ZT207E, ZT208E
ZT211E, ZT213E

Low Power 5V 250kbps RS232 Transceivers

Features

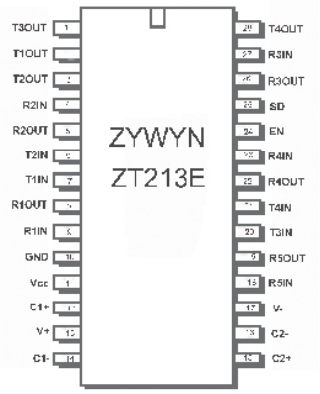
- Meets EIA/TIA-232F and CCITT V.28/V.24 specifications for V_{CC} at +5V ±10%
- Low Quiescent Current – 3mA.
- Low Shutdown Current (where applicable) - 1µA typical, 10µA max.
- Guaranteed Standard Data Rate 250kbps
- Proprietary Switch-Capacitor Regulated Voltage Converters (patent pending)
- Wake Up Feature in Shutdown Mode
- Tri-State Receiver Outputs
- Latch-up Free
- ESD Protection for RS-232 I/O's ±15kV Human Body Model (HBM)
- Drop-in Replacements for MAX207E, SP207E, MAX208E, SP208E, MAX211E, SP211E, MAX213E, SP213E,
- High Data Rate at 1000kbps Available on ZT230F Series

General Description

The ZT230E series devices are +5V powered EIA/TIA-232 and V.28/V.24 communication interfaces with low power requirements. These transceivers consist of combinations up to five line drivers, five line receivers and the proprietary switch-capacitor regulated voltage converters. The ZT211E and ZT213E feature a low power shutdown mode which draws as little current as 1µA typical with receiver outputs tri-stated and in wake-up. These devices operate from a single +5V power supply at the guaranteed data rate of 250k bits/sec with enhanced electrostatic discharge (ESD) protection in all RS232 I/O pins exceeding ±15kV HBM.

Applications

- Battery-Powered Applications
- Notebooks, Subnotebooks, and Palmtops
- Industrial and Embedded PCs
- Data Cables for Cell Phones and PDAs
- Terminal Adapters and POS terminals
- Peripherals interface
- Routers and HUBs



28-pin SSOP/WSOIC

Now Available in Green Package Option

Product Selection Guide And Cross Reference

Part Number	# 0f RS232 Tx	# of RS232 Rx	# of Rx active in SD	# of 0.1µF caps	Shut Down	Wake Up	TTL Tri-State	Data Rate (kbps)	ESD HBM on RS232 I/O	Pin-to-Pin Cross SIPEX	Pin-to-Pin Cross MAXIM
ZT207E	5	3	0	4	No	No	No	250	± 15kV	SP207E	MAX207E
ZT208E	4	4	0	4	No	No	No	250	± 15kV	SP208E	MAX208E
ZT211E	4	5	0	4	Yes	No	Yes	250	± 15kV	SP211E	MAX211E
ZT213E	4	5	2	4	Yes	Yes	Yes	250	± 15kV	SP213E	MAX213E

Absolute Maximum Ratings

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

Power Supply, (V_{CC}) ..... –0.3V to +6.0V
V+ ..... –0.3V to +7.0V
V– ..... +0.3V to –7.0V
|V+| + |V-| ..... +13.0V
I_{CC} (DC V_{CC} or GND current) ..... ±100mA

Input Voltages

TxIN, SHUTDOWN, EN ..... –0.3V to +6.0V
RxIN ..... ±25V

Output Voltages

TxOUT ..... ±12V
RxOUT ..... –0.3V to (V_{CC} +0.3V)

Short-Circuit Duration

TxOUT ..... Continuous
Operating Temperature ..... –40°C to +85°C
Storage Temperature ..... –65°C to +150°C

Power Dissipation Per Package

24-pin SSOP (derate 8.00mW/°C above +70°C) ... 640mW
24-pin WSOIC (derate 11.76mW/°C above +70°C) 941mW
28-pin SSOP (derate 9.52mW/°C above +70°C) ... 762mW
28-pin WSOIC (derate 12.50mW/°C above +70°C) 1W

Storage Considerations

Storage in a low humidity environment is preferred. Large high density plastic packages are moisture sensitive and should be stored in Dry Vapor Barrier Bags. Prior to usage, the parts should remain bagged and stored below 40°C and 60%RH. If the parts are removed from the bag, they should be used within 48 hours or stored in an environment at or below 20%RH. If the above conditions cannot be followed, the parts should be baked for four hours at 125°C in order remove moisture prior to soldering. Zywyn ships product in Dry Vapor Barrier Bags with a humidity indicator card and desiccant pack. The humidity indicator should be below 30%RH.

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Electrical Characteristics

Unless otherwise stated, V_{CC} = +5.0V, $T_A = T_{min}$ to T_{max}, C1 to C4 = 0.1µF, typical values apply at V_{CC} = +5.0V and T_A = 25°C.

Parameter	Condition	Min	Typ	Max	Units
TTL Logic Input TTL Logic Output RS-232 Input RS-232 Output Charge Pump Pin Power Pin	T_1IN, T_2IN, T_3IN, T_4IN, T_5IN, $\overline{EN}$, $\overline{SD}$ R_1OUT, R_2OUT, R_3OUT, R_4OUT, R_5OUT R_1IN, R_2IN, R_3IN, R_4IN, R_5IN T_1OUT, T_2OUT, T_3OUT, T_4OUT, T_5OUT C_1P, C_1N, C_2P, C_2N V_{CC}, V_{GND}, V_{DD}, V_{SS}	see specifications below			
Charge Pump Caps Temp 0°C to +70°C Temp –40°C to +85°C V_{CC} Voltage Range	C_1P, C_1N, C_2P, C_2N Commercial Grade Industrial Grade V_{CC} = +5.0V Supply	0.1 0 –40 4.5	0.1 +25 +25 5	1.0 +70 +85 5.5	µF °C °C V
Supply Current Quiescent Supply Current Transmitters Loaded	TTL Inputs = V_{CC}/GND, RS-232 Input = float, T_A = 25°C V_{CC} = +5.0V ±10%, No load on transmitter outputs TTL Inputs = V_{CC}/GND, RS-232 Inputs = float, T_A = 25°C V_{CC} = +5.0V, All transmitter outputs loaded with R_L = 3kΩ		3 15	6 	mA mA
Supply Current, SHUTDOWN Enabled	$\overline{SD}$ = GND, TTL Inputs = V_{CC}/GND, T_A = 25°C RS-232 Inputs = float, V_{CC} = +5.0V		1	10	µA
TTL LOGIC Input					
Input Threshold Low Input Threshold High Input Hysteresis Input Leakage Current Input Leakage Current	 V_{CC} = +5.0V Supply V_{IN} = V_{CC} and GND, T_xIN, $\overline{EN}$, $\overline{SD}$ V_{IN} = V_{CC} and GND, T_xIN	 2.4 	 0.5 ±0.01 50	0.8 ±1 200	V V V µA µA
TTL LOGIC Output					
Output Voltage Low Output Voltage High Output Leakage Current	I_{OUT} = 1.6mA I_{OUT} = –1.0mA Receiver Outputs Disabled, V_{OUT} = V_{CC} or GND, $\overline{SD}$ = GND, $\overline{EN}$ = V_{CC}	 V_{CC}–0.6 	 V_{CC}–0.1 ±0.05	0.4 ±10	V V µA
Receiver Input					
Input Voltage Range Input Threshold Low Input Threshold High Input Hysteresis Input Resistance	$T_A = T_{min} – T_{max}$ T_A = 25°C, V_{CC} = 5.0V V_{CC} = +5.0V Supply T_A = 25°C V_{IN} = ±25V, T_A = 25°C	–25 0.8 3	 1.5 0.5 	25 2.4 7	V V V V kΩ
Transmitter Output					
Output Voltage Swing Output Resistance Output Short-Circuit Current Output Leakage Current	R_L = 3kΩ, All Outputs are loaded V_{CC} = V_{DD} = V_{SS} = GND, V_{OUT} = ±2V V_{OUT} = GND Transmitter Disabled, V_{OUT} = ±12V	±5 300 	±6 ±5	 ±60 	V Ω mA µA

Electrical Characteristics

Unless otherwise stated, V_{CC} = +5.0V, $T_A = T_{min}$ to T_{max}, C1 to C4 = 0.1µF, typical values apply at V_{CC} = +5.0V and T_A = 25°C.

Parameter	Condition	Min	Typ	Max	Units
Timing Characteristics					
Maximum Data Rate One Transmitter Switching, Refers to Figure 1 and 2.	R_L = 3kΩ, C_L = 1000pF, T_A = 25°C	250			kbps
Transition-Region Slew Rate	R_L = 3~7kΩ, C_L = 150pF to 1000pF, One Transmitter Switching, T_A = 25°C, Measured from +3V to –3V or –3V to +3V, V_{CC}=4.5V	6		30	V/µs
Transmitter Propagation t_{PLH} Transmitter Propagation t_{PHL} Transmitter Output Enable Time Transmitter Output Disable Time	All transmitters loaded with R_L = 3kΩ, C_L = 1000pF All transmitters loaded with R_L = 3kΩ, C_L = 1000pF		1.5 1.5 0.4 0.25		µs µs µs µs
Receiver Propagation t_{PLH} Receiver Propagation t_{PHL} Receiver Skew Receiver Output Enable Time Receiver Output Disable Time	C_L = 150pF C_L = 150pF $t_{PHL} - t_{PLH}$		0.15 0.15 50 0.2 0.2		µs µs ns µs µs
ESD Tolerance					
RS-232 I/Os ESD HBM			±15		kV
TTL/CMOS I/Os ESD HBM			±2		kV

SD	$\overline{EN}$	ZT213E Only		Power Up/Down	Receiver Outputs
		$\overline{SD}$	EN		
0	0	1	1	Up	Enable
0	1	1	0	Up	Tri-State
1	0	0	1	Down	Enable
1	1	0	0	Down	Tri-State

Table 1. Wake-Up Truth Table for ZT213E

Circuit Description

Proprietary Switch-Capacitor Regulated Voltage Converter

Different from other suppliers, Zywyn uses a patent pending switch-capacitor voltage-controlled source and sink current generators design to provide powerful bipolar voltages to maintain compliant EIA/RS232 levels regardless of power supply fluctuations. The design consists of an internal regulated oscillator, a two phase clock cycling, regulated complementary MOS switches, fast switching diode and switch capacitors.

The switch capacitor bi-directional current generators operate with Zywyn's proprietary smartly regulated complementary MOS switches and fast switching diode from its proprietary high voltage process technology. The efficiency of these bi-directional current generators is well over 70%. The switching frequency is generated by an internal oscillator and regulated by the current loads. The switch capacitor pump design delivers higher negative bucked voltage than the positive boosted voltage to achieve a balanced voltage controlled source and sink current generators resulting a balanced bipolar voltage supplies to the chip.

With its unique proprietary design technique, Zywyn's interface product series provide a better power efficient, stable and compliant EIA/RS232 levels with superior low power consumption.

Controlled Enable and Power-Down

The ZT211E and ZT213E both feature an enable input, which allows the receiver outputs to be either tri–stated or enabled. This can be especially useful when the receiver is tied directly to a microprocessor data bus. For the ZT211E, enable is active low, in which a logic LOW applied to the $\overline{EN}$ pin will enable the receiver outputs. For the ZT213E, enable is active high in which a logic HIGH applied to the $\overline{EN}$ pin will enable the receiver outputs.

ZT211E and ZT213E have a low-power shutdown mode controlled by the $\overline{SD}$ pin. During shutdown the driver output and the switch-capacitor regulated voltage converter are disabled with the supply current falls to less than 1µA.

ZT213E includes a wakeup function (see Table 1) that enables two receivers during a shutdown state. With only the receivers active during the shutdown state, the devices draw 5-10µA of supply current. A typical application is when a RS232 cable is connected or when the peripheral is enabled such as a modem, the devices will automatically become active again. The ring indicator signal from the modem could be passed through an active receiver in the ZT213E that is itself in the shutdown mode. The ring indicator signal would propagate through the ZT213E to the power management circuitry of the computer to power up the microprocessor and the ZT213E drivers. After the supply voltage to the ZT213E reaches +5.0V, the $\overline{SD}$ pin can be disabled, taking the ZT213E out of the shutdown mode. All receivers that are active during shutdown maintain 500mV (typ.) of hysteresis.

ESD Immunity

Electro-Static Discharge (ESD) is an important factor when implementing a serial port into a system. In some applications, it is crucial that the ESD protection for the system must meet a certain tolerance level. Since RS232 transceiver devices are exposed to the outside world, there are many environmental factors that can effect the serial port and even subject it to transients that could potentially damage the transceiver itself.

The RS232 transceiver is usually routed from the serial port connector to the transceiver IC through the metal trace on the printed circuit board. This trace will have some small amount of resistance that will add some protection in terms of limiting transient current to the IC. However for added voltage protection, transient voltage suppressors (TVS) or transzorbs, which are back-to-back diode arrays clamp, are usually necessary to protect the serial port circuity.

To further reduce cost within their system, more engineers are requiring higher ESD tolerances from the transceiver ICs themselves without having to add costly TVS circuitry. Zywyn's RS232 transceivers includes built-in transient voltage suppression where external ESD circuitry is not necessary to meet the MIL-STD-883, Method 3015, Human Body Model and the EN61000-4-2 Air/Contact Discharge tests.

The Human Body Model has been the generally accepted ESD testing method for semiconductors. This test is intended to simulate the human body's potential to store electrostatic energy and discharge it to an integrated circuit upon close proximity or contact. This method will test the IC's capability to withstand an ESD transient during normal handling such as in manufacturing areas where the ICs tend to be handled frequently.

RS232 Signal Characteristics

The charge pump voltage converter efficiently converts the necessary voltage for the driver's output transistors so that the RS232 output is close to the ideal rail voltage of 10V.

While loaded with a typical RS232 load, the driver's output level only drops 0.2V from its open circuit voltage. Zywyn's low-drop driver circuitry working with its efficient voltage regulator allows superior line driving capability while meeting the requirements of TIA/EIA-232-E.

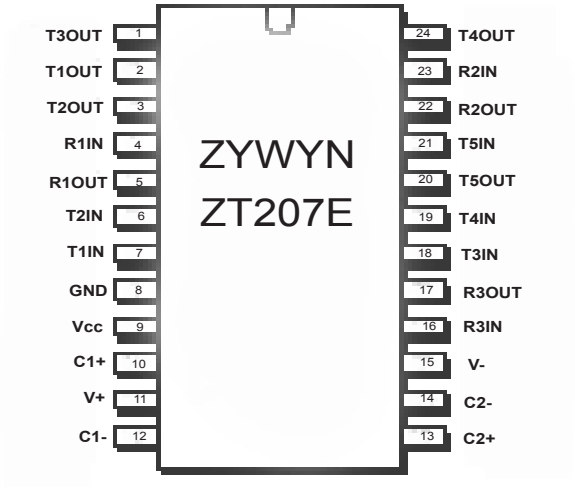
The drivers are inverting transmitters, which accept TTL or CMOS inputs and produces the RS-232 compliant signals that is inverted relative to the input logic levels. Typically the RS232 output voltage swing is ±6V. Even under the worst case loading conditions of 3kohms and 2500pF, the output is guaranteed to be ±5V, which adheres to the RS232 standard specifications. The transmitter outputs are protected against infinite short-circuits to ground without degradation in reliability. The instantaneous slew rate of the transmitter output is internally limited to a maximum of 30V/µs in order to meet the TIA/EIA-232-E requirements.

The receivers convert RS-232 input signals to inverted TTL signals. The inputs have a typical hysteresis margin of 500mV in order to account for signal degradation caused by system interference and other noise related disturbers. This ensures that the receiver is relatively immune to noisy transmission lines. The input thresholds are 0.8V minimum and 2.4V maximum, which are within the TIA/EIA-232 requirements. The receiver inputs are also protected against voltages up to ±25V. Should an input be left unconnected, a 5kohm pull-down resistor to ground will force the output of the receiver to a high state.

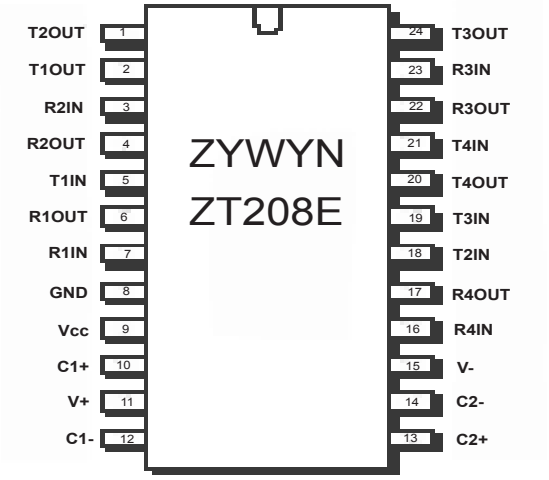
Specification	RS-232D	RS-423A	RS-422	RS-485	RS-562
Mode of Operation	Single-Ended	Single-Ended	Differential	Differential	Single-Ended
No. of Drivers and Receivers Allowed on One Line	1 Driver 1 Receiver	1 Driver 10 Receivers	1 Driver 10 Receivers	32 Drivers 32 Receivers	1 Driver 1 Receiver
Maximum Cable Length	50 feet	4,000 feet	4,000 feet	4,000 feet	C ≤ 2,500 pF@ <20kbps; C ≤ 1,000 pF@ >20kbps
Maximum Data Rate	20 kbps	100 kbps	10 Mbps	10 Mbps	64 kbps
Driver Output Maximum Voltage	± 25V	± 6V	- 0.25V to +6V	- 7V to +12V	- 3.7V to +13.2V
Driver Output Signal Level					
Loaded	±5V	±3.6V	±2V	±1.5V	±3.7V
Unloaded	±15V	±6V	±5V	±5V	±13.2V
Driver Load Impedance	3 ~ 7KΩ	450 Ω	100 Ω	54 Ω	3 ~ 7KΩ
Maximum Driver Output Current (High Impedance State)					
Power On				±100µA	
Power Off	V_{MAX}/300	100µA	±100µA	±100µA	
Slew Rate	30V/µs max.	Controls Provided			30V/µs max.
Receiver Input Voltage Range	±15V	±12V	-7V to +7V	-7V to +12V	±15V
Receiver Input Sensitivity	±3V	±200mV	±200mV	±200mV	±3V
Receiver Input Resistivity	3 ~ 7KΩ	4KΩmin.	4KΩmin.	12KΩmin.	3 ~ 7KΩ

Table 2. EIA Standard Parameter Summary

Pin Configuration



24-pin SSOP/PDIP/WSOIC



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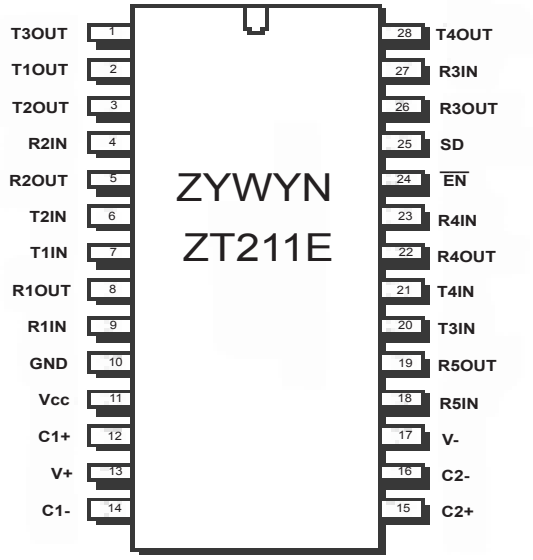
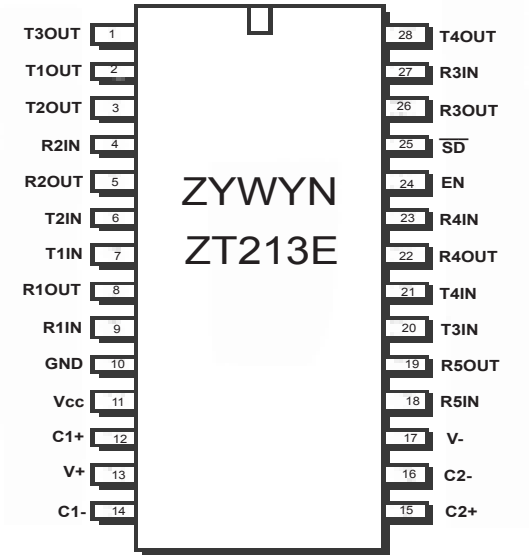
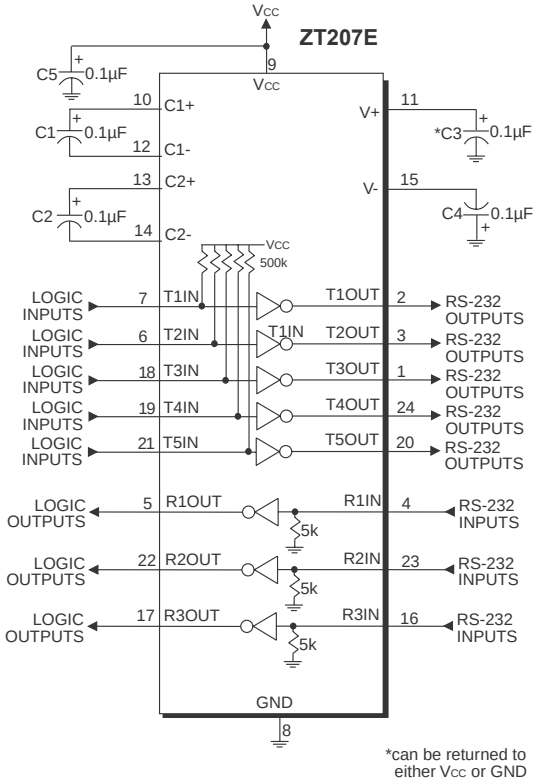


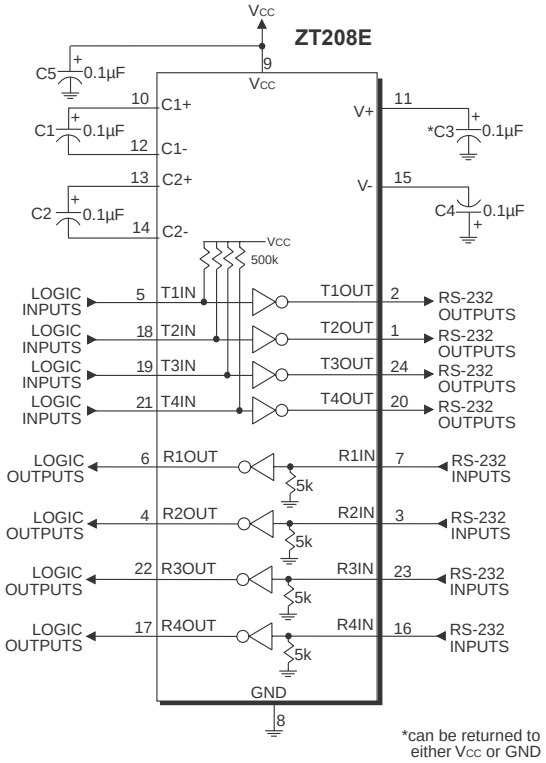
28-pin SSOP/WSOIC

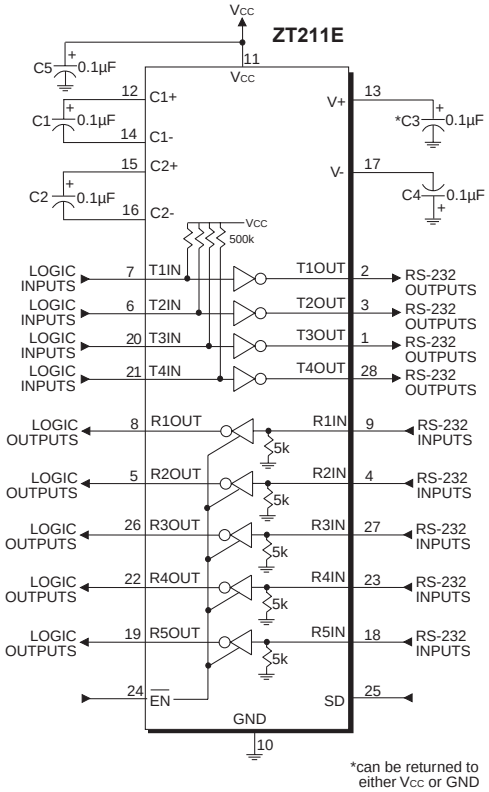


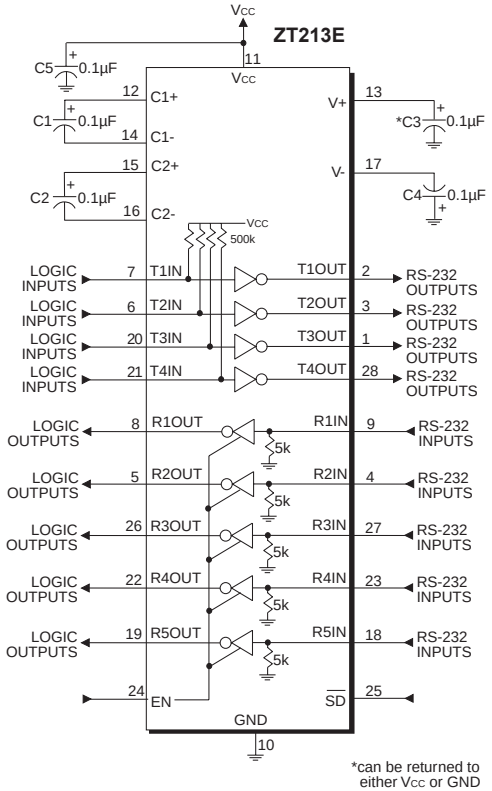
28-pin SSOP/WSOIC

Typical Application Circuits

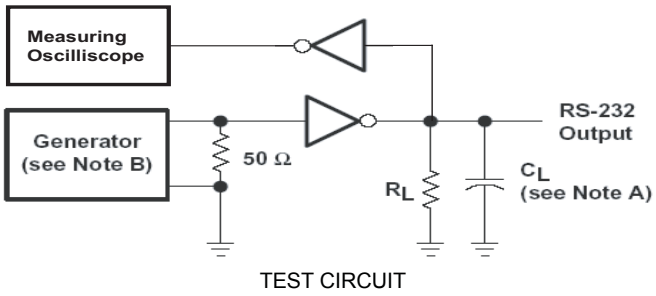








Typical Test Circuits



TEST CIRCUIT

Maximum Data Rate Test Circuit

Notes:

A. R_L = 3kΩ , C_L = 1000pF, T_A = 25°C,

One Driver Switching.

B. The pulse generator had the following characteristics:

PRR = 250 kbps, Zo = 50Ω, 50% duty cycle,

T_r & T_f ≤ 10ns

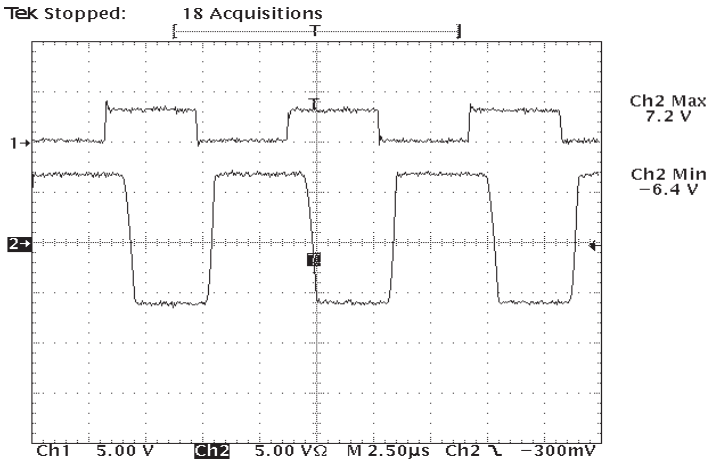


Figure 1. ZT230E TxIN to TxOut (no load) at 250kbps waveform

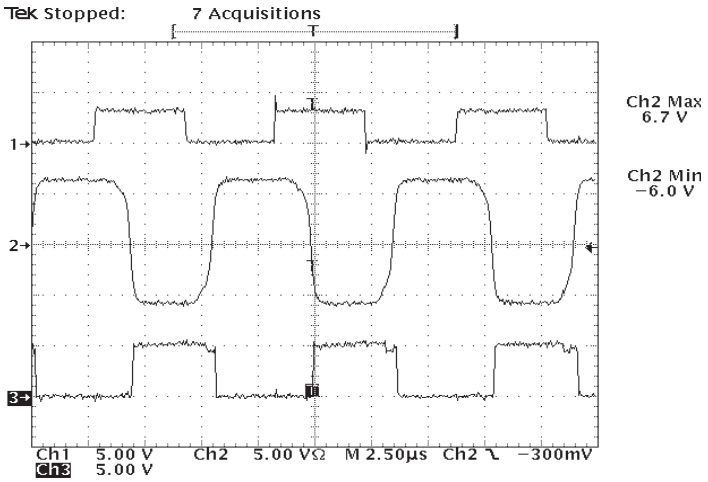
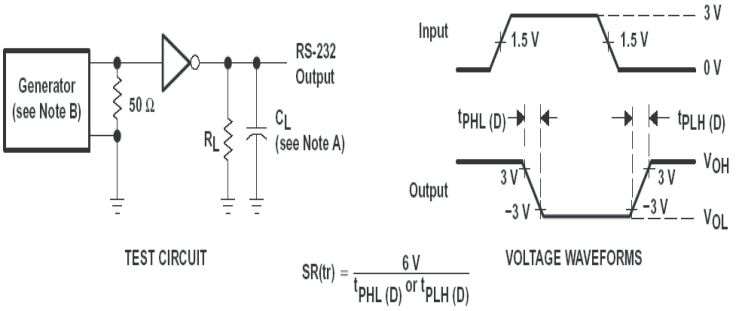


Figure 2. ZT230E TxIN to TxOut to RxOut (loopback to Rx with 1000pF load) at 250kbps waveform

Test Circuit RS232 Signal Characteristics

Figure 1 shows the normal RS232 transceiver function with a TTL/CMOS signal applied to the input on channel 1 and the resultant RS232 output shown on channel 2. This figure shows a typical RS232 line driver output without loading. In other words, this is the open circuit RS232 output voltage. The charge pump voltage converter efficiently converts the necessary voltage for the driver's output transistors so that the RS232 output is close to the ideal rail voltage of 6.6V.

Figure 2 shows the RS232 transceiver function using the TTL/CMOS input on channel 1 while showing the RS232 output on channel 2. This figure shows the RS232 signal while the output is loaded with 3kohms and 1000pF. The resistive load is the receiver's input impedance as the driver's output is looped back to the receiver's input. The resultant output on channel 3 is the receiver's TTL/CMOS output. While loaded with a typical RS232 load, the driver's output level only drops 0.2V from its open circuit voltage while running at 250kbps. The RS-232 output on channel 2 also shows good signal integrity while at the high data rates, which allows the receiver to process the signal will minimum skew and delay. Zywyn's low-drop driver circuitry working with its efficient voltage regulator allows superior line driving capability with the bonus of ±15kV ESD immunity.



Driver Transition-Region Slew Rate Test Circuit

Notes:

A. R_L = 3k~7kΩ , C_L = 150pF to 1000pF,

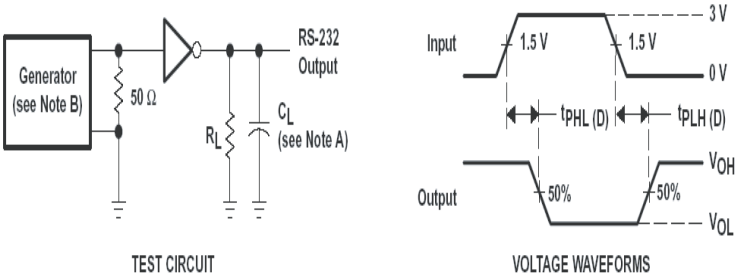
One Driver Switching, T_A = 25°C,

Measured from +3V to -3V or -3V to +3V.

B. The pulse generator had the following characteristics:

PRR = 250 kbps, Zo = 50Ω, 50% duty cycle,

T_r & T_f ≤ 10ns



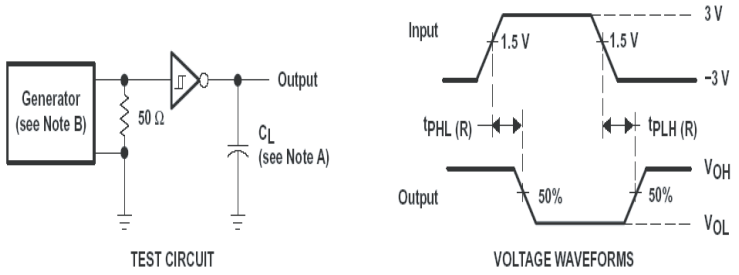
Driver Propagation (t_{PHL} & t_{PLH}) Test Circuit

Notes:

A. All drivers loaded with R_L = 3kΩ , C_L = 1000pF.

B. The pulse generator had the following characteristics:

PRR = 250 kbps, Zo = 50Ω, 50% duty cycle,



Receiver Propagation Delay Times Test Circuit

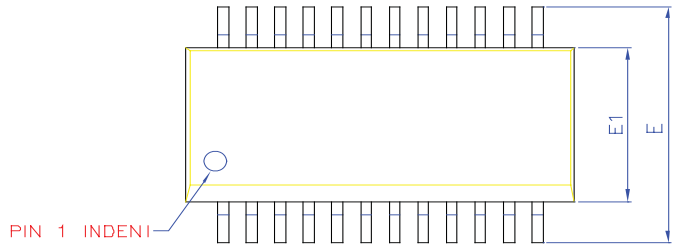
Notes:

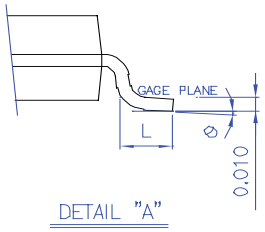
A. C_L = 150pF, including probe and jig capacitance.

B. The pulse generator had the following characteristics:

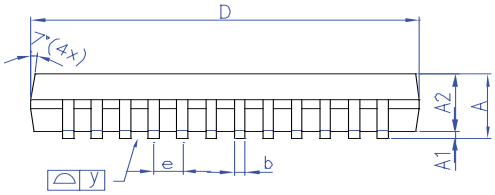
PRR = 250 kbps, Zo = 50Ω, 50% duty cycle,

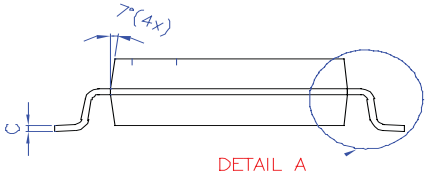
Package Information





DETAIL "A"





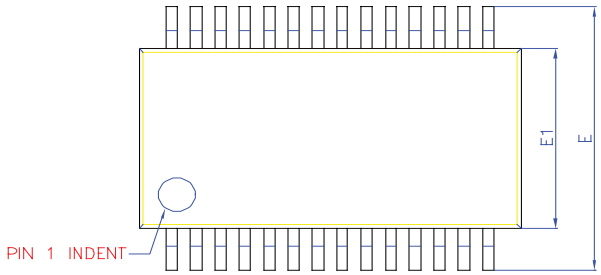
DETAIL A

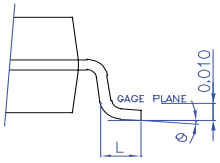
NOTE :
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010"[0.25mm] PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.003"[0.08mm] TOTAL IN EXCESS OF THE "b" DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.002B"[0.07mm]
5. TOLERANCE : ±0.010"[0.25mm] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT : JEDEC SPEC MO-137

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.73	——	1.99	0.068	——	0.079
A1	0.05	——	0.21	0.002	——	0.008
A2	——	1.75	——	——	0.069	——
b	0.22	0.30	0.38	0.0086	0.012	0.015
C	0.13	0.15	0.20	0.0051	0.006	0.0079
D	8.07	——	8.33	0.317	——	0.328
E	7.40	7.80	8.20	0.291	0.307	0.323
E1	5.00	5.30	5.60	0.197	0.209	0.220
e	——	0.65	——	——	0.0256	——
L	0.56	0.75	0.97	0.022	0.030	0.037
y	——	——	0.076	——	——	0.003
θ	0°	——	8°	0°	——	8°

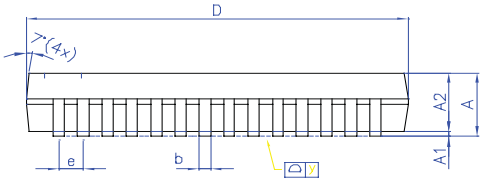
24-pin SSOP

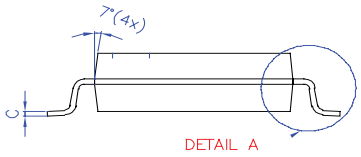
CUSTOMER		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 24L (.209") BODY .025" LEAD PITCH SMALL OUTLINE PACKAGE DRAWING
DRAW BY: Monica Chen	11/02/99	
CHECK BY: Lee Chen	11/02/99	
APPROVAL: Paul Lau	11/02/99	DWG. NO. PO-SSOP-002 REV. 0
APPROVAL: Jack Tu	11/03/99	UNIT : INCH SCALE 12/1 SHEET 1 OF 1





DETAIL "A"





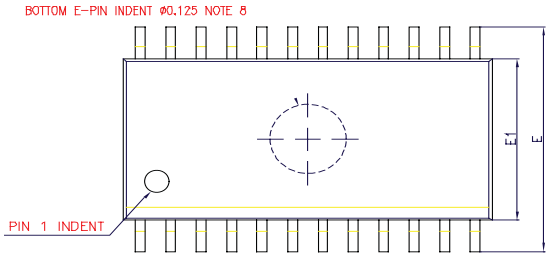
DETAIL A

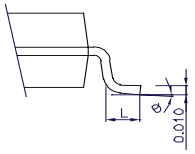
NOTE :
1. CONTROLLING DIMENSION : mm
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010"[0.25mm] PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.003"[0.08mm] TOTAL IN EXCESS OF THE "b" DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.002B"[0.07mm]
5. TOLERANCE : ±0.010"[0.25mm] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT : JEDEC SPEC MO-150

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	——	——	2.00	——	——	0.079
A1	0.05	——	——	0.002	——	——
A2	——	1.75	——	——	0.069	——
b	0.22	0.30	0.38	0.0086	0.012	0.015
C	0.13	0.15	0.20	0.0051	0.006	0.0079
D	10.08	10.20	10.34	0.397	0.402	0.407
E	7.40	7.80	8.20	0.291	0.307	0.323
E1	5.00	5.30	5.60	0.197	0.209	0.220
e	——	0.65	——	——	0.0256	——
L	0.56	0.75	0.97	0.022	0.030	0.037
θ	——	4°	8°	——	4°	8°
y	——	——	0.076	——	——	0.003

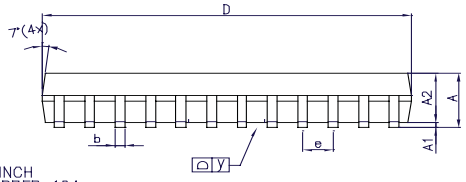
28-pin SSOP

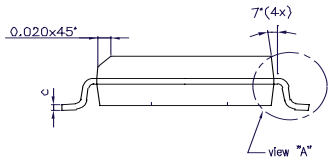
CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 28L (.209") BODY .025" LEAD PITCH SMALL OUTLINE PACKAGE DRAWING
DRAW BY: Monica Chen	10/11/99	
CHECK BY: Lee Chen	11/17/99	
APPROVAL: Paul Lau	11/17/99	DWG. NO. PO-SSOP-011 REV. 0
APPROVAL: Jack Tu	11/19/99	UNIT : mm SCALE : 10/1 SHEET 1 OF 1





view "A"





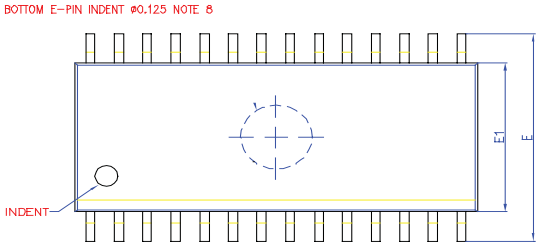
NOTE :
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010"[0.25mm] PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.003"[0.08mm] TOTAL IN EXCESS OF THE "b" DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.0028"[0.07mm]
5. TOLERANCE : ±0.010"[0.25mm] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT : JEDEC SPEC MS-013
8. BOTTOM E-PIN INDENT IN MARKED AS BELOW :

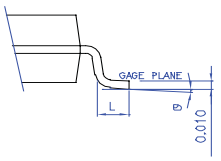
X : A ~ M
X : 1 ~ 14

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.36	2.49	2.64	0.093	0.098	0.104
A1	0.10	—	0.30	0.004	—	0.012
A2	—	2.34	—	—	0.092	—
b	0.33	0.41	0.51	0.013	0.016	0.020
C	0.23	0.25	0.30	0.009	0.010	0.012
D	15.19	15.39	15.49	0.598	0.606	0.610
E	10.01	10.31	10.64	0.394	0.406	0.419
E1	7.39	7.49	7.59	0.291	0.295	0.299
e	—	1.27	—	—	0.050	—
L	0.38	0.81	1.27	0.015	0.032	0.050
y	—	—	0.076	—	—	0.003
θ	0°	—	8°	0°	—	8°

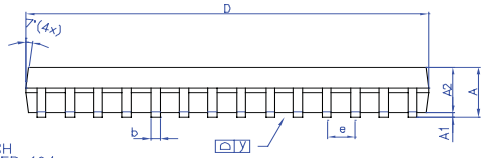
24-pin wSOIC

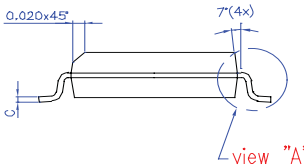
CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 24L WIDE BODY SMALL OUTLINE PACKAGE DRAWING
DRAW BY: Monica Chen	10/26/99	
CHECK BY: Leo Chen	11/01/99	
APPROVAL: Paul Lee	11/02/99	DWG. NO. PO-SOP-007 REV. 0
APPROVAL: Jack Tu	11/02/99	UNIT : INCH SCALE : 6/1 SHEET 1 OF 1





view "A"





NOTE :
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010"[0.25mm] PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.003"[0.08mm] TOTAL IN EXCESS OF THE "b" DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.0028"[0.07mm]
5. TOLERANCE : ±0.010"[0.25mm] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT : JEDEC SPEC MS-013
8. BOTTOM E-PIN INDENT IN MARKED AS BELOW :

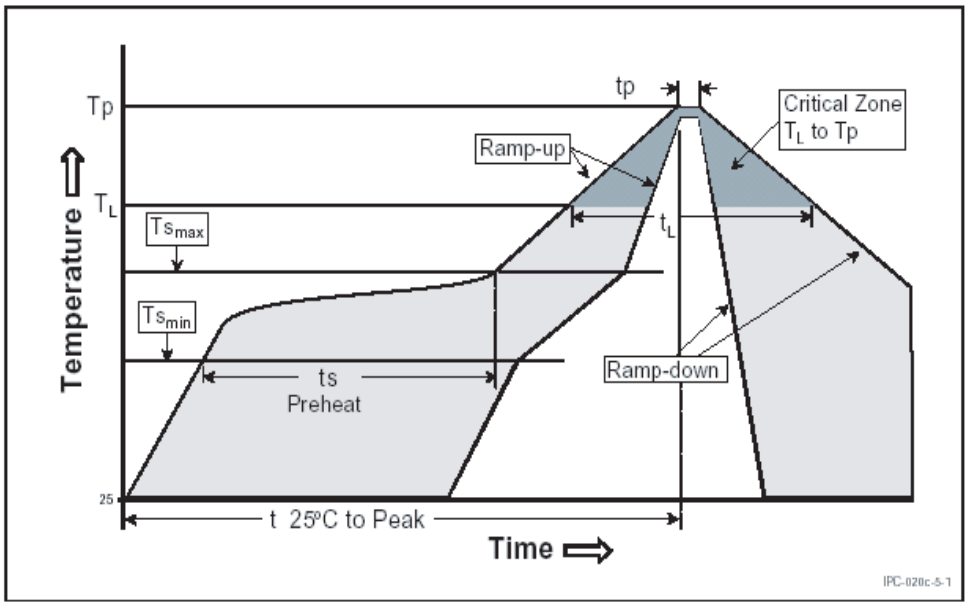
X : A ~ M
Y : 1 ~ 12

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.36	2.49	2.64	0.093	0.098	0.104
A1	0.10	—	0.30	0.004	—	0.012
A2	—	2.34	—	—	0.092	—
b	0.33	0.41	0.51	0.013	0.016	0.020
C	0.23	0.25	0.30	0.009	0.010	0.012
D	17.70	17.91	18.11	0.697	0.705	0.713
E	10.01	10.31	10.64	0.394	0.406	0.419
E1	7.39	7.49	7.59	0.291	0.295	0.299
e	—	1.27	—	—	0.050	—
L	0.38	0.81	1.27	0.015	0.032	0.050
y	—	—	0.076	—	—	0.003
θ	0°	—	8°	0°	—	8°

28-pin wSOIC

CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 28L WIDE BODY SMALL OUTLINE PACKAGE DRAWING
DRAW BY: Monica Chen	10/26/99	
CHECK BY: Leo Chen	11/01/99	
APPROVAL: Paul Lee	11/02/99	DWG. NO. PO-SOP-008 REV. 0
APPROVAL: Jack Tu	11/02/99	UNIT : INCH SCALE : 6/1 SHEET 1 OF 1

Green Package SMD IR Reflow Profile Information

IR Reflow Profile Conditions		
Profile Feature	JESD Sn-Pb Eutectic Assembly	**JESD Pb-free Assembly**
Average Ramp-Up Rate (T_{Smax} to T_P)	3°C/seconds max.	**3°C/seconds max.**
Pre-heat **- Temperature Min (T_{Smin})** **- Temperature Max (T_{Smax})** **- Time (T_{Smin} to t_{Smax})**	 100°C 150°C 60~120 seconds	 **150°C** **200°C** **60~180 seconds**
Time maintained above: **- Temperature (T_L)** **- Time (t_L)**	 183°C 60~150 seconds	 **217°C** **60~150 seconds**
Peak/Classification Temperature (T_P)	235°C+5/-0°C	**255°C+5/-0°C**
Time within 5°C of actual Peak Temperature (t_P)	10~30 seconds	**20~40 seconds**
Ramp-Down Rate	6°C/second max.	**6°C/second max.**
Time 25°C to Peak Temperature	6 minutes max.	**8 minutes max.**

Zywyn Green Packages are Pb-free and RoHS compliance.

Ordering Information

Part Number	Drivers	Receivers	Temperature Range	Package Type	Green Package
ZT207ECA	5	3	0°C to +70°C	24-pin SSOP	
ZT207ECT	5	3	0°C to +70°C	24-pin WSOIC	
ZT208ECA	4	4	0°C to +70°C	24-pin SSOP	
ZT208ECT	4	4	0°C to +70°C	24-pin WSOIC	
ZT211ECA	4	5	0°C to +70°C	28-pin SSOP	
ZT211ECT	4	5	0°C to +70°C	28-pin WSOIC	
ZT213ECA	4	5 (2 active in SD)	0°C to +70°C	28-pin SSOP	
ZT213ECT	4	5 (2 active in SD)	0°C to +70°C	28-pin WSOIC	
ZT207EEA	5	3	-40°C to +85°C	24-pin SSOP	ZT207LEEA
ZT207EET	5	3	-40°C to +85°C	24-pin WSOIC	ZT207LEET
ZT208EEA	4	4	-40°C to +85°C	24-pin SSOP	ZT208LEEA
ZT208EET	4	4	-40°C to +85°C	24-pin WSOIC	ZT208LEET
ZT211EEA	4	5	-40°C to +85°C	28-pin SSOP	ZT211LEEA
ZT211EET	4	5	-40°C to +85°C	28-pin WSOIC	ZT211LEET
ZT213EEA	4	5 (2 active in SD)	-40°C to +85°C	28-pin SSOP	ZT213LEEA
ZT213EET	4	5 (2 active in SD)	-40°C to +85°C	28-pin WSOIC	ZT213LEET

Please contact the factory for pricing, availabiliy on Tape-and-Reel, and *Green Package* options.

Zywyn Corporation
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Email: sales@zywyn.com • www.zywyn.com