

CT1487M/CT1589M

MIL-STD-1553 LOW POWER SINGLE AND DUAL TRANSCEIVERS

FEATURES

- Available in $\pm 15V$ (CT1487M) and $\pm 12V$ (CT1589M) versions
- AC interstage coupling prevents static burnout
- Receiver filtered to improve S/N ratio of system
- Dissipates only 1.3 watt total at 25% transmitting duty cycle (dual unit - 1.8 watts total). 100% duty cycle permissible at 125°C case temperature
- 20 mV typical output offset
- Meets MIL-STL-1553A/B
- Available to Standard Military Drawings (see Ordering Information)
- 24 pin double dip package or flat pack for single unit
- 36 pin double dip package or flat pack for dual unit
- TTL compatible

Note: All data shown is for a single transceiver unless otherwise noted. Dual transceivers are two completely independent units in a common package.

GENERAL DESCRIPTION

The CT1487M/CT1589M family of single and dual transceivers is a second generation series incorporating monolithic bipolar devices for improved reliability and producibility. For thermal considerations, the drive stage transistors are "off" the bipolar array. Input/output signals are compatible with both MIL-STD-1553A and B systems.

DETAILED DESCRIPTION

RECEIVER DESCRIPTION

The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are RX DATA OUT and $\overline{\text{RX DATA OUT}}$ and represent positive and negative excursions, respectively, of the input beyond a predetermined threshold. See Figure 2 for receiver logic waveforms.

The positive and negative thresholds are designed for optimum word error rate. The receiver begins to detect Data Bus signals (1 MHz, sinusoidal) that exceed 0.9 volt nominal peak-to-peak when used with the specified transformer. See Figure 4 for typical input/output connections.

If the RECEIVER STROBE input is LOW, the RX DATA OUT and $\overline{\text{RX DATA OUT}}$ are inhibited. If unused, a 2K-ohm pullup to +5V is recommended.

Note: See ORDERING INFORMATION for units with inverted outputs. (Pg 7)

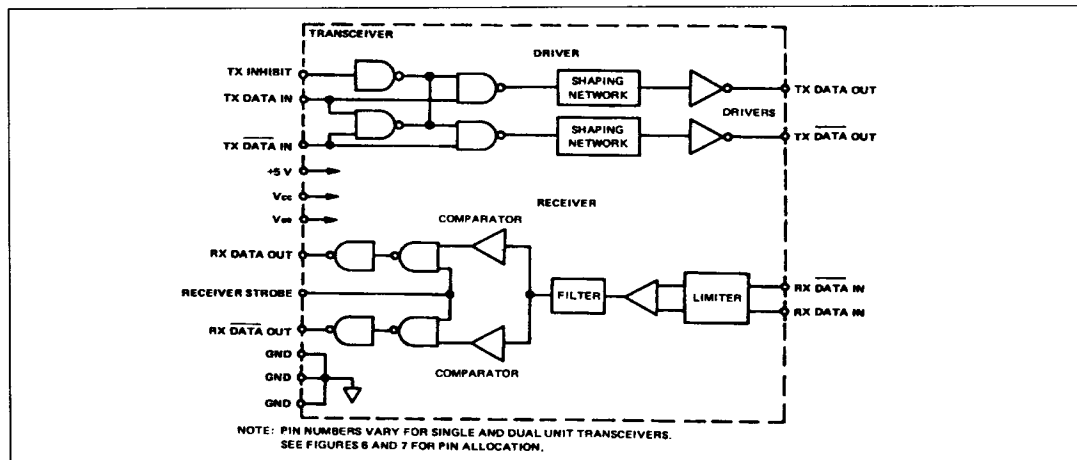


Figure 1: Functional Diagram, CT1487M

DRIVER DESCRIPTION

The Driver section accepts complementary TTL data at the input. When coupled to the Data Bus with the specified transformer (isolated on the Data Bus side with 55-ohm fault isolation resistors and loaded by two 70-ohm terminations plus additional receivers), the Data Bus signal produced is 6.8 volts nominal peak-to-peak (at point A, Figure 4).

When both TX DATA IN and TX $\overline{\text{DATA IN}}$ inputs are both held LOW or held HIGH, the driver output becomes a high impedance and is removed from the line. In addition, an overriding TX INHIBIT input takes priority over the condition of the data inputs and disables the driver. See Figure 3 for the driver logic waveforms.

TX DATA IN and TX $\overline{\text{DATA IN}}$ inputs must be complementary waveforms of 50% average duty cycle and with less than 15 ns skew between them.

CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS	CT1487	CT1589
Power supply voltage (V_{cc})	-0.3 to +18.0V	-0.3 to +18.0V
Power supply voltage (V_{ee})	+0.3 to -18.0V	+0.3 to -18.0V
Power supply voltage (V_{ccl})	-0.3 to +7.0V	-0.3 to +7.0V
Logic input voltage (RECEIVER STROBE, INHIBIT, TX $\overline{\text{DATA IN}}$, TX DATA IN)	-0.3 to +5.5V	-0.3 to +5.5V
Receiver differential input (RX DATA IN, RX $\overline{\text{DATA IN}}$)	± 20 V (40 V p-p)	± 20 V (40 V p-p)
Receiver input voltage (RX DATA IN or RX $\overline{\text{DATA IN}}$)	± 15 V	± 15 V
Driver output current (TX DATA OUT or TD DATA OUT)	+200 mA	+300 mA
Transmission duty cycle at $T_c = 125^\circ\text{C}$ Operating case temperature range (T_c)	100% -55 to +125°C	100% -55 to +125°C

POWER AND THERMAL DATA, TOTAL HYBRID (DRIVER AND RECEIVER)

PARAMETER/CONDITION	SYMBOL	CT1487M			CT1589M			UNIT	
		MIN	TYP	MAX	MIN	TYP	MAX		
Power supply voltages	V_{cc}	14.25	15	15.75	11.4	12	12.6	V	
	V_{ee}	-14.25	-15	-15.75	-11.4	-12	-12.6	V	
	V_{ccl}	4.5	5	5.5	4.5	5	5.5	V	
Power dissipation of most critical (hottest) device in hybrid during continuous transmission (100% duty cycle)	P_c	Note 1	350	500	Note 1	350	500	mW	
Thermal resistance, most critical device	θ_{jc}			50			50	°C/W	
Junction to case temperature rise of most critical device at 100% duty cycle transmission	T_{jc}			25			25	°C	
Total supply current "standby" mode, or transmitting at less than 1% duty cycle (e.g. 20 μs of transmission every 2ms or longer interval)	I_{cc} I_{ee} I_{ccl}	Note 2	S* D*	S* D*	Note 2	S* D*	S* D*	mA	
			15 30	22 44		15 30	22 44		
			25 50	35 70		25 50	35 70		
			32 64	45 90		32 64	45 90		
Total supply current transmitting at 1MHz into a 35-ohm load at point A in Figure 4	DUTY CYCLE	I_{cc}			Note 3			mA	
			25%	Note 3		55 70 75 100	Note 3		70 85 95 120
			100%	Note 3		185 200 235 260	Note 3		224 240 290 315

* S = single unit, D = dual unit (one unit transmitting)

- Notes: 1. Decreases linearly to zero at zero duty cycle.
2. I_{ee} and I_{ccl} limits do not change with mode of operation or duty cycle.
3. Decreases linearly to applicable "standby" value at zero duty cycle.

ELECTRICAL CHARACTERISTICS, RECEIVER SECTION (See Figure 2)

PARAMETER/CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS					
Differential input impedance DC to 1MHz	Z_{in}	9 K			ohms
Differential voltage range	V_{idr}	$\pm 20V$			V_{peak}
Input common mode voltage range	V_{icr}	$\pm 10V$			V_{peak}
Common mode rejection ratio (from point A, Figure 4)	CMRR	40			dB
STROBE characteristics (Logic "0" inhibits output)					
"0" input current ($v_s = 0.4 V$)	I_{i1}			-1	mA
"1" input current ($V_s = 2.7 V$)	I_{i1}			40	μA
"0" input voltage	V_{i1}			0.7	V
"1" input voltage	V_{ih}	2			V
Threshold characteristics (sine wave at 1MHz) NOTE: Threshold voltages refer to point A, Figure 4.	V_{th1}	0.8		1.1	V_{p-p}
Filter characteristics (sine wave input)	2 MHz	V_{th2}	1.5	8	V_{p-p}
	3 MHz	V_{th3}	5		V_{p-p}
OUTPUT CHARACTERISTICS					
"1" state ($I_{source} = 400 \mu A$)	V_{oh}	2.5	3.4		
"0" state ($I_{sink} = 4 mA$) NOTE: With receiver input below threshold both RX DATA OUT and RX DATA OUT remain in "0" state.	V_{oh}			0.5	
Delay (average) from differential input zero crossings to RX DATA OUT and RX DATA OUT output 50% points	t_{DRX}		340	450	ns

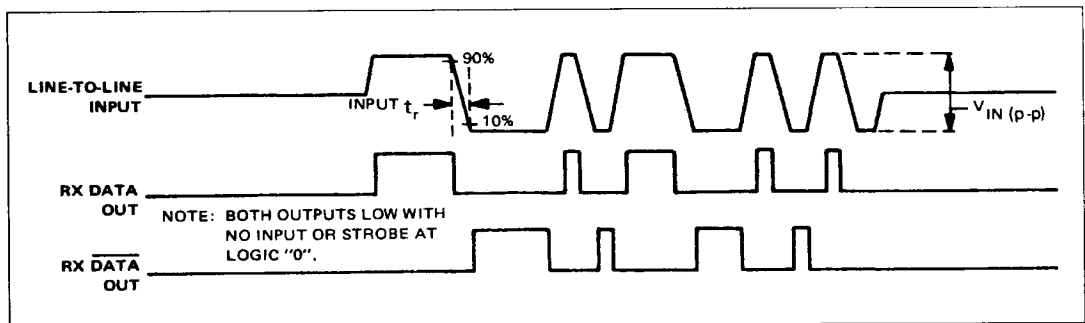


Figure 2: Receiver Logic Waveforms (for Inverted Data Output, see Ordering Information)

ELECTRICAL CHARACTERISTICS, DRIVER SECTION (See Figure 3)

PARAMETER/CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS					
"0" input current ($V_{in} = 0.4 \text{ V}$)	I_{ii}			-1	mA
"1" input current ($V_{in} = 2.7 \text{ V}$)	I_{ih}			80	μA
"0" input voltage	V_{ii}			0.7	V
"1" input voltage	V_{ih}	2			V
Delay from TX INHIBIT (0 \rightarrow 1) to inhibited output impedance	t_{DXOFF}		150	225	ns
Delay from TX INHIBIT (1 \rightarrow 0) to active output impedance	t_{DXON}		100	150	ns
Differential output noise	V_{noi}			10	mV_{p-p}
Differential output impedance (inhibited) at 1 MHz	Z_{oi}	8K			ohms
OUTPUT CHARACTERISTICS					
Differential output level at point B, Figure 4 (145-ohm load)	V_o	26	28	35	V_{p-p}
Rise and fall times (10%–90% of p-p output)	t_r	100	160	300	ns
Output offset at point A in Figure 4 (35-ohm load) 2.5 μs after mid-bit crossing of parity bit of last word of a 660 μs message	V_{os}		± 20	± 75	mV peak
Delay from 50% point of TX DATA IN or TX DATA IN to zero crossing of differential output	t_{DTX}		100	200	ns

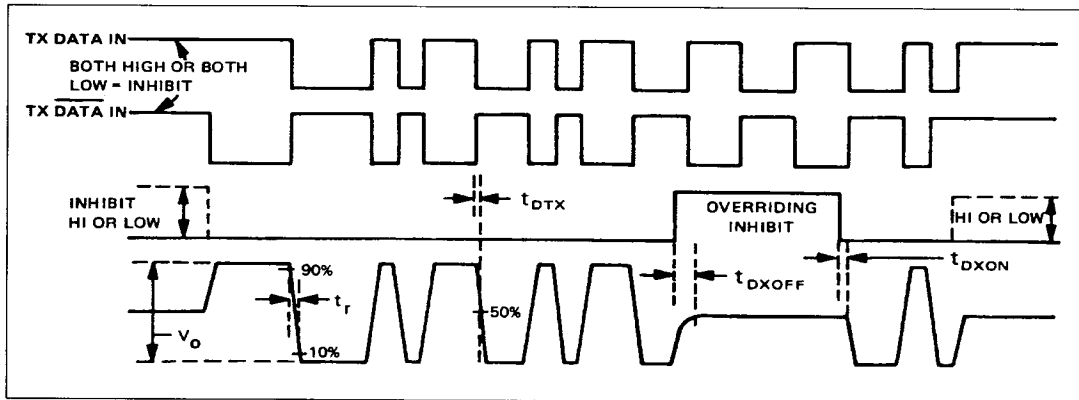


Figure 3: Driver Logic Waveforms

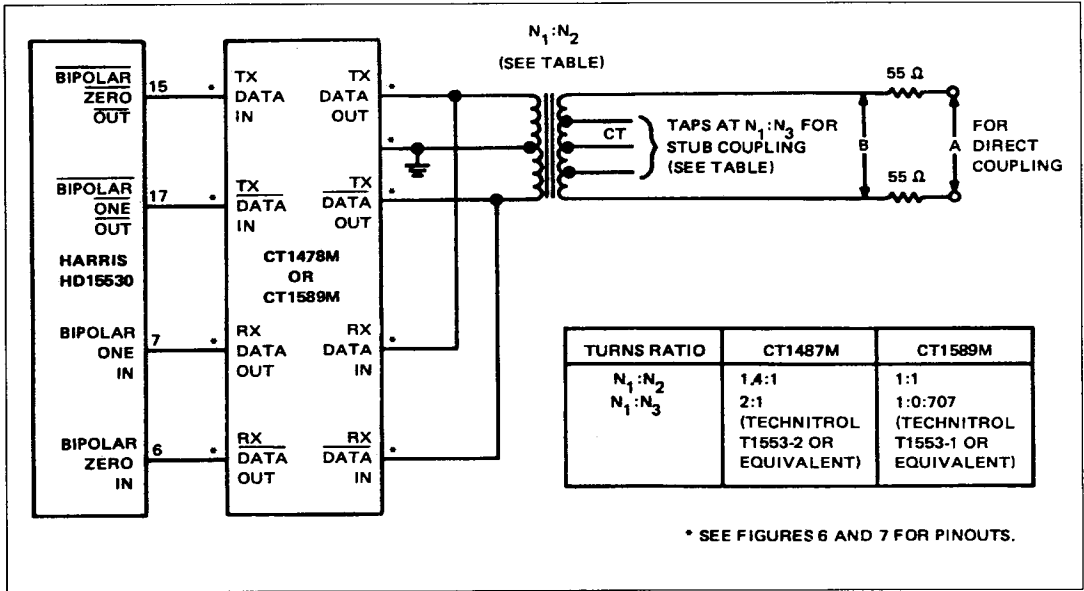


Figure 4: Typical Input/Output Connections

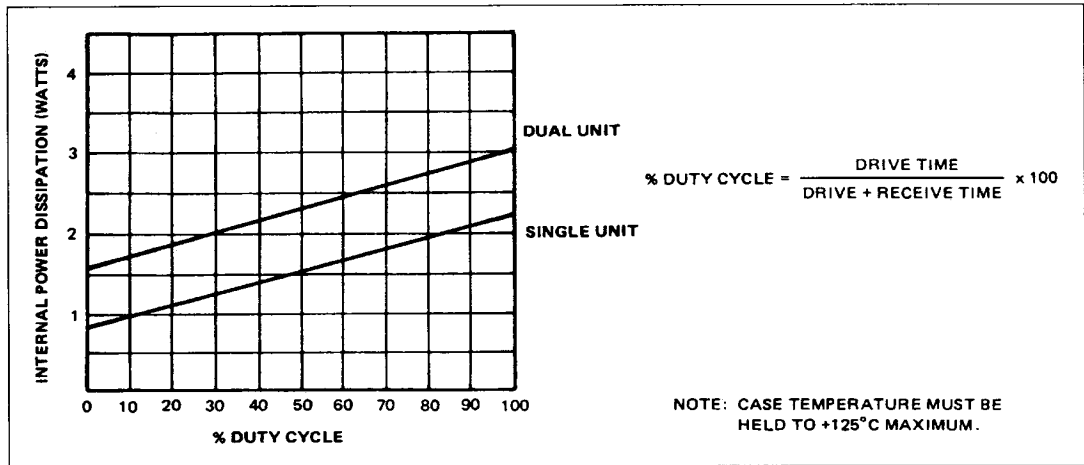


Figure 5: Typical Internal Power Dissipation (Total Hybrid)

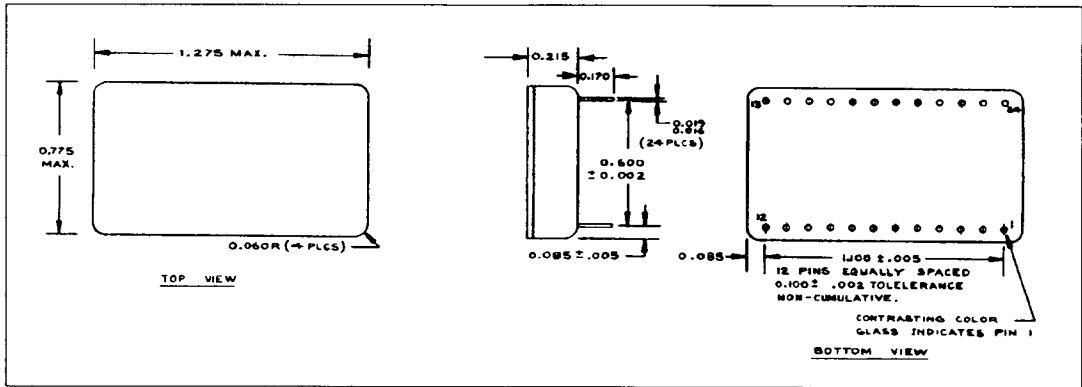


Figure 6: Mechanical Outline for the "MP" Package

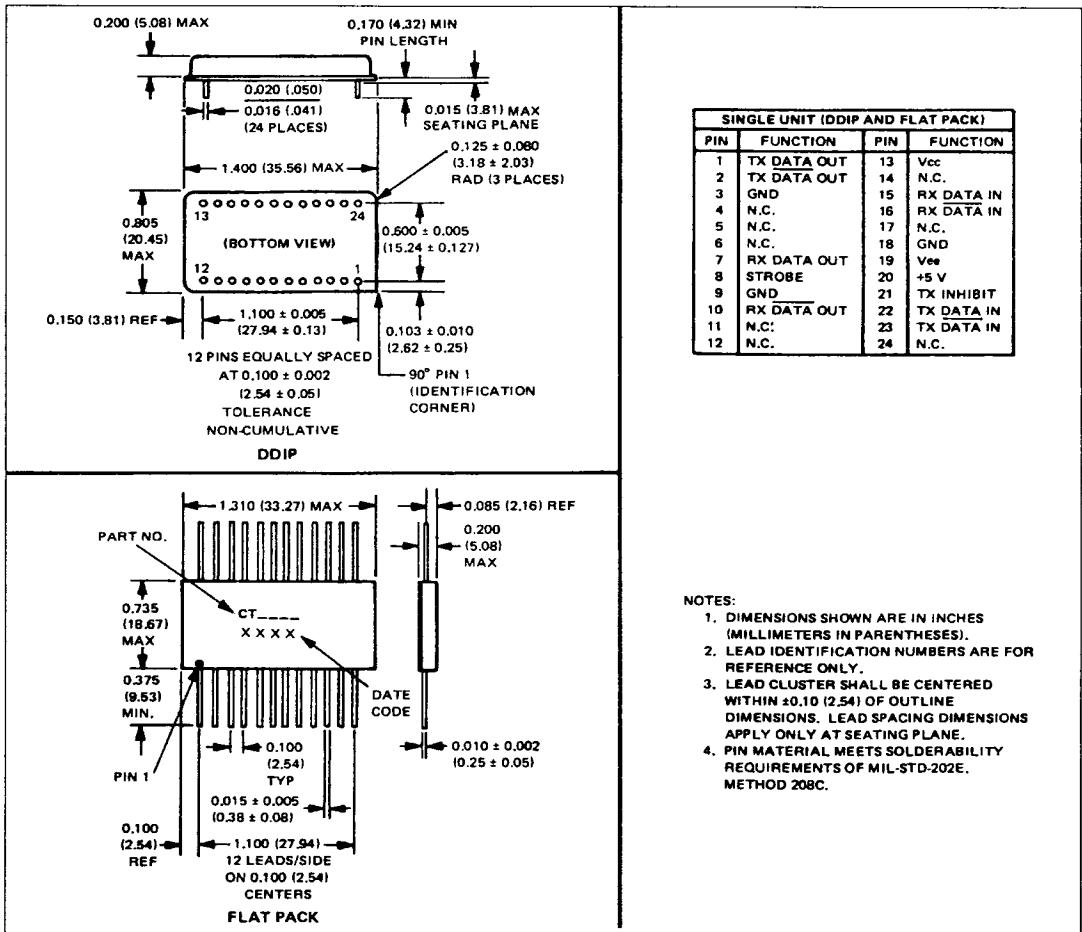


Figure 7: Mechanical Outline and Pinouts (Single Unit)

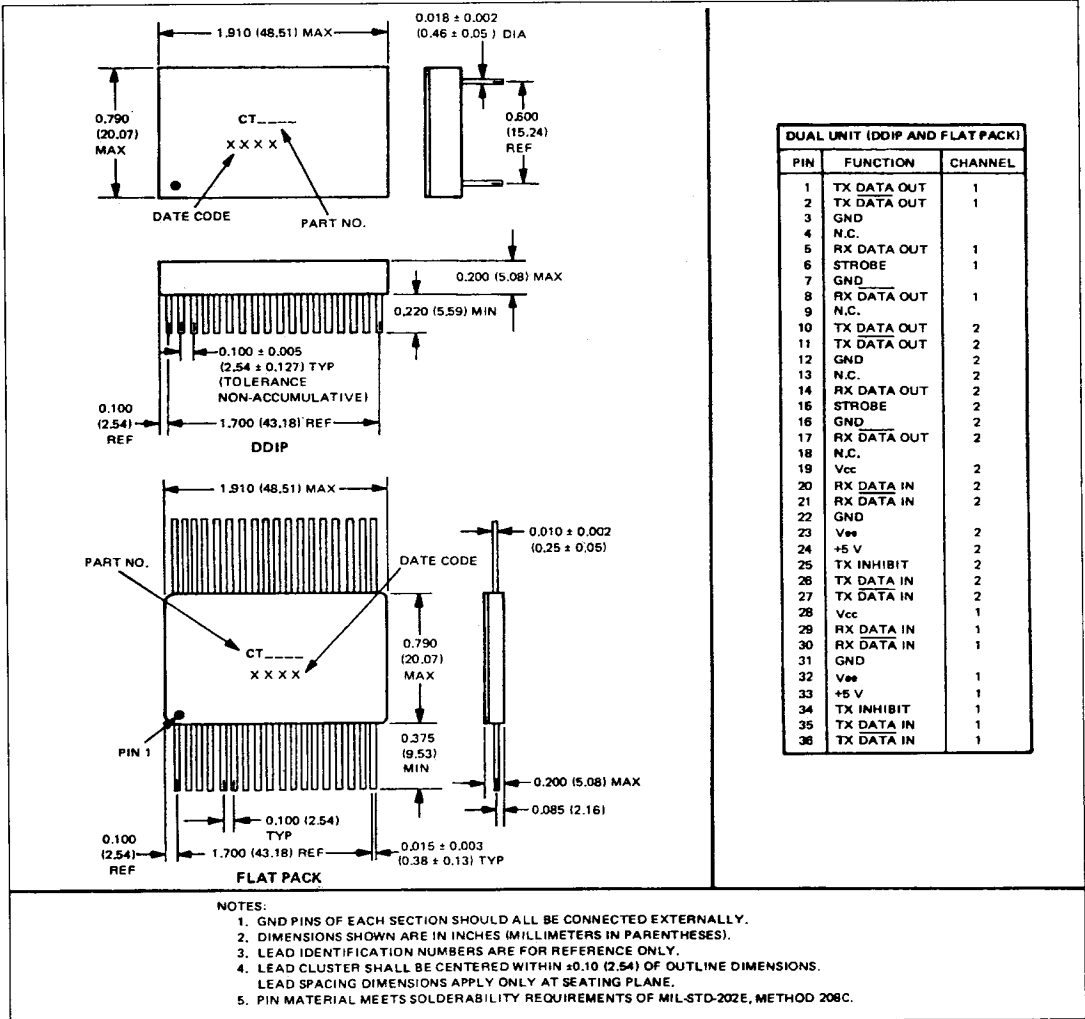


Figure 8: Mechanical Outline and Pinouts (Dual Unit)

CT1487M/CT1589M

ORDERING INFORMATION

Some of these devices are available to Standard Military Drawings. Contact Customer Services at one of the addresses below for more information.

"Inverted Receiver Data Output" refers to the logic state of RX DATA OUT and RX DATA OUT when the bus is quiet. All part numbers with the "I" suffix produce logic "1" at the receiver outputs for quiet bus.

CT1487M	-	±15 V Single Unit Plug-in Package	CT1589M	-	±12 V Single Unit Plug-in Package
CT1487MP	-	±15 V Single Unit Plug-in Package	CT1589MP	-	±12 V Single Unit Plug-in Package
CT1487MFP	-	±15 V Single Unit Flat Pack	CT1589MFP	-	±12 V Single Unit Flat Pack
CT1487MI	-	±15 V Single Unit Plug-in Package, Inverted Receiver Data Outputs	CT1589MI	-	±12 V Single Unit Plug-in Package, Inverted Receiver Data Outputs
CT1487MIFP	-	±15 V Single Unit Flat Pack, Inverted Receiver Data Outputs	CT1589MIFP	-	±12 V Single Unit Flat Pack, Inverted Receiver Data Outputs
CT1487D	-	±15 V Dual Unit Plug-in Package	CT1589D	-	±12 V Dual Unit Plug-in Package
CT1487DI	-	±15 V Dual Unit Plug-in Package, Inverted Receiver Data Outputs	CT1589DI	-	±12 V Dual Unit Plug-in Package, Inverted Receiver Data Outputs
CT1487DFP	-	±15 V Dual Unit Flat Pack	CT1589DFP	-	±12 V Dual Unit Flat Pack
CT1487DIFP	-	±15 V Dual Unit Flat Pack, Inverted Receiver Data Outputs	CT1589DIFP	-	±12 V Dual Unit Flat Pack, Inverted Receiver Data Outputs