

CT1698 MIL-STD-1397 Type E 10MHz Low Level Serial Interface

Features

- Optional transformer isolation
- Internally set threshold
- Matched to 50 ohm system impedance power on and off
- Operates with ± 5 volt supplies
- Power management
- External output level adjustment
- Accepts synchronous input data
- Unique Manchester decoder requires no clock
- Generates one clock per received bit
- May be used for serial decoding of indefinite word lengths
- Interfaces directly to the CT2500 protocol device
- Other Wire and Fiber Optic types available



General Description

CT1698 is a single hybrid microcircuit which incorporates a serial encoder, transceiver, and Manchester decoder in one package. The encoder accepts serial NRZ data in conjunction with two synchronous clocks. The CT1698 receiver section accepts bipolar Manchester encoded signals and passes level detected signals to the serial decoder. The CT1698 has a power management function and a variable drive level option. The transmitter standby mode is available to reduce the overall power consumption of the CT1698. The variable drive level output is externally programmable for testing purposes. Aeroflex Circuit Technology is a 80,000 square foot MIL-PRF-38534 certified facility in Plainview, N.Y.

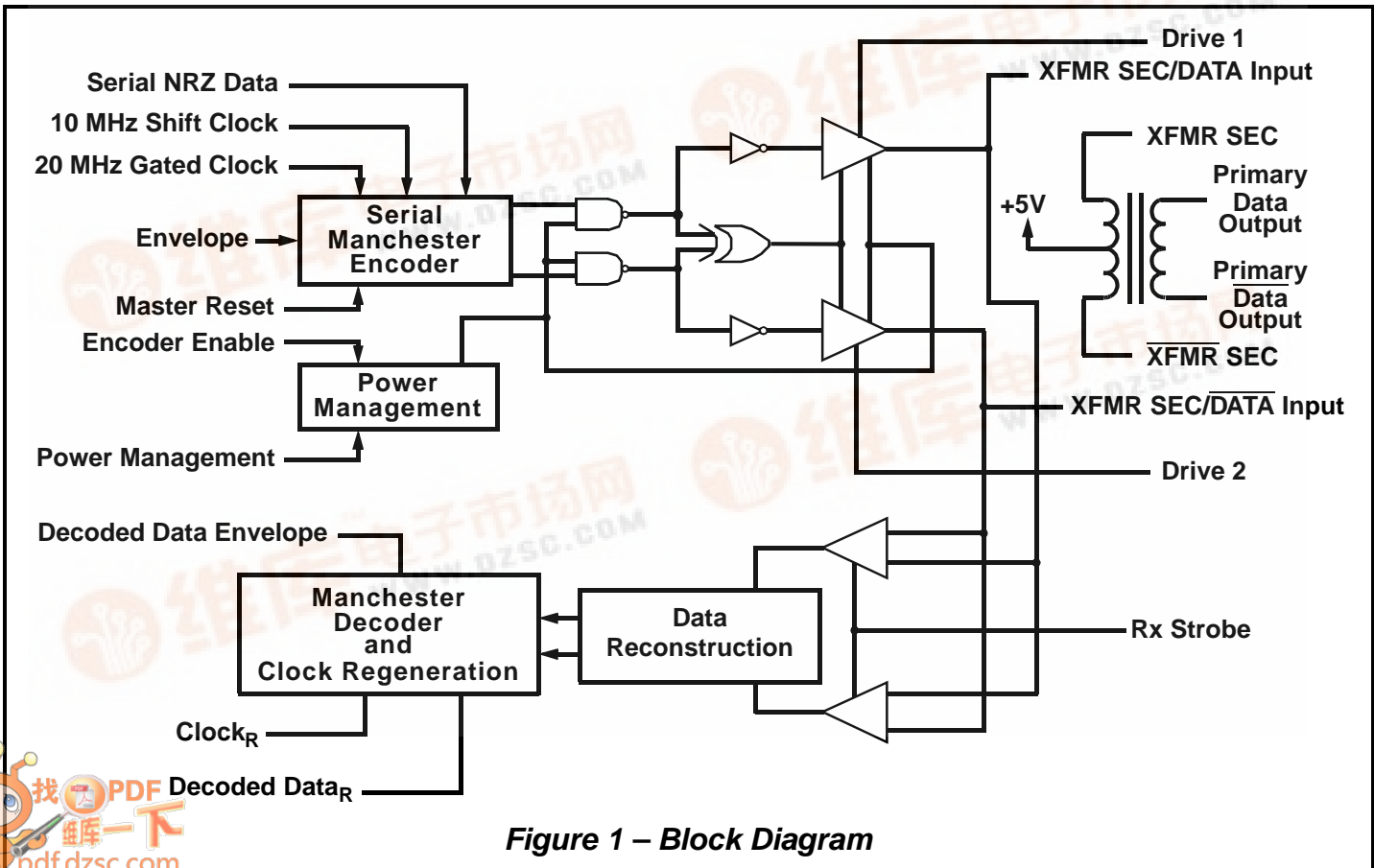


Figure 1 – Block Diagram



Transmission

The CT1698 accepts synchronous NRZ Data in conjunction with two clocks signals. The NRZ data stream is then converted to Manchester code which is transformer coupled to a 50 ohm Tri-axial cable for transmission up to 1000 ft.

The transmitter may be placed into standby condition. This reduces power consumption by approximately 600mW. Power management is made available via two standard TTL input pins. The Receiver is always active and is not affected by the power management circuitry.

The drive level of the transmitter may be changed by adding external resistors to the drive pins. These pins allow the designer to externally program the transmitter output level from 0.7 to 2.8 Volts peak to peak.

The transceiver is matched for 50 ohm operation over a wide band of frequencies. This condition is maintained with power on and off.

Reception

The CT1698 receiver section accepts a bipolar signal which is level detected and passed to the serial decoder. The decoder section reconstructs the data and strips the clock from the serial stream. An NRZ decoded data stream is then produced synchronously with a recovered clock. The receiver is designed to meet the MIL-STD-1397 Type E requirements.

Electrical Requirements

The specification detailed herein encompasses a hybrid Transceiver/Encoder-Decoder designed to meet the requirements of the MIL-STD-1397 Type E. The transceiver is transformer coupled to the specified triaxial cable.

See Figure 1 for Block Diagram. Inputs and Outputs are all Synchronous NRZ DATA STREAMS. The transformer is internal to the package with its use being optional.

Encoding Timing / Transmitter Specification

Symbol	Parameter / Condition	Min	Typ	Max	Unit
Encode Timing					
t1	Input data set-up time	10		40	ns
t2	Encode clock set-up time	10		40	ns
t3	Encode envelope set-up time	10		40	ns
t4	Encode envelope turn-off time	10		35	ns
t5	Transmitter activation set-up time	100			ns
t6	Transmitter deactivation hold-time	50			ns
tw1	20 MHz gated CK pulse width high	20		30	ns
tw2	Encoder shift CK pulse width high	45		55	ns
Output Signals					
Va	Output amplitude (see Figure 2)	.45	.7	.8	V
T	Pulse period	97	100	103	ns
Ts	Width of 1st positive half bit	45		65	ns
Te	Width of last half bit	47		65	ns
T/2	Half pulse period	47	50	53	ns
Tr	Pulse rise time	.05		.3	V/ns
Tf	Pulse fall time	.05		.3	V/ns
Vs	Voltage overshoot			100	mV
Tos	Offset Voltage 2T after last zero crossing			30	mV
Tdtx	Delay from 20 MHz clock input to data output on TXFMR secondary		20	55	ns
Zo	Output Impedance	45	50	55	Ω

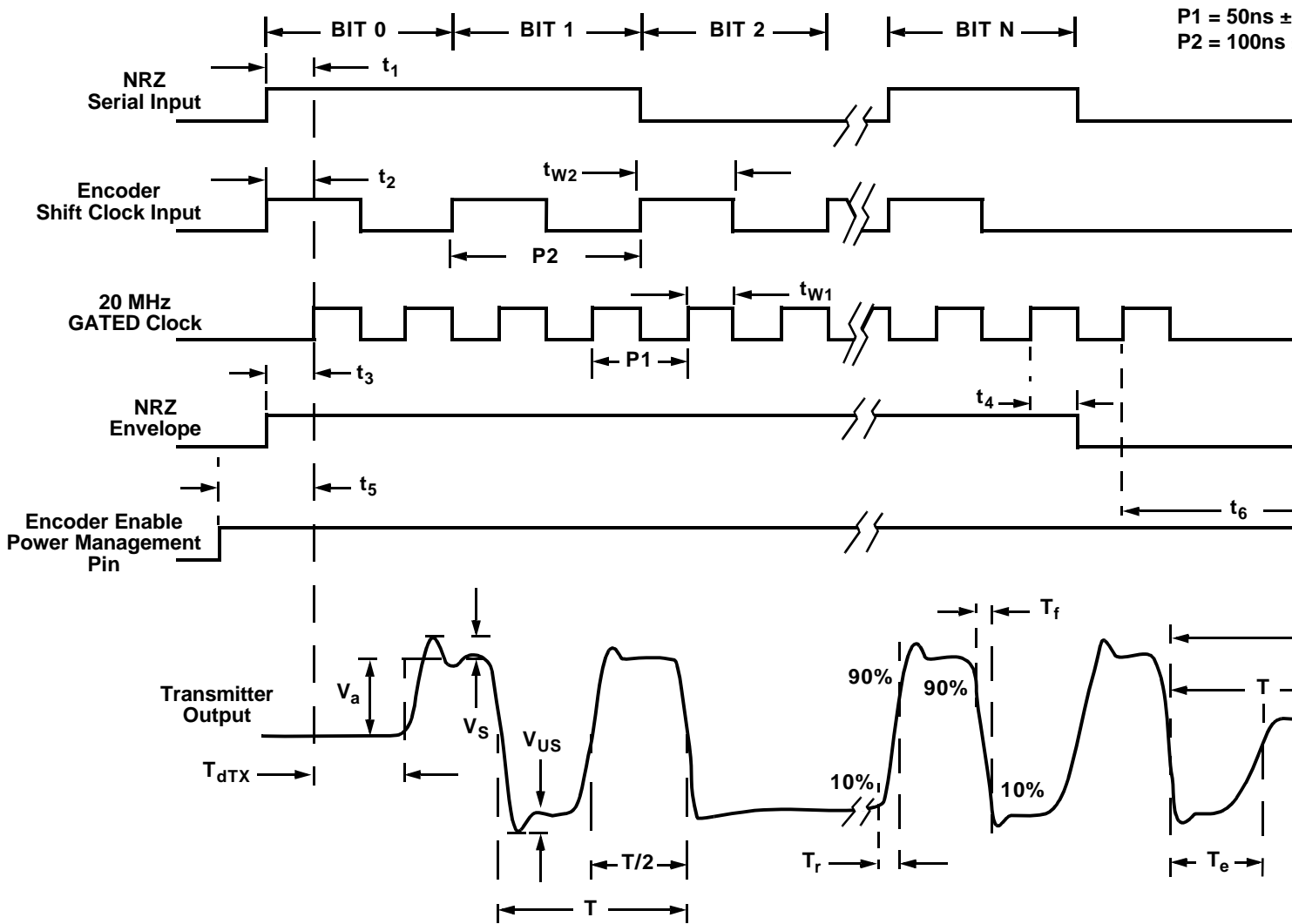


Figure 2 Encoder – Transmitter Timing

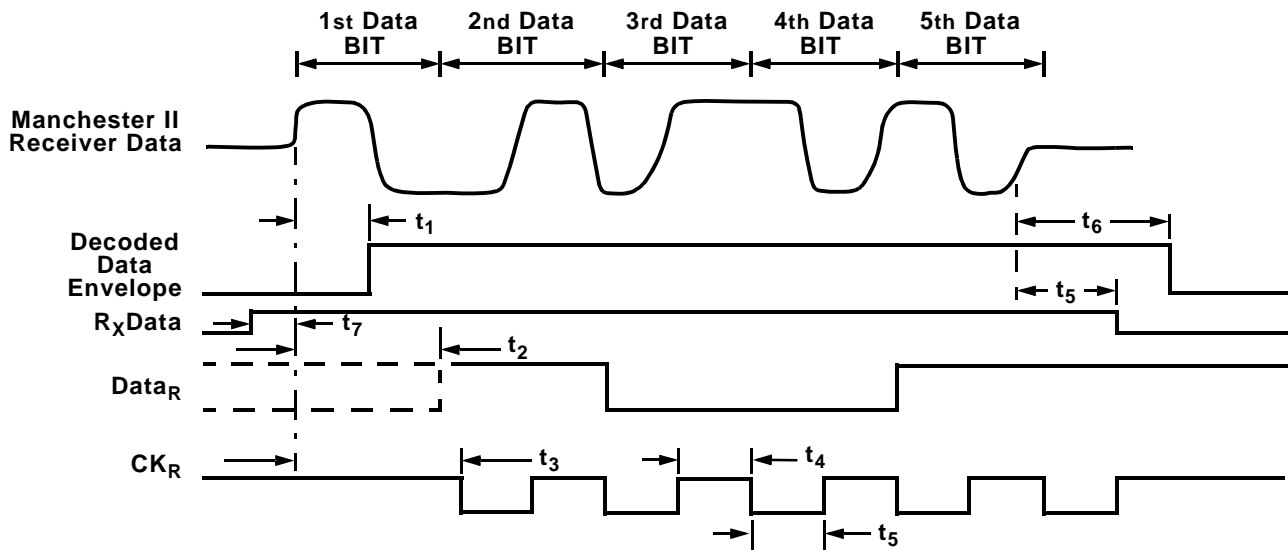


Figure 3 Receiver / Decode Timing

Symbol	Parameter / Condition	Min	Nom	Max	Units
t1	Envelope delay time	-	-	100	nsec
t2	Data decode delay	-	115	125	nsec
t3	Clock low transition delay	-	130	-	nsec
t4	Clock _R high time	35	50	65	nsec
t5	Clock _R low time	35	50	65	nsec
t6	Envelope off delay	120	-	270	nsec
t7	Receiver strobe enable to input data set-up time	5			nsec
t8	Receiver strobe disable to input data hold-time	20			?

Power Management Functional Table

Encoder Enable (Pin 10)	Power Management Input (Pin 9)	Receiver Status	Transmitter Status
0	0	Active	Standby
X	1	Active	Active
1	X	Active	Active

Power management timing see Figure 2.

Drive Level Control Pins

External Resistors may be connected from pins 5 and 6 to V_{EE} or GND to change the Transmitter Output Level. If pins 5 and 6 are left open the CT1698 operates within the MIL-STD-1397 Type E specification. Resistors connected from pins 5 and 6 to V_{EE} or Ground must be equal. Unequal resistors will result in a transmitter output offset level.

The formula for peak to peak transmitter output swing with resistors connected between 5 and 6 to V_{EE} is:

$$V_{OUT_{pk-pk}} = 1.39 + \frac{125 \pm 15\% \text{ Volts}}{R_{EXT}}, \quad R_{EXT} \geq 90\Omega$$

The formula for peak to peak transmitter output swing with resistors connected between pins 5 and 6 to ground is:

$$V_{OUT_{pk-pk}} = 1.39 - \frac{50 (V_{EE} - 2.5) \pm 15\% \text{ Volts}}{R_{EXT}}, \quad R_{EXT} \geq 180\Omega$$

Functional Description and Pinout

Pin #	Pin Name	Function	Load or Drive
1	XFMR primary/ TX data output	Transformer lead for connection to center conductor of tri-axial cable	
2	XFMR secondary	Secondary isolated winding, same phase as center conductor	
3	TXDATA output/ RX data input	Transmitter-receiver I/O pin (usually connected to pin 2)	
4	No connection		
5	Drive 2	Output level adjustment selected by resistor to GND or V_{EE}	
6	Drive 1	Output level adjustment selected by resistor to GND or V_{EE}	
7	-5 Volts		
8	R_X strobe	Low level disables receiver	3 S loads
9	Power management input	Controls transmitter power consumption in conjunction with pin 10	1 S load
10	Encoder enable	Controls transmitter power consumption in conjunction with pin 9	1 S load
11	Case/signal GND		
12	Case/signal GND		
13	Decoded data envelope	High after reception of first half bit; goes low after reception of last half bit (normally low in inactive state)	4 S drive
14	TP3 test point	Alignment point: no electrical connection permitted	
15	TP1 test point	Alignment point: no electrical connection permitted	
16	TP2 test point	Alignment point: no electrical connection permitted	
17	-5 Volts		
18	TP4 test point	Alignment point: no electrical connection permitted	
19	$clock_R$	Reconstructed clock; one clock pulse per input bit received	3 S drive
20	No connection		
21	Decoded Data $_R$	NRZ reconstructed data. Sampled on $clock_R$ rising edge	3 S drive

Functional Description and Pinout (continued)

Pin #	Pin Name	Function	Load or Drive
22	No connection		
23	+5 volts		
24	+5 volts		
25	10 MHz encoder shift clock	One cycle required per data bit. Must be high in first half of bit cell	1 S load
26	NRZ serial input data	Serial input to be Manchester encoded with the 20 MHz gated CK	1 S load
27	Encode envelope	Must be high to enable transmission; must go low before reception of last 20 MHz positive edge to complete transmission	1 S load
28	20 MHz gated clock (encoder)	Each bit to be encoded requires two positive edges of the 20 MHz CK. These edges must occur at 25ns and 75ns into the bit cell. The end of transmission requires an additional edge in conjunction with a logic low on the encode envelope. $t_R, t_F \leq 5\text{nsec}$.	1 S load
29	$\overline{\text{Master reset}}$ reset pulse ≤ 15 nsec	Logic low resets encoder	2 S load
30	No connection		
31	No connection		
32	TXDATA output/ RX DATA input	Transmitter-Receiver I/O pin (usually connected to pin 33)	
33	$\overline{\text{XFMR}}$ secondary	Secondary isolated winding, same phase as outer signal conductor	
34	$\overline{\text{XFMR}}$ primary/ TX DATA output	Transformer lead for connection to outer signal conductor of tri-axial	

Load and Drive Definitions

1 S load: requires

$$I_{IL} = -2\text{mA max.}, V_{IL} = 0.8\text{V max}$$

$$I_{IH} = 50\mu\text{A max.}, V_{IH} = 2.5\text{V min} \quad C_{IN} < 15 \text{ pf}$$

1 S drive:

$$I_{OH} = 50\mu\text{A min.}, V_{OH} = 2.5\text{V min}$$

$$I_{OL} = -2 \text{ mA min.}, V_{OL} = 0.5\text{V max}$$

Power Consumption

	Current (mA)	
	Typ	Max
I_{CC} Standby mode	325	450
I_{EE} Standby mode	85	105
I_{CC} 100% Transmission	380	510
I_{EE} 100% Transmission	125	160

Absolute Maximum Ratings

$$V_{CC} \text{ (Pins 23, 24)} \quad +7 \text{ Volts Max}$$

$$V_{EE} \text{ (Pins 7, 17)} \quad -7 \text{ Volts Max}$$

Logic Input Voltage Applied:

$$\text{Logic Low} \quad -1.2\text{V @ } 10\text{mA Max}$$

$$\text{Logic High} \quad +5.5 \text{ Volts}$$

When used with the internal transformer, the CT1698 will not be damaged by cable open circuits or by short circuits of the following types:

- Line-to-line
- Line-to-ground
- To voltage sources of 0 to 115 volts alternating current, 60 hertz, line-to-ground

Environmental Parameters

Operating Temperature -55°C to $+100^\circ\text{C}$ Case

Storage Temperature -55°C to $+150^\circ\text{C}$

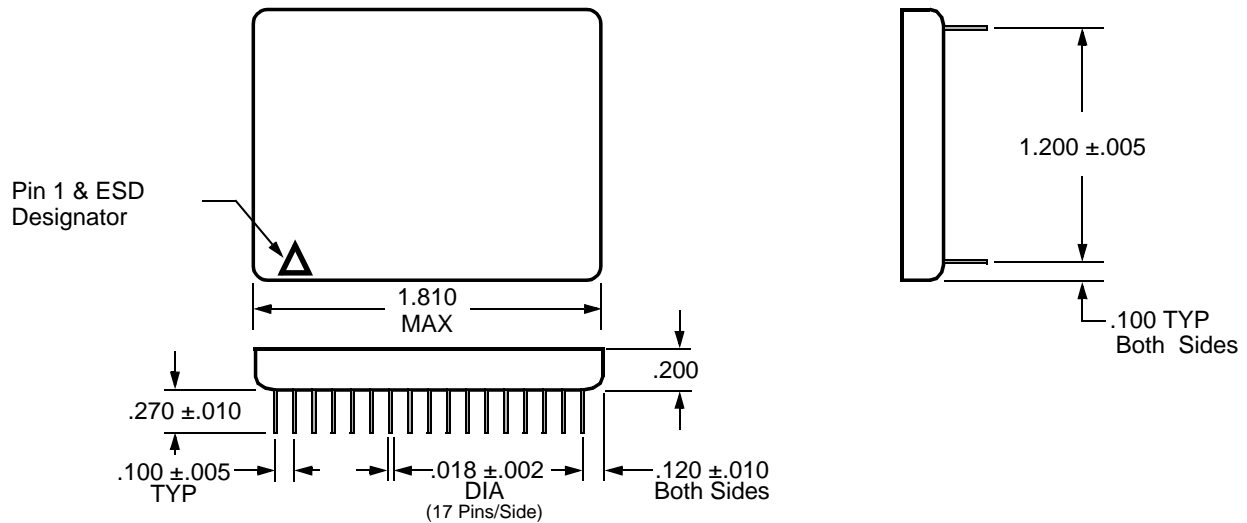
Screened per individual test methods of MIL-STD-883



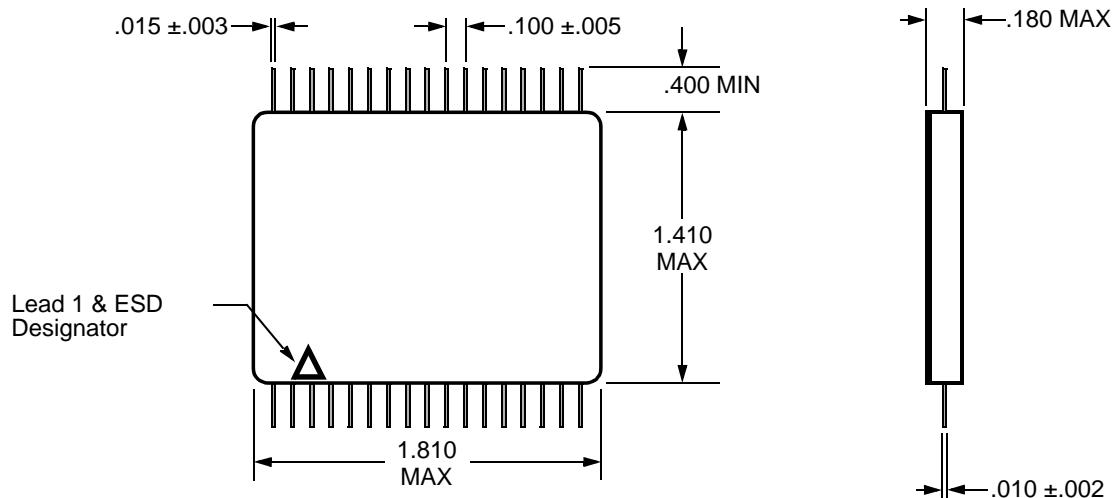
Ordering Information

Model Number	Package
CT1698	Plug-in Package
CT1698FP	Flat Package

Plug-In Package Outline



Flat Package Outline



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