Zywyn

ZT202F, ZT232F
ZT310F, ZT312F

Low Power 5V 1,000kbps RS232 Transceivers

Features

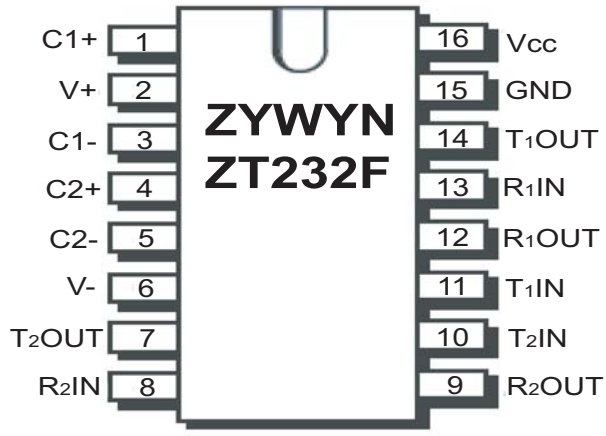
- Meets EIA/TIA-232F and CCITT V.28/V.24 specifications for V_{CC} at +5V ±10%
- Low Quiescent Current – 3mA typ., 5mA max.
- Low Shutdown Current (where applicable) - 1µA typical, 5µA max.
- Guaranteed High Data Rate 1,000kbps
- Proprietary Switch-Capacitor Regulated Voltage Converters (patent pending)
- Use Small 0.1µF Capacitors
- Wake Up Feature (where applicable) in Shutdown Mode
- Tri-State Receiver Outputs
- Latch-up Free
- ESD Protection for RS-232 I/O's
  ±15kV Human Body Model (HBM)
- Standard Data Rate at 250kbps Available on ZT232E Series

General Description

The ZT232F series devices are +5V powered EIA/TIA-232 and CCITT V.28/V.24 communication interfaces with low power requirements. These transceivers consist of two line drivers, two line receivers and the proprietary switch-capacitor regulated voltage converters. The ZT310F and ZT312F 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 high data rate of 1,000k bits/sec with enhanced electrostatic discharge (ESD) protection in all RS232 I/O pins exceeding ±15kV HBM.

Applications

- Single Power Supply Applications
- Industrial and Embedded PCs
- Set Top Boxes
- Terminal Adapters
- POS terminals
- Peripherals Interface
- Routers and HUBs



16-pin PDIP/nSOIC/wSOIC/TSSOP

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 EXAR	Pin-to-Pin Cross MAXIM
ZT202F	2	2	0	4	No	No	No	1000	± 15kV	N/A	N/A
ZT232F	2	2	0	4	No	No	No	1000	± 15kV	N/A	N/A
ZT310F	2	2	0	4	Yes	No	Yes	1000	± 15kV	N/A	N/A
ZT312F	2	2	2	4	Yes	Yes	Yes	1000	± 15kV	N/A	N/A

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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
16-pin PDIP (derate 11.20mW/°C above +70°C) 896mW
16-pin nSOIC (derate 10.00mW/°C above +70°C) 720mW
16-pin wSOIC (derate 10.10mW/°C above +70°C) 787mW
16-pin SSOP (derate 7.20mW/°C above +70°C) 584mW
16-pin TSSOP (derate 6.80mW/°C above +70°C) 556mW
18-pin PDIP (derate 12.60mW/°C above +70°C) 962mW
18-pin wSOIC (derate 11.10mW/°C above +70°C) 850mW
20-pin PDIP (derate 12.80mW/°C above +70°C) 976mW
20-pin SSOP (derate 8.10mW/°C above +70°C) 647mW
20-pin wSOIC (derate 11.10mW/°C above +70°C) 850mW
20-pin TSSOP (derate 7.20mW/°C above +70°C) 584mW

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 168 hours or stored in an environment at or below 20%RH. If the above conditions cannot be followed, the parts should be baked for 12 hours at 125°C in order to 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. The MSL of this product is 3.

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, $\overline{EN}$, $\overline{SHDN}$ R_1OUT, R_2OUT R_1IN, R_2IN T_1OUT, T_2OUT 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	TTL Inputs = V_{CC}/GND, RS-232 Input = float, T_A = 25°C V_{CC} = +5.0V ±10%, No load on transmitter outputs (For ZT232F) (For ZT202F, ZT310F, ZT312F)		3 4	5 8	mA mA
Supply Current Transmitters Loaded	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		15		mA
Supply Current, SHUTDOWN Enabled	$\overline{SHDN}$ = GND, TTL Inputs = V_{CC}/GND, T_A = 25°C $\overline{RS\text{-}232}$ Inputs = float, V_{CC} = +5.0V (For ZT310F/ZT312F)		1	5	µA
TTL LOGIC Input Input Threshold Low Input Threshold High Input Hysteresis Input Leakage Current	V_{CC} = +5.0V Supply T_1IN, T_2IN, $\overline{EN}$, $\overline{SHDN}$ T_1IN, T_2IN, $\overline{EN}$, $\overline{SHDN}$ T_1IN, T_2IN T_xIN = GND	 2.4 	 0.5 15	 0.8 200	 V V V µA
TTL LOGIC Output Output Voltage Low Output Voltage High Output Leakage Current	 I_{OUT} = 3.2mA I_{OUT} = –1.0mA $\overline{SHDN}$ = GND, $\overline{EN}$ = V_{CC}; GND ≤ V_{OUT} ≤ V_{CC} (For ZT310F/ZT312F)	 3.5 	 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 0.2 3	 1.2 1.7 0.5 	 25 2.4 1.0 7	 V V V V kΩ
Transmitter Output Output Voltage Swing Output Resistance Output Short-Circuit Current Output Leakage Current	 R_L = 3~7kΩ, All Outputs are loaded (For ZT232F) R_L = 3~7kΩ, All Outputs are loaded, V_{CC}= 5.25V (For ZT202F, ZT310F, ZT312F) $V_{CC} = V_{DD} = V_{SS}$ = GND, V_{OUT} = ±2V V_{OUT} = GND Transmitter Disabled, V_{OUT} = ±12V	 ±5 ±5 300 	 ±6 ±9 ±20 ±5	 ±60 	 V 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 (1Tx/1Rx) Switching	R_L = 3~7kΩ, C_L = 50pF~2500pF, T_A = 25°C	1000			kbps
Transition-Region Slew Rate	R_L = 3~7kΩ, C_L = 50pF~2500pF, One Transmitter Switching, T_A = 25°C, Measured from +3V to –3V or –3V to +3V, V_{CC} = 4.5V		90		V/µs
Transmitter Propagation t_{PLH}	All transmitters loaded with R_L = 3kΩ, C_L = 1000pF		2.0		µs
Transmitter Propagation t_{PHL}	All transmitters loaded with R_L = 3kΩ, C_L = 1000pF		2.0		µs
Tramsmitter Skew	t_{PHL}- t_{PLH}		100		ns
Transmitter Output Enable Time	(For ZT310F/ZT312F)		0.4		µs
Transmitter Output Disable Time	(For ZT310F/ZT312F)		0.25		µs
Receiver Propagation t_{PLH}	C_L = 150pF		0.15		µs
Receiver Propagation t_{PHL}	C_L = 150pF		0.15		µs
Receiver Skew	t_{PHL} - t_{PLH}		50		ns
Receiver Output Enable Time	(For ZT310F/ZT312F)		0.2		µs
Receiver Output Disable Time	(for ZT310F/ZT312F)		0.2		µs
ESD Tolerance					
RS-232 I/Os ESD HBM			±15		kV
TTL/CMOS I/Os ESD HBM			±2		kV

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

Table 1. Wake-Up Truth Table for ZT312F

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 ZT310F and ZT312F 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 ZT310F, enable is active low, in which a logic HIGH applied to the OFF pin will enable the receiver outputs. For the ZT310F, enable is active high in which a logic HIGH applied to the EN pin will enable the receiver outputs.

ZT310F and ZT312F have a low-power shutdown mode controlled by the ON/OFF pin for the ZT310F and the SHDN pin for the ZT312F. During shutdown the driver output and the switch-capacitor regulated voltage converter are disabled with the supply current falls to less than 1µA.

ZT312F includes a wakeup function that enables both 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. After the supply voltage to the ZT312F reaches +5.0V, the SHDN pin can be disabled, taking the ZT312F 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.

EN61000-4-2 is used for testing ESD on equipment and systems. For system manufacturers, they must guarantee a certain amount of ESD protection since the system itself is exposed to the outside environment and human presence. EN61000-4-2 specifies that the system is required to withstand an amount of static electricity when ESD is applied to exposed metal points and surfaces of the equipment that are accessible to personnel during normal usage. The transceiver IC receives most of the ESD current when the ESD source is applied to the connector pins.

There are two methods within EN61000-4-2, the Air Discharge method and the Contact Discharge method. With the Air Discharge Method, an ESD voltage is applied to the equipment under test through air, which simulates an electrically charged person ready to connect a cable onto the rear of the system and the high energy potential on the person discharges through an arcing path to the rear panel of the system before he or she even touches the system. The Contact Discharge Method applies the ESD current directly to the EUT. This method was devised to reduce the unpredictability of the ESD arc. The discharge current rise time is constant since the energy is directly transferred without the air-gap arc inconsistencies.

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.

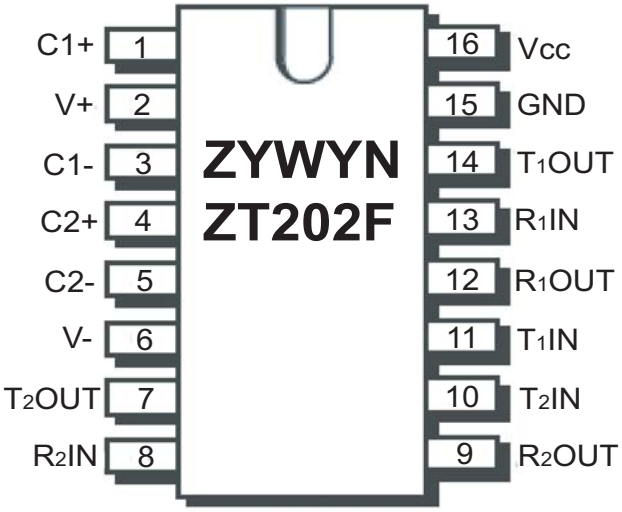
The drivers are inverting transmitters, which accept TTL or CMOS inputs and produces the RS-232 compliant signals that is inverted relative to the input logic levels. Typically the RS232 output voltage swing is ±6V. Even under the worst case loading conditions of 3kohms and 2500pF, the output is guaranteed 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 pulldown resistor to ground will force the output of the receiver to a high state.

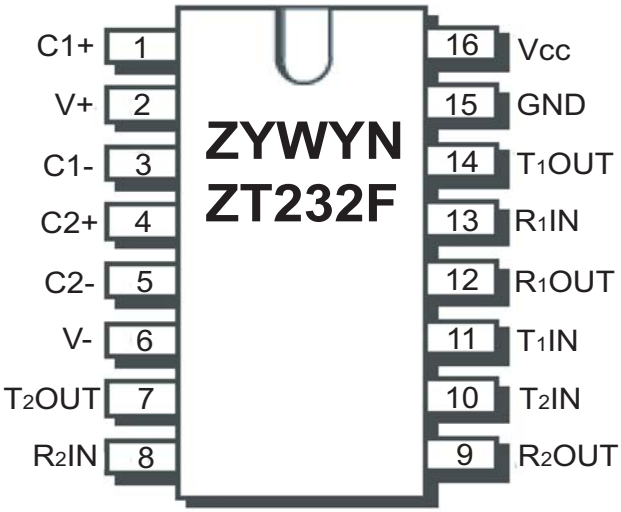
Specification	RS-232D	RS-423A	RS-422	RS-485	RS-562
Mode of Operation	Single-Ended	Single-Ended	Differential	Differential	Single-Ended
No. of Drivers and Receivers Allowed on One Line	1 Driver 1 Receiver	1 Driver 10 Receivers	1 Driver 10 Receivers	32 Drivers 32 Receivers	1 Driver 1 Receiver
Maximum Cable 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



16-pin PDIP/nSOIC/wSOIC/TSSOP



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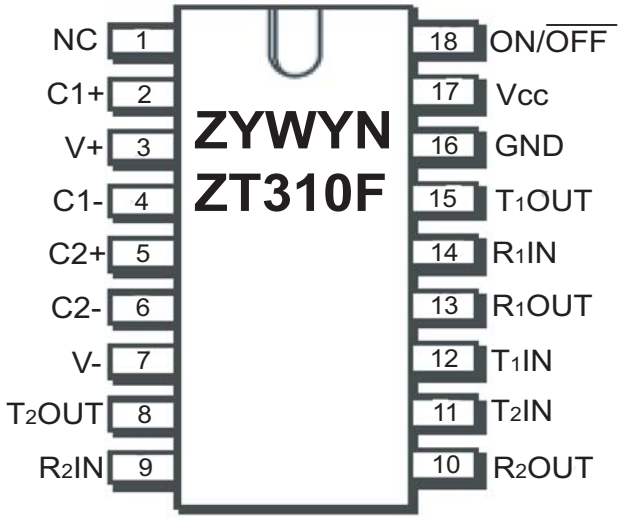
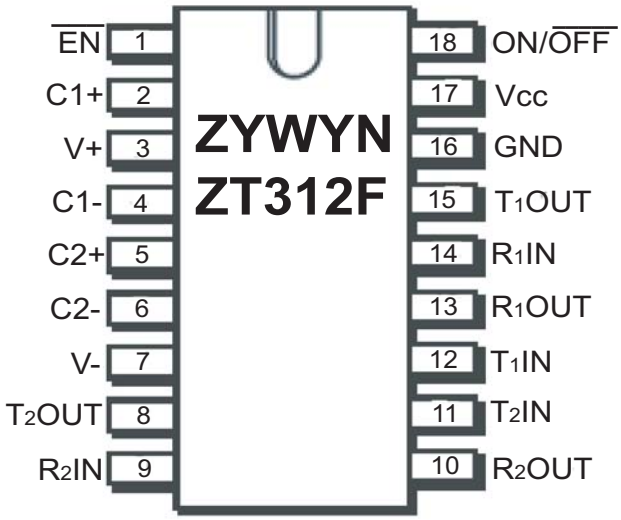


18-pin PDIP/wSOIC



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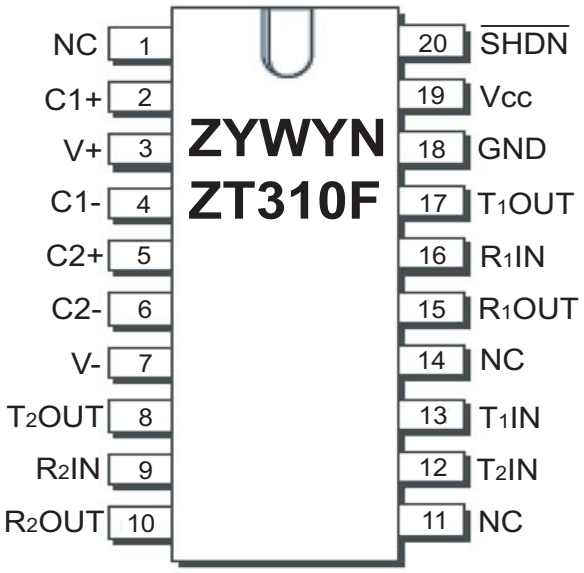
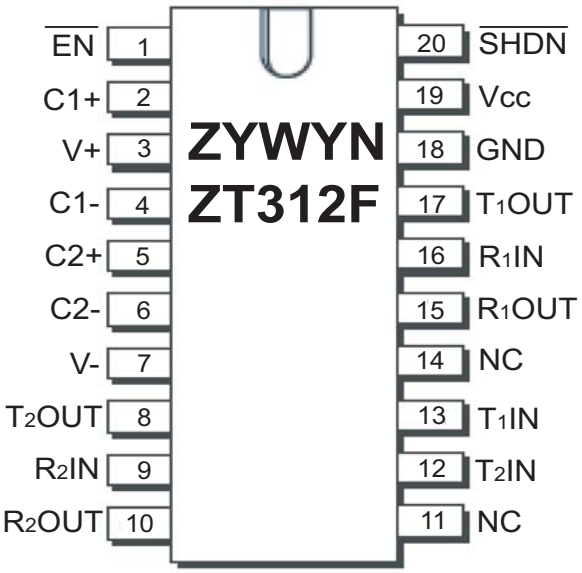
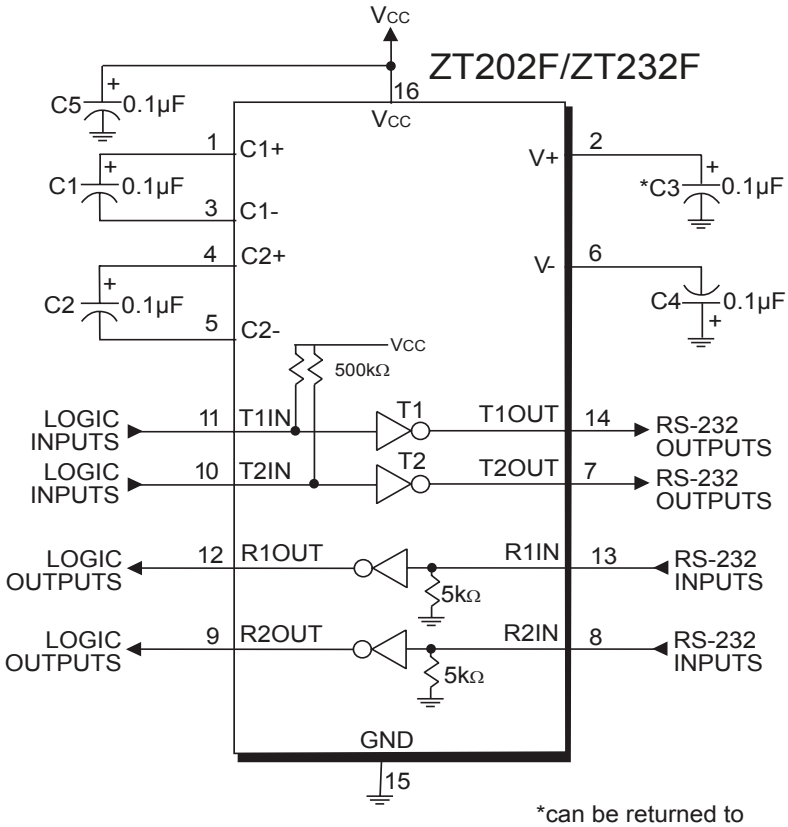


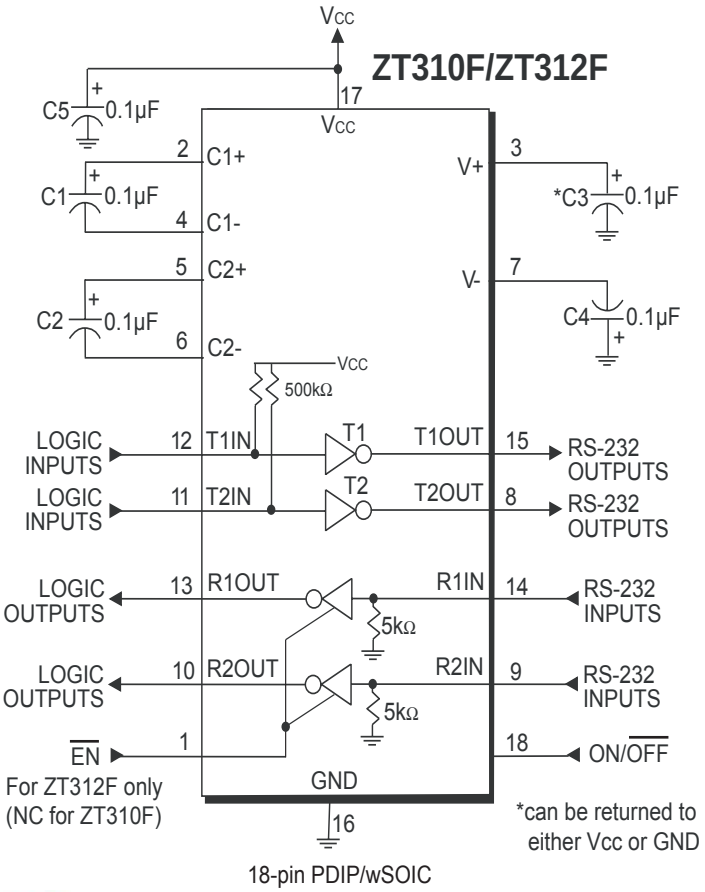
20-pin SSOP

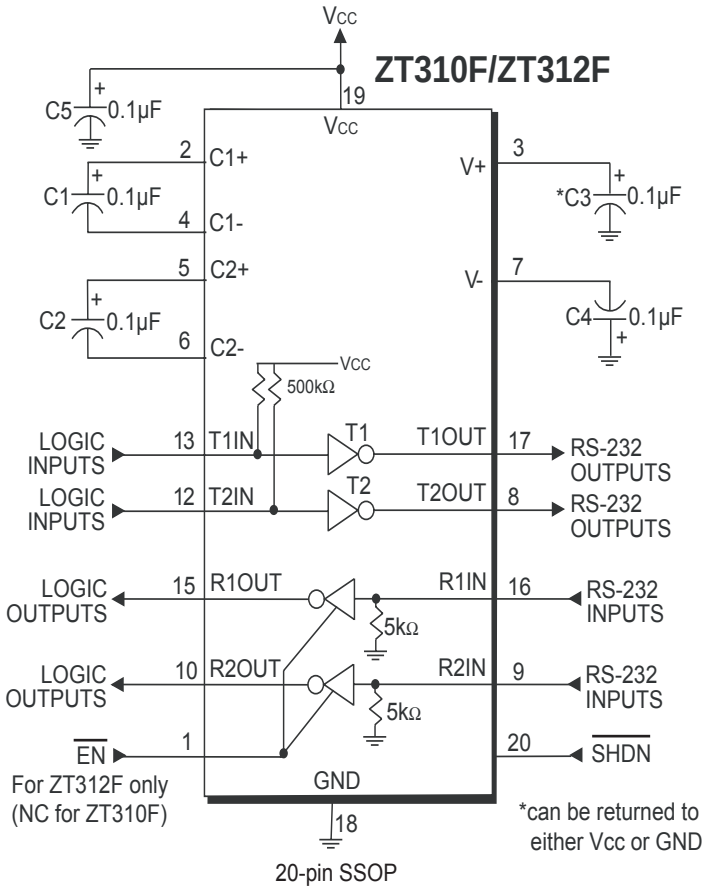


20-pin SSOP

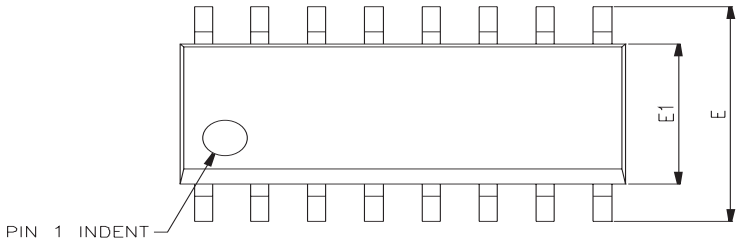
Typical Application Circuits

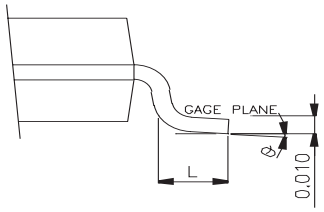




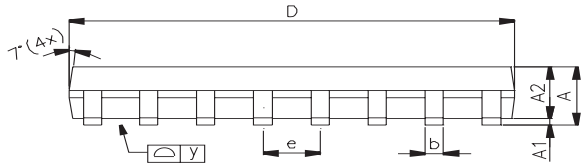


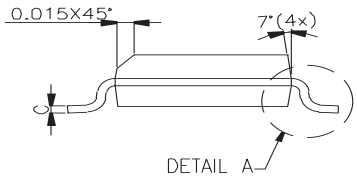
Package Information





DETAIL A





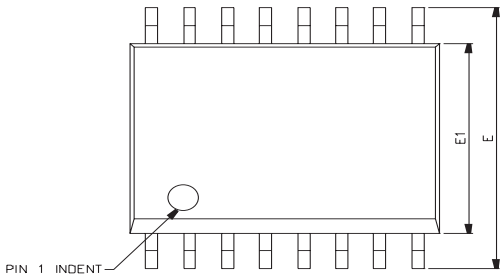
DETAIL A

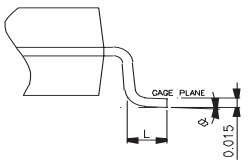
NOTE :
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END. DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL 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 0.0028"[0.07mm]
5. TOLERANCE : ±0.010"[0.25mm] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT : JEDEC SPEC MS-012

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.47	1.60	1.73	0.058	0.063	0.068
A1	0.10	——	0.25	0.004	——	0.010
A2	——	1.45	——	——	0.057	——
b	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.0098
D	9.80	9.91	10.01	0.386	0.390	0.394
E	5.79	5.99	6.20	0.228	0.236	0.244
E1	3.81	3.91	3.99	0.150	0.154	0.157
e	——	1.27	——	——	0.050	——
L	0.38	0.71	1.27	0.015	0.028	0.050
y	——	——	0.076	——	——	0.003
θ	0°	——	8°	0°	——	8°

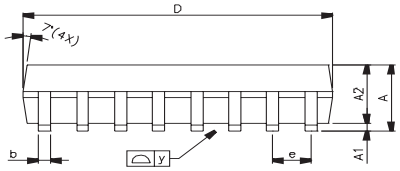
16-pin nSOIC

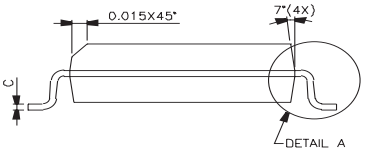
CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 16L SMALL OUTLINE PACKAGE DRAWING(0.150")
DRAW BY: Monica Chen	11/09/99	
CHECK BY: Lee Chen	11/10/99	DWG. NO. PO-SOP-003 REV. 0
APPROVAL: Paul Lee	11/10/99	
APPROVAL: Jack Fu	11/11/99	UNIT : INCH SCALE : 12/1 SHEET 1 OF 1





DETAIL A



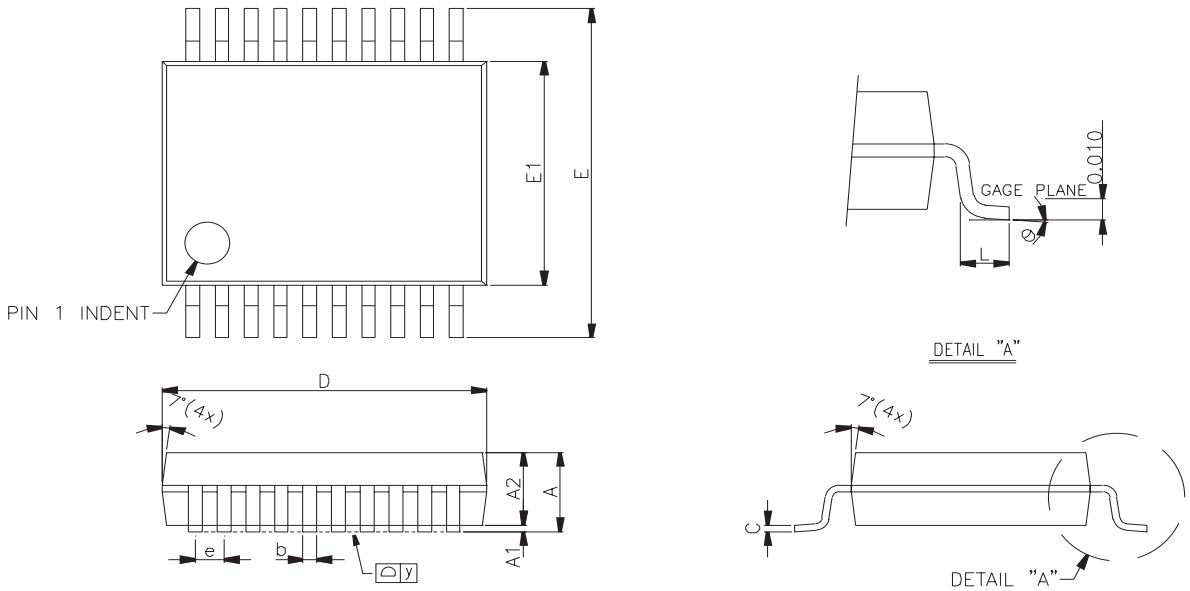


NOTE :
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END. DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL 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 0.0028"[0.07mm]
5. TOLERANCE : ±0.010"[0.25mm] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT : JEDEC SPEC MS-013

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	——	2.31	——	——	0.091	——
b	0.33	0.41	0.51	0.013	0.016	0.020
C	0.18	0.23	0.28	0.007	0.009	0.011
D	10.08	10.31	10.49	0.397	0.406	0.413
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°

16-pin wSOIC

CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 16L WIDE BODY SMALL OUTLINE PACKAGE DRAWING
DRAW BY: Monica Chen	10/28/99	
CHECK BY: Lee Chen	11/01/99	DWG. NO. PO-SOP-004 REV. 0
APPROVAL: Paul Lee	11/02/99	
APPROVAL: Jack Fu	11/02/99	UNIT : INCH SCALE : 8/1 SHEET 1 OF 1

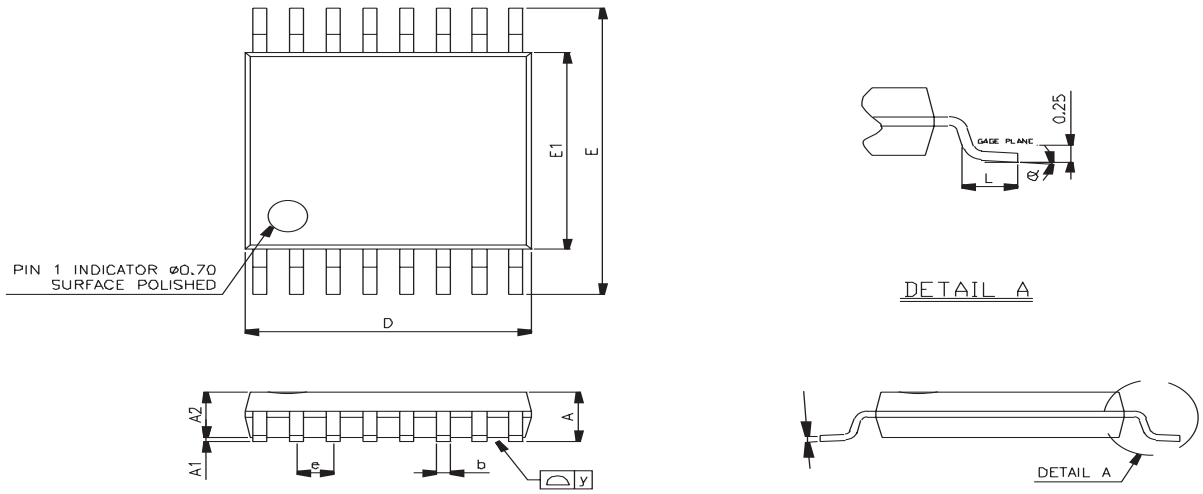


NOTE :
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL 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 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	7.08	7.20	7.34	0.279	0.284	0.289
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

20-pin SSOP

CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 20L MEDIUM FINE PITCH STANDARD SMALL OUTLINE PACKAGE DRAWING
DRAW BY: Monica Chen	09/29/99	
CHECK BY: Leo Chen	12/01/99	
APPROVAL: Paul Lee	12/01/99	DWG. NO. PO-SSOP-010 REV. 0
APPROVAL: Jack Fu	12/01/99	UNIT : INCH SCALE : 12/1 SHEET 1 OF 1

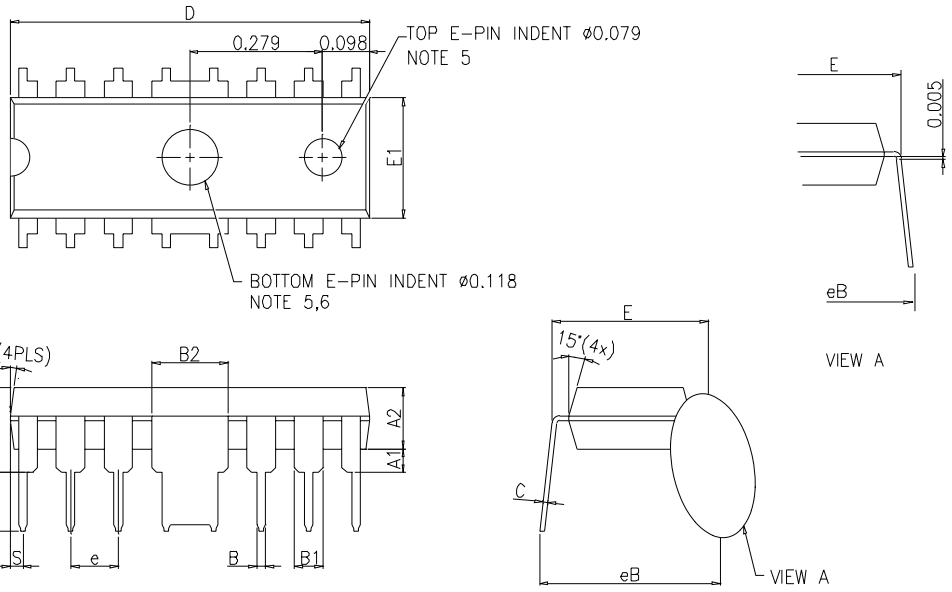


NOTE :
1. CONTROLLING DIMENSION : mm
2. LEAD FRAME MATERIAL : OLIN C7025/EFTEC 64T
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006"[0.15mm] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH 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 MO-153

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.05	1.10	1.20	0.041	0.043	0.047
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	——	1.00	1.05	——	0.039	0.041
b	0.20	0.25	0.28	0.008	0.010	0.011
C	——	0.127	——	——	0.005	——
D	4.90	5.075	5.10	0.193	0.1998	0.200⚠
E	6.20	6.40	6.60	0.244	◇.252	0.260
E1	4.30	4.40	4.50	0.170	◇.173	0.177
e	——	0.65	——	——	0.026	——
L	0.50	0.60	0.70	0.020	0.024	0.028
y	——	——	0.076	——	——	0.003
θ	0°	4°	8°	0°	4°	8°

16-pin TSSOP

CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE: 16L TSSOP PACKAGE OUTLINE DRAWING
DRAW BY: Monica Chen	06/05/00	
CHECK BY: Leo Chen	06/12/00	
APPROVAL: Paul Lee	06/12/00	DWG. NO. PO-TSSOP-002 REV. 1
APPROVAL: Jack Fu	06/12/00	UNIT : mm SCALE : 15/1 SHEET 1 OF 1



NOTES :

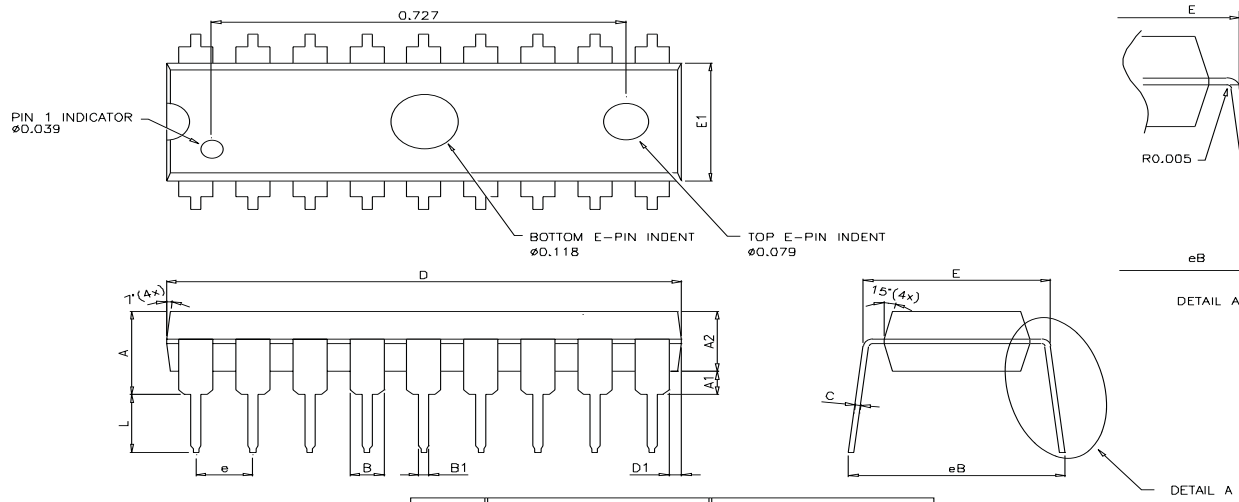
1. CONTROLLING DIMENSION : INCH
2. LEAD FRAME MATERIAL : OLIN 151 3/4 HARD
3. PACKAGE DIMENSION EXCLUDE MOLDING FLASH
4. THE MAX. ALLOEABLE MOLDING FLASH IS 0.010"
5. THE DEPTH OF E-PIN INDENT : 0.010"-0.015".
6. BOTTOM E-PIN INDENT ARE MARKED AS BELOW :

X : A ~ M
Y : 0 ~ 9

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—		—	—	0.180
A1	0.38	0.51	0.64	0.015	0.020	0.025
A2	3.05	3.30		0.120	0.130	0.140
B	0.41	0.46		0.016	0.018	0.020
B1	1.40	1.52		0.055	0.060	0.065
C	0.20	0.25		0.008	0.010	0.012
D	18.90	19.15		0.744	0.754	0.760
E	7.62	—		0.300	—	0.325
E1	6.35	6.50		0.250	0.256	0.260
e	—	2.54	—	—	0.100	—
L	2.79	3.05	3.30	0.110	0.120	0.130
eB	7.62	—		0.300	—	0.380
S	0.56	0.69	0.76	0.022	0.027	0.030
B2	3.94	4.06	4.19	0.155	0.160	0.165

16-pin PDIP

CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE : 16L PLASTIC DIP BATWING PACKAGE OUTLINE DRAWING
DRAW BY: Vivi Chen	07/07/99	
CHECK BY: Thomas Kao	7/8/'99	
APPROVAL: Paul Leu	7/8/'99	DWG. NO. PO-DIP-004 REV. 0
APPROVAL: Jack Ju	7/8/'99	UNIT : INCH SCALE : 5/1 SHEET 1 OF 1



NOTES :

1. CONTROLLING DIMENSION : INCH
2. PACKAGE DIMENSION EXCLUDE MOLD FLASH OR PROTRUSION.
3. ALLOWABLE MOLD FLASH OR PROTRUSION SHALL NOT EXCEED 0.010".
4. FREMA MATERIAL: A194
5. TOLERANCE : 0.010" UNLESS OTHERWISE SPECIFIED.
6. AFTER SOLDER DIPPING LEAD THICKNESS WILL BE 0.020" MAX.
7. THE BOTTOM E-PIN INDENT ARE MARKED AS FOLLOW:

X : A~M (Except I)
Y : 0~9

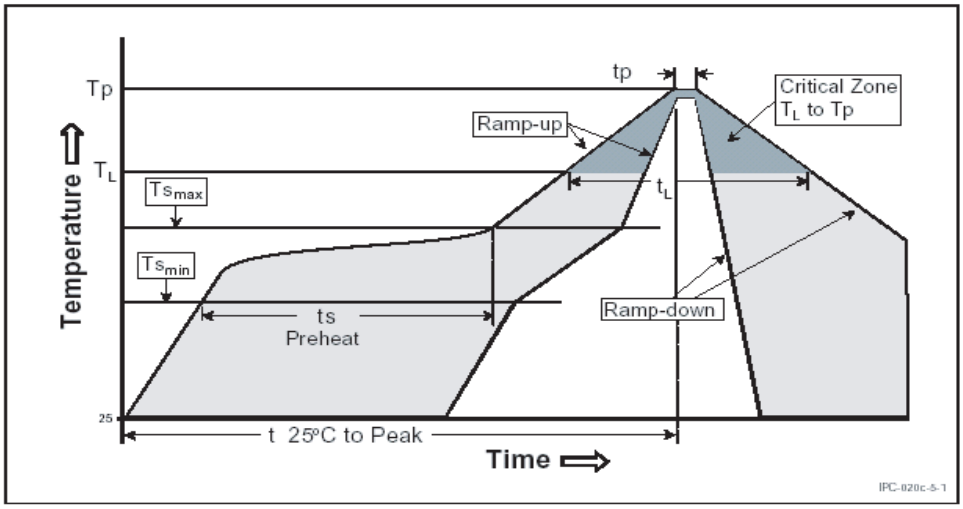
SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—	4.57	—	—	0.180
A1	0.38	—	—	0.015	—	—
A2	—	3.30	3.56	—	0.130	0.140
B1	0.36	0.46	0.56	0.014	0.018	0.022
B	1.27	1.52	1.78	0.050	0.060	0.070
C	0.20	0.25	0.33	0.008	0.010	0.013
D	22.71	22.96	23.11	0.894	0.904	0.910
D1	0.43	0.56	0.69	0.017	0.022	0.027
E	7.62	—	8.26	0.300	—	0.325
E1	6.40	6.50	6.65	0.252	0.256	0.262
e	—	2.54	—	—	0.100	—
L	3.18	—	—	0.125	—	—
eB	8.38	—	9.65	0.330	—	0.380

18-pin PDIP

CUSTOMER :		ZYWYN CORPORATION
APPROVED BY	DATE	TITLE : 18L P-DIP PACKAGE OUTLINE DRAWING
DRAW BY: Vivi Chen	07/14/'99	
CHECK BY: Thomas Kao	7/14/'99	
APPROVAL: Paul Leu	7/14/'99	DWG. NO. PO-DIP-005 REV. 0
APPROVAL: Jack Ju	7/15/'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.**

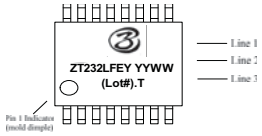
Zywyn Green Packages are Pb-free and RoHS compliance.

Ordering Information

Part Number	Drivers	Receivers	Temperature Range	Package Type
ZT202LFEN	2	2	-40°C to +85°C	16-pin nSOIC
ZT202LFEP	2	2	-40°C to +85°C	16-pin PDIP
ZT202LFET	2	2	-40°C to +85°C	16-pin wSOIC
ZT202LFEY	2	2	-40°C to +85°C	16-pin TSSOP
ZT232LFEN	2	2	-40°C to +85°C	16-pin nSOIC
ZT232LFEP	2	2	-40°C to +85°C	16-pin PDIP
ZT232LFET	2	2	-40°C to +85°C	16-pin wSOIC
ZT232LFEY	2	2	-40°C to +85°C	16-pin TSSOP
ZT310LFET	2	2	-40°C to +85°C	18-pin wSOIC
ZT310LFEA	2	2	-40°C to +85°C	20-pin SSOP
ZT312LFET	2	2(with $\overline{EN}$)	-40°C to +85°C	18-pin wSOIC
ZT312LFEA	2	2(with $\overline{EN}$)	-40°C to +85°C	20-pin SSOP

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

TOPSIDE MARK INSTRUCTIONS:



Line 1: Zywyn (logo)
Line 2: Zywyn Part Number "ZT232LFEY", Space " ", Date Code (Prod Year & Week)
Line 3: Lot #, dot and Country ".T"
Note: Pin # 1 "△" Indicator Required if no mold dimple

BOTTOMSIDE MARK INSTRUCTIONS:

No Bottom -side Marking

Zywyn Corporation
Headquarters and Sales Office
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Email: sales@zywyn.com • www.zywyn.com