplitude under the micro control and counteracting the effects of the cable with the varying data stream. The ST3293 is a full duplex device that operates from a single +5V supply. It features driver output short circuit current limiting and an open circuit fail-safe receiver input. The PE input can be used as an emphasis enable. The PE held LOW disable the emphasis instead set to HIGH enable the emphasis with the configuration on C0, C1 and C2 when DI change logic level. The DI input can direct drive the outputs with a fixed emphasis or without emphasis as shown in the timing diagram.

ORDERING CODES

Type	Temperature Range	Package	Comments
ST3293BD	-40 to 85 °C	SO-14 (Tube)	50 parts per tube / 20 tube per box
ST3293BDR	-40 to 85 °C	SO-14 (Tape & Reel)	2500 parts per reel

PIN CONFIGURATION



PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1	C0	Emphasis Control Input 0
2	C1	Emphasis Control Input 1
3	C2	Emphasis Control Input 2
4	PV_{CC}	Supply Voltage
5	RO	Receiver Output
6	DI	Driver Input
7	PGND	Ground
8	Y	Non-inverting Driver Output
9	Z	Inverting Driver Output
10	B	Inverting Receiver Input
11	A	Non-inverting Receiver Input
12	PE	Emphasis Enable
13	LGND	Ground
14	LV_{CC}	Supply Voltage

TRUTH TABLE
TRANSMITTING INPUTS

INPUTS		OUTPUTS	EMPHASIS STATUS
PE	DI	PECTRL	
L	X	L	Disabled
H	0->1	H	Enabled
H	1->0	H	Enabled

X= Don't Care; Z=High Impedance

EMPHASIS CONTROL INPUT

INPUTS PE = HIGH			DRIVER EMPHASIS FACTOR (DEF)
C0	C1	C2	RL = 100 Ω
L	L	L	1.0
L	L	H	1.1
L	H	L	1.2
L	H	H	1.3
H	L	L	1.4
H	L	H	1.5
H	H	L	1.6
H	H	H	1.7

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to 7	V
C0, C1, C2, DI, PE	Control Input Voltage	-0.5 to 7	V
Y, Z	Driver Output Voltage V_{CC} = 0V or V_{OUT} = Z-state	-0.5 to 7	V
A, B	Receiver Input Voltage	-14 to 14	V
RO	Receiver Output Voltage	-0.5 to (V_{CC} + 0.5)	V
PD	Continuous Total Power Dissipation (SO-14)	0.5	W
T_J	Operating Junction Temperature Range	-40 to 150	°C
T_{stg}	Storage Temperature Range	-65 to 150	°C
ESD	Human Boby Model (Receiver Inputs vs GND)	±1	KV

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage		4.75		5.25	V
V_{IH}	High Level Logic Input Voltage	C0, C1, C2, DI, PE	2		V_{CC}	V
V_{IL}	Low Level Logic Input Voltage	C0, C1, C2, DI, PE	0		0.8	V
I_{IN}	Input Current of Logic Input	C0, C1, C2, DI, PE			±2	µA
I_{CC}	Supply Current	No Load			4	mA
T_A	Operating Temperature Range		-40		85	°C

DRIVER ELECTRICAL CHARACTERISTICS

(V_{CC} = 5V ± 5%, -40°C < T_A < 85°C, unless otherwise noted. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$\|V_{OD}\|$	Differential Output Voltage	No Load	2		V_{CC}	V
$\|V_{OD1}\|$	Differential Output Voltage without Emphasis	R = 100 Ω, PE = Low	2	2.32	2.8	V
DPER	Differential Output Emphasis Step Precision	See Truth Table	0.9		1.1	
DEF	Differential Output Emphasis Factor	See Truth Table	1		2	
$\|V_{OPD}\|$	Differential Driver Output with Emphasis	R = 100 Ω, DEF = 1.1		2.52		V
		R = 100 Ω, DEF = 1.7		3.85		
ΔV_{OD}	Change in Magnitude of Differential Output Voltage	R = 100 Ω, All DEF values	-0.2	0	0.2	V
V_{OC}	Driver Common-Mode Output Voltage	R = 100 Ω, All DEF values	1	V_{CC}/2	3.5	V
ΔV_{OC}	Change in Magnitude of Common Mode Output Voltage	R = 100 Ω	-0.2	0	0.2	V
I_{OFF}	Output Leakage Current (Y and Z)	V_{CC} = GND V_O = 6V		0.1	±100	µA
I_{OSD}	Driver Short Circuit Output Current	V_O = 0V, C0 = C1 = C2 = 0	-30	-50	-150	mA

RECEIVER DC ELECTRICAL CHARACTERISTICS

(V_{CC} = 5V ± 5%, -40°C < T_A < 85°C, unless otherwise noted. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TH}	Receiver Differential Threshold Voltage	-7V ≤ V_{CM} ≤ 7V	-200		200	mV
V_{HYST}	Receiver Input Hysteresis	V_{CM} = 0V		50		mV
V_{OL}	Low Level Output Voltage	I_{OL} = 4mA	GND	0.2	0.4	mV
V_{OH}	High Level Output Voltage	I_{OH} = -4mA	3.7	4.7	V_{CC}	mV
I_{IN}	Input Current	V_{IN}=10V, Other Input = GND		0.32	1.5	mA
		V_{IN}=10V, Other Input = GND		-0.5	-2.5	
R_{IN}	Receiver Input Resistance	-7V ≤ V_{CM} ≤ 7V, V_{CC} = 0V	12	24		KΩ

SWITCHING CHARACTERISTICS

(V_{CC} = 5V ± 5%, -40°C < T_A < 85°C, unless otherwise noted. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{DPLH} t_{DPHL}	Driver Differential Propagation Delay, Low to High and High to Low	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF		16	25	ns
t_{TLH}, t_{THL}	Driver Differential rise and fall time	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF		8	12	ns
t_{EDO}	Propagation delay time from PE, C0, C1, C2 to differential output without emphasis	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF |DO|-200mV			45	ns
t_s	Setup Time PE to DI	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF		-8		ns
t_h	Hold Time PE to DI	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF		8		ns
t_{DSKEW}	Differential Driver Output Skew $\|t_{dPLH}-t_{dPHL}\|$	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF		1.5	3	ns
f_{MAX}	Maximum Frequency	R_{DIFF} = 100 Ω C_{L1} = C_{L2} = 50pF	25	40		Mbps
t_{RLH}, t_{RHL}	Receiver Propagation Delay	C_L = 15pF, V_{ID} = 2V, V_{CM} = 0V		28	45	ns
t_{RSKEW}	Receiver Output Skew $\|t_{RLH}-t_{RHL}\|$	C_L = 15pF		2	4	ns

LOGIC DIAGRAM

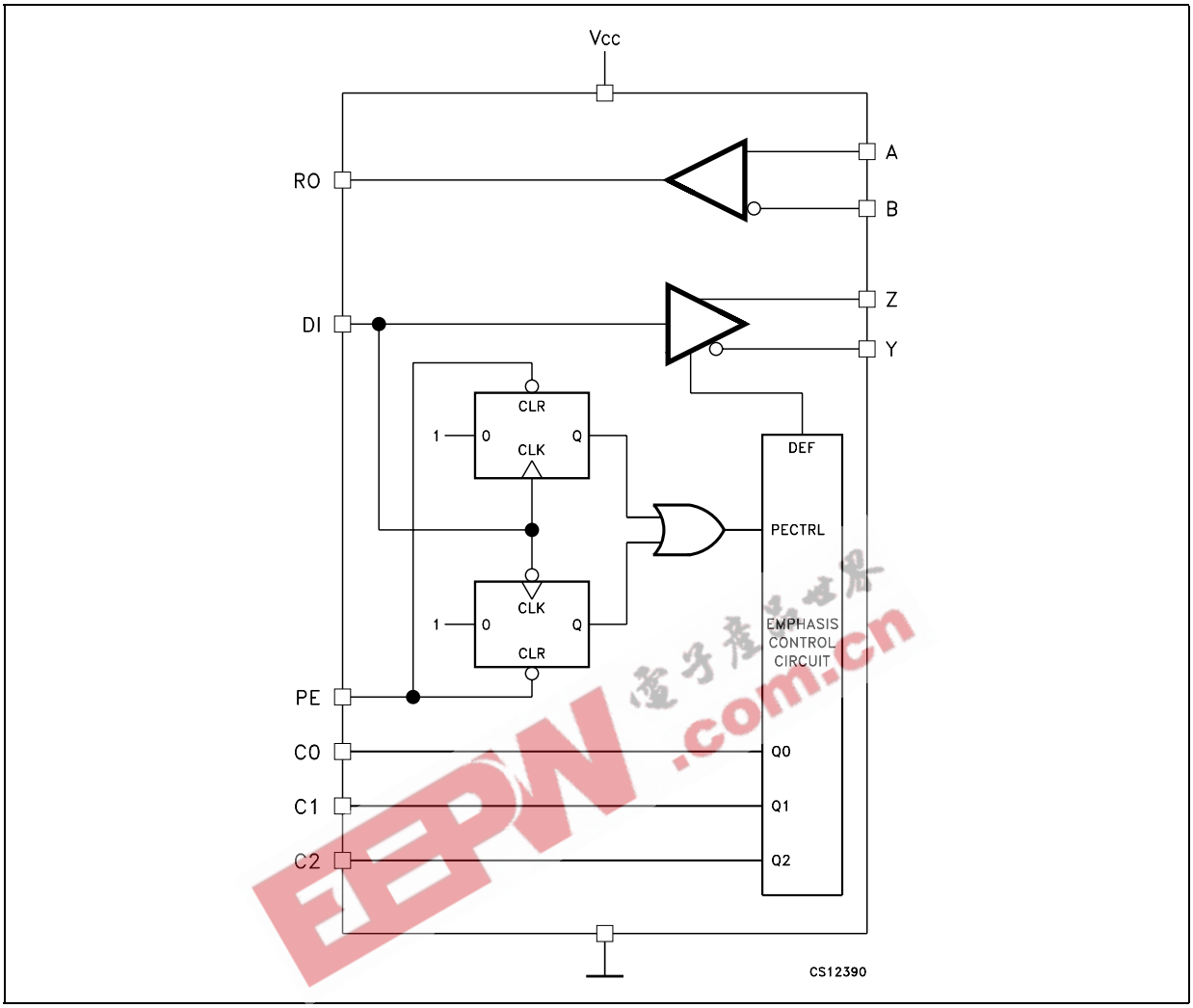


Figure 1 : Test Circuit

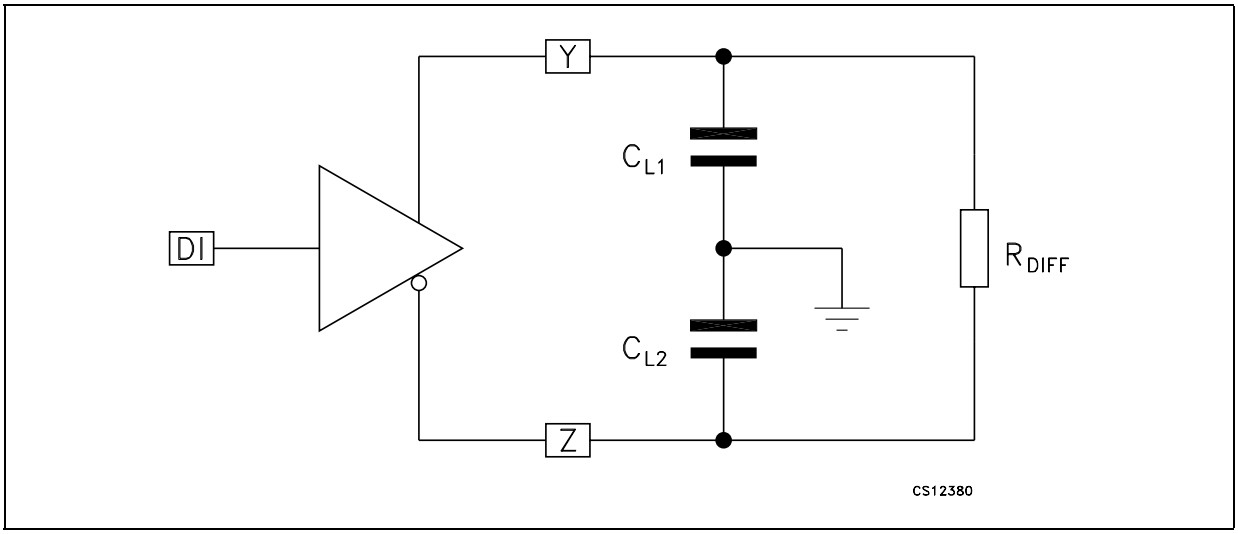


Figure 2 :

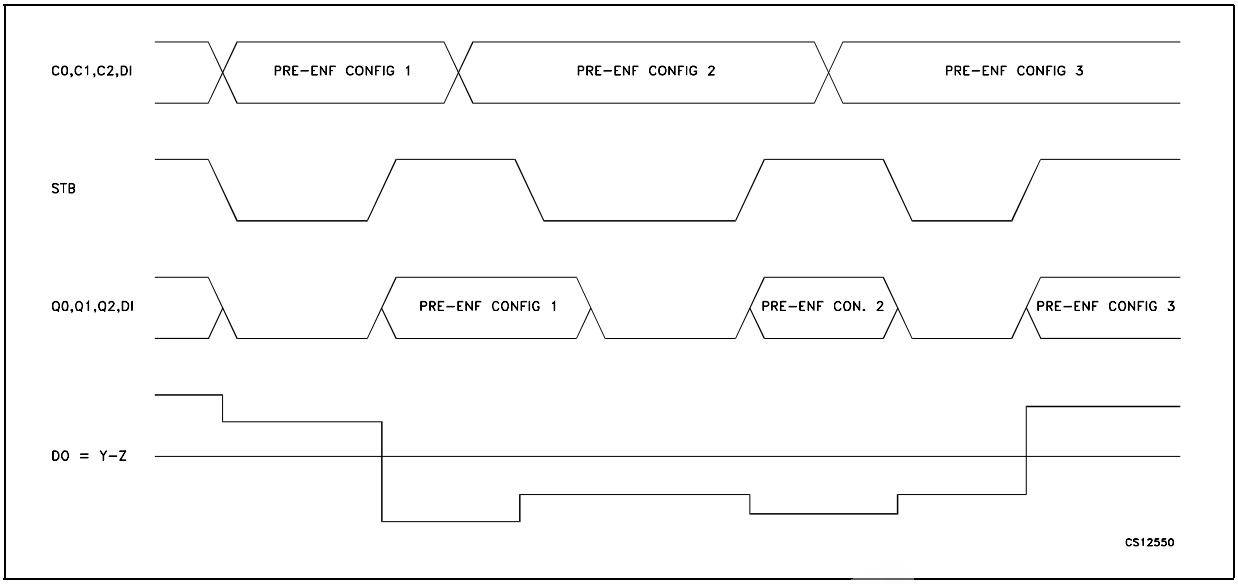


Figure 3 :

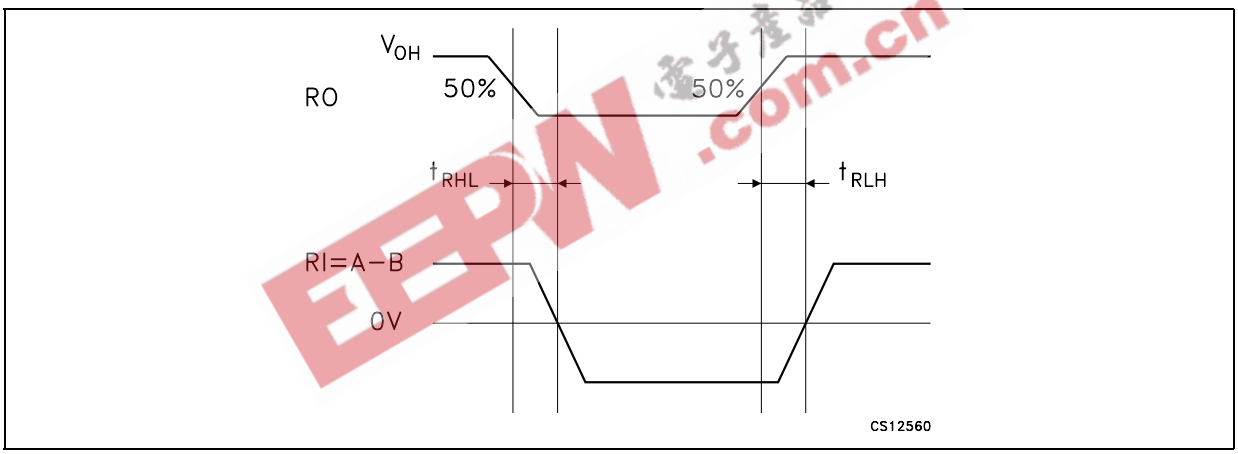


Figure 4 :

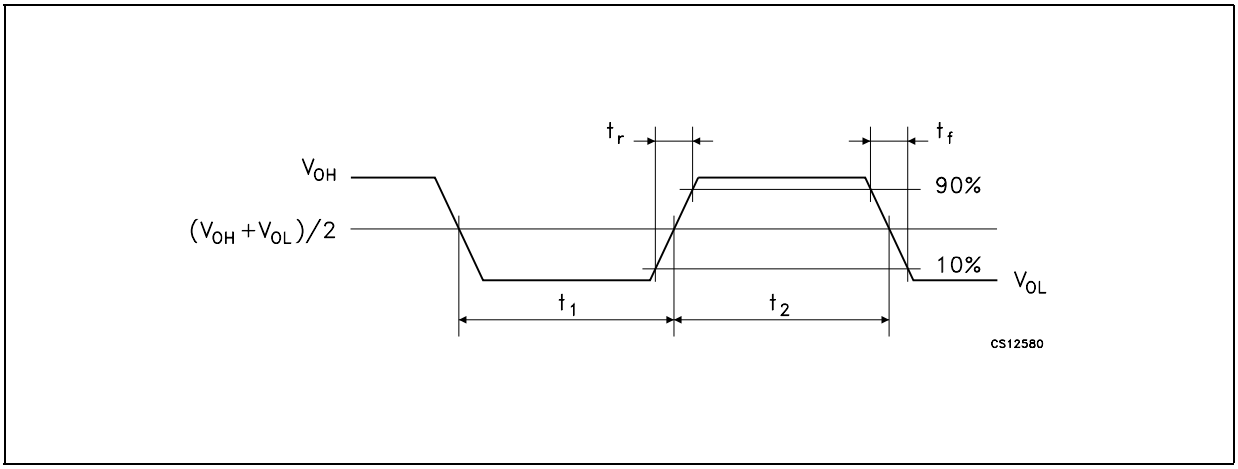


Figure 5 :

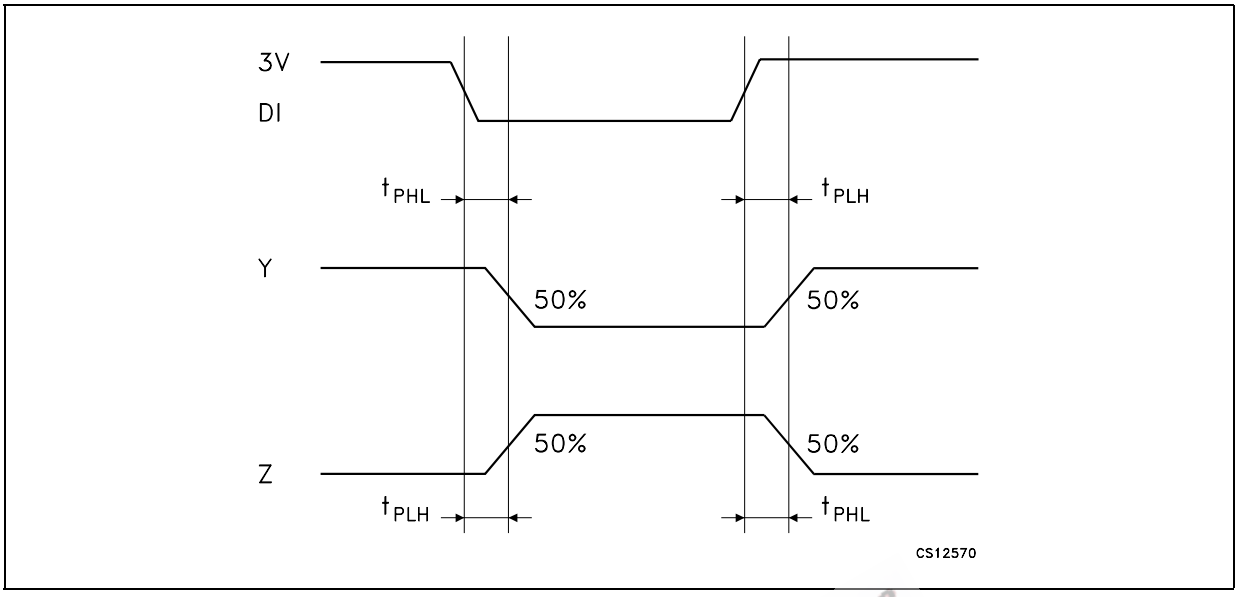


Figure 6 :

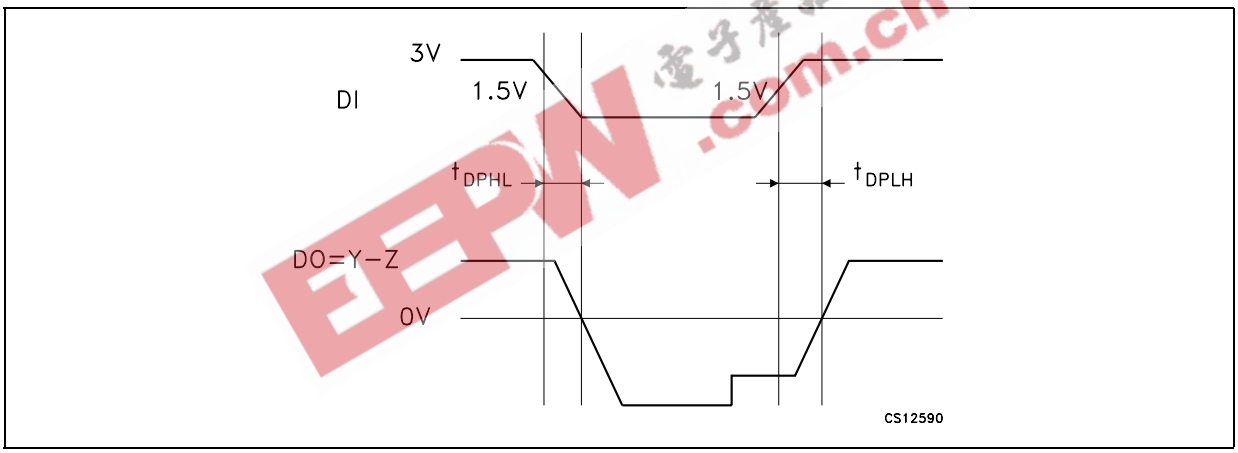
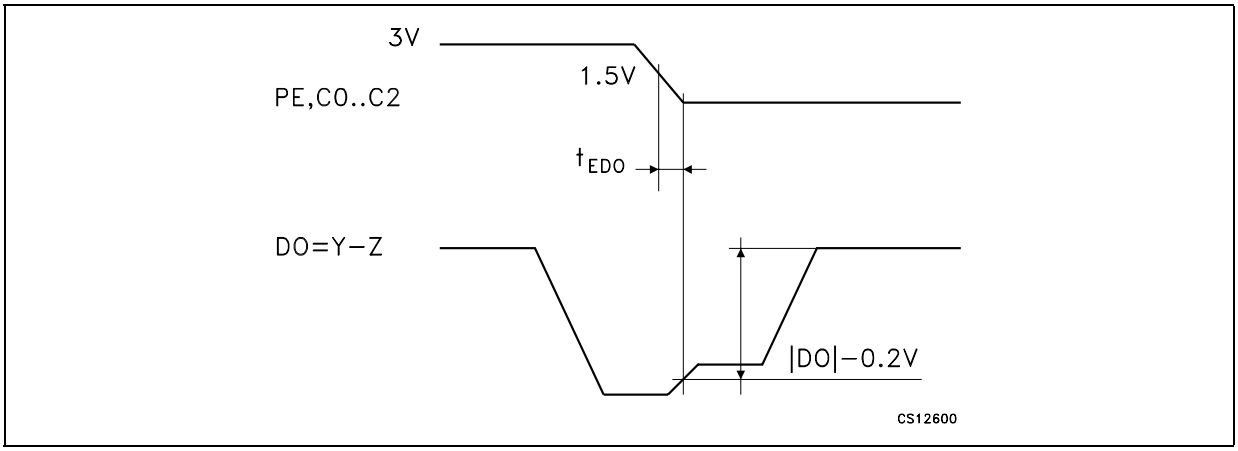
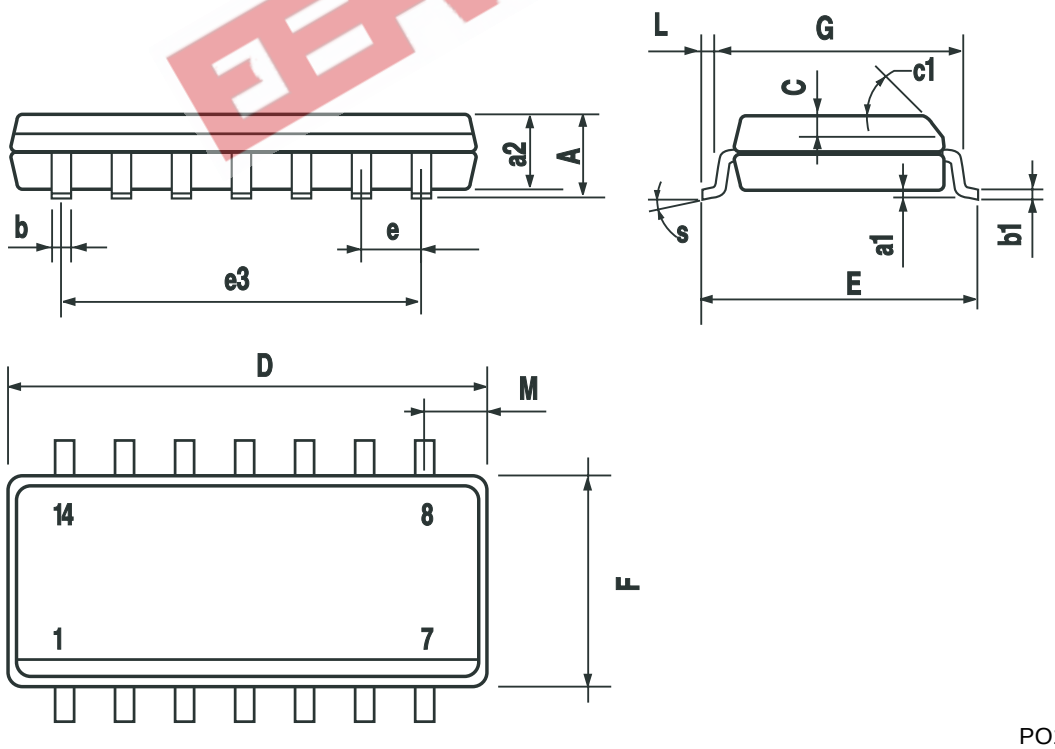


Figure 7 :



SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



PO13G

Tape & Reel SO-14 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			22.4			0.882
Ao	6.4		6.6	0.252		0.260
Bo	9		9.2	0.354		0.362
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319