Standard Products

CT3232M Low Power Driver / Receiver

for MIL-STD-1553B, MACAIR (A3818, A4905, A5232, A5690) & SAE-AS15531

www.aeroflex.com/Avionics

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FEATURES

- Compatable with MIL-STD-1553A/B & MACAIR (A3818, A4905, A5232, A5690)
- ±12V to ±15V/+5V DC power supply operation
- 1.5Watt total hybrid dissipation at 25% transmitting duty cycle
- Monolithic construction
- TTL compatible
- Full military (-55°C to +125°C) temperature range
- Driver / Receiver in a single Package for Space & Weight Savings
- Filtering on Receiver to improve S/N ratio of system
- Designed for commercial, industrial and aerospace applications
- MIL-PRF-38534 compliant devices available
- Aeroflex-Plainview is a Class H & K MIL-PRF-38534 manufacturer
- Packaging – hermetic metal plug-in or flat package
  24 Lead, 1.27" sq. max x .200"H Flat package
  24 Pin, 1.27" sq. max x .175"H Plug-In package

DRIVER DESCRIPTION

The CT3232 Driver section accepts complementary TTL Data at the input, and produces a 30 Volt nominal peak-to-peak differential signal across a 140Ω load at the output. When coupled to the Data Bus with a 1:1 transformer, isolated on the Data Bus side with two 55.0Ω fault isolation resistors, and loaded by two 70Ω terminations plus additional receivers, the Data Bus signal produced is 7.2 Volts nominal peak-to-peak.

When both "DATA" and "$\overline{\text{DATA}}$" inputs are held low or both are held high, the driver output becomes a high impedance and is "removed" from the line. In addition, an overriding "INHIBIT" input provides for removal of the Driver output from the line. A logic "1" applied to the "INHIBIT" takes priority over the condition of the data inputs and disables the Driver. See Driver Logic Waveforms, Figure 3.

DATA and DATA inputs must be complementary waveforms, of 50% duty cycle average, with no gate delays between them. It is recommended that those inputs be driven from a "D" type flip-flop.

RECEIVER DESCRIPTION

The CT3232 Receiver section accepts Bi-Phase Differential data at the input and produces two TTL signals at the output. The outputs are "DATA" and "$\overline{\text{DATA}}$", and represent positive and negative excursions (respectively) of the input beyond a predetermined threshold. See Receiver Logic Waveforms, Figure 2.

The positive and negative thresholds may be internally set by grounding the appropriate pins, or externally set with resistors. The pre-set internal thresholds will detect Data Bus signals exceeding 1Volt p-p and ignore signals less than 0.5Volt p-p when used with 1:1 transformer (See Figure 4 for a suitable transformer and typical connection).

A low level at the STROBE input inhibits the DATA and $\overline{\text{DATA}}$ outputs. If unused, a 2KΩ pull-up to +5V is recommended.

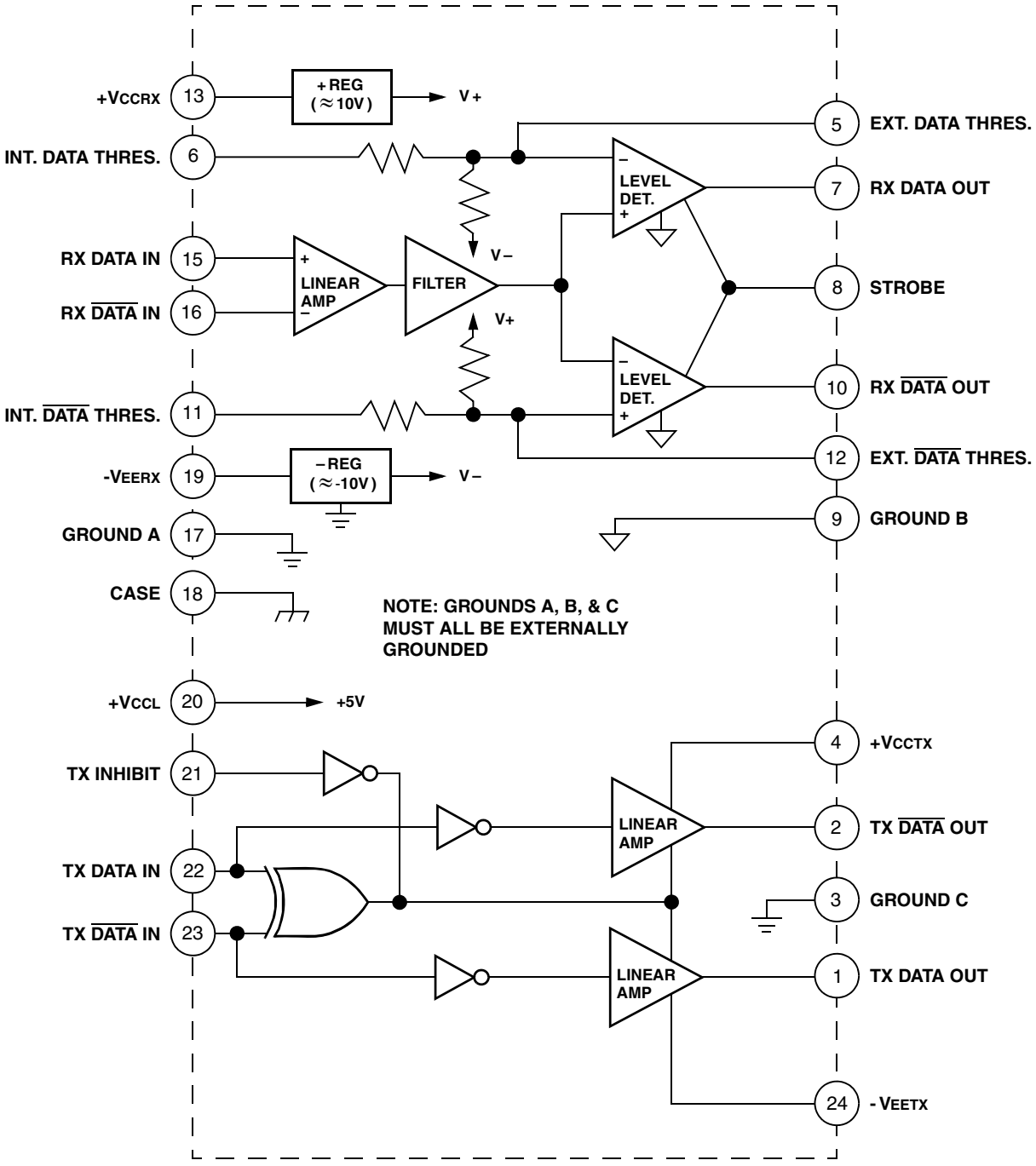

FIGURE 1 – CT3232 Functional Block Diagram and Pinouts

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RANGE	UNITS
Positive Supply Voltage, Pin 4 or 13	-0.3 to +18.0	Volts
Negative Supply Voltage, Pin 24 or 19	0.3 to -18.0	Volts
Logic Voltage, Pin 20	-0.3 to + 7.0	Volts
Logic Input Voltage, Pin 8, 21, 22, or 23	-0.3 to +5.5	Volts
Receiver Differential Input, Pin 15 to Pin 16	±20 (40Vp-p)	Volts
Receiver Input Voltage, Pin 15 or Pin 16	±15	Volts
Driver Peak Output Current, Pin 1 or Pin 2	±300	mA
Total Package Power Dissipation at (Ambient) T_A = + 25°C (Derate above T_A = + 25°C at 40 mW/°C)	4.0 (Note 1)	Watts
Power Dissipation at Specified Case Temperatures	See Figure 5	
Operating Case Temperature Range (T_C) (See Figure 5 for limitations)	- 55 to + 125	°C

ELECTRICAL CHARACTERISTICS

RECEIVER SECTION

Parameter / Condition		Sym	Min	Typ	Max	Unit
Power Supply Voltage Ranges		V_{CCRX} V_{EERX} V_{CCL}	+11.75 -11.75 +4.75	- - -	+15.75 -15.75 +5.25	V V V
Supply Current		I_{CCRX} I_{EERX} I_{CCL}	- - -	25 30 35	- - -	mA mA mA
Differential Input Impedance	f = 1MHz	Z_{IN}	9K	-	-	Ω
Differential Voltage Range		V_{IDR}	±20	-	-	Vpeak
Input Common Mode Voltage Range		V_{ICR}	±10	-	-	Vpeak
Common Mode Rejection Ratio (From Point A, Figure 4)		CMRR	40	-	-	dB
Strobe Characteristics (Logic "0" inhibits Output) "0" Input Current (V_{STROBE} = 0.5 V) "1" Input Current (V_{STROBE} = 2.7 V) "0" Input Voltage "1" Input Voltage Strobe Delay (turn-on or turn-off)		 I_{IL} I_{IH} V_{IL} V_{IH} t_{SD}	 - - - 2.0 -	 - - - - 20	 -4 400 0.7 - -	 mA µA V V ns
Threshold Characteristics (Sinewave input, 100KHz to 1MHz) *Note: Threshold voltages are referred to the Input* Internal (Pin 6 & 11 grounded) External (Pin 6 & 11 open; threshold setting resistors from Pin 5 to ground & from Pin 12 to ground; R_{TH} Max = 10KΩ)		 V_{TH_1} R_{TH}/V_{TH_1}	 0.6 -	 - 4000	 0.9 -	 Vp-p Ω/Vp-p
Filter Characteristics (Pin 6 & 11 Grounded) (Sinewave input)	f = 2MHz f = 3MHz	V_{TH_2} V_{TH_3}	1.0 3.0	- -	3.0 -	Vp-p Vp-p

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RECEIVER SECTION

Parameter / Condition	Sym	Min	Typ	Max	Unit
Output Characteristics, RX Data & RX $\overline{\text{Data}}$					
"1" State (I_{SOURCE} = -0.4 mA) Note 2	V_{OH}	2.5	3.3	-	V
"0" State (I_{SINK} = 4 mA) Note 2	V_{OL}	-	-	0.5	V
Note: With Receiver input below threshold, both RX Data & RX Data outputs remain in "1" state.					
Delay (average) from differential input zero crossings to RX Data & RX $\overline{\text{Data}}$ output 50% points.	t_{DRX}	-	290	450	ns

Note 1: Assumes unit in free air (natural convection cooling).

DRIVER SECTION

Parameter / Condition		Sym	Min	Typ	Max	Unit
Power Supply Voltage Ranges		V_{CCTX}	+11.75	-	+15.75	V
(See Receiver Section for V_{CCL})		V_{EETXL}	-11.75	-	-15.75	V
Supply Current, "Standby" mode (See Receiver Section for I_{CCL})		I_{CCTXS}	-	12	Note 2	mA
(TX Inhibit high; or TX Data & TX $\overline{\text{Data}}$ both high or both low)		I_{EETXS}	-	0	1.0	mA
Supply Current transmitting at 1MHz into a 35Ω load at point A in Figure 4	Duty Cycle	I_{CCX25}	Note 4	45	Note 2	mA
	25%	I_{EEX25}	Note 3	35	Note 2	mA
Note: I_{CCL} limits do not change with mode of operation or duty cycle	100%	V_{CCTX}	Note 4	150	Note 2	mA
		I_{EETX}	Note 3	135	Note 2	mA
Input Characteristics, TX Data In or TX $\overline{\text{Data}}$ In						
"0" Input Current (V_{IN} = 0.4 V)		I_{ILD}	-	-	-1.2	mA
"1" Input Current (V_{IN} = 2.7 V)		I_{IHD}	-	-	100	µa
"0" Input Voltage		V_{ILD}	-	-	0.7	V
"1" Input Voltage		V_{IHD}	2.0	-	-	V
Inhibit Characteristic						
"0" Input Current (V_{IN} = 0.4 V)		I_{ILI}	-	-	-0.8	mA
"1" Input Current (V_{IN} = 2.7 V)		I_{IHI}	-	-	50	µA
"0" Input Voltage		V_{ILI}	-	-	0.7	V
"1" Input Voltage		V_{IHI}	2.0	-	-	V
Delay from TX Inhibit (0→1) to inhibited output impedance		t_{DXOFF}	-	300	400	ns
Delay from TX $\overline{\text{Inhibit}}$ (1→0) to active output impedance		t_{DXON}	-	100	250	ns
Differential Output Noise, inhibit mode		V_{NOI}	-	-	10	mV_{PEAK}
Differential output impedance (inhibited) at 1MHz		Z_{OI}	10K	-	-	Ω
Output Characteristics (Figure 3)						
Differential output level (140 ohm load)		V_O	28	32	35	Vp-p
Differential Active output impedance at 1MHz		Z_{OA}	-	-	10	Ω
Rise and Fall times (10% to 90% of p-p output)		t_R / t_F	200	150	300	ns
Output offset at point A in Fig. 4 (35Ω load) 2.5µS after mid-bit crossing of the parity bit of the last word of a 660µS message		V_{OS}	-	±20	±75	mVpeak
Delay from 50% point of TX Data or TX $\overline{\text{Data}}$ input to zero crossing of differential output		t_{DTX}	-	220	350	ns

Note 2: Maximum supply currents for driver and receiver combined are included in power and thermal data table.

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

Parameter / Condition		Sym	Min	Typ	Max	Unit
Total Supply Current, "Standby" mode or transmitting at less than 1% duty cycle (e.g. 20µS of transmission every 2mS or longer interval)		ICCS IEES ICCL	- - -	40 30 35	50 40 45	mA mA mA
Total Supply Current transmitting at 1MHz into a 35Ω load at point A in Figure 4	Duty Cycle	ICC25	Note 4	70	80	mA
	25%	IEE25	Note 4	65	75	mA
Note: Iccl limits do not change with mode of operation or duty cycle	100%	ICC100	Note 4	175	190	mA
		IEE100	Note 3	165	180	mA
Power Dissipation of most critical (hottest) device in hybrid during continuous transmission (100% duty cycle)	Supply Voltage					
	±12V	PC12	Note 3	300	400	mW
	±15V	PC15	Note 3	450	600	mW
Thermal Resistance, junction-to-case, of most critical device		ØJC	-	80	100	°C / W
Allowable transmitting duty cycle when case is held to +100°C maximum		Note 5	-	-	100	%
Allowable transmitting duty cycle when case is held to +125°C maximum	Supply Voltage					
	±12V	Note 5	-	-	80	%
	±15V	Note 5	-	-	55	%

Note 3: Decreases linearly to zero at zero duty cycle.
Note 4: Decreases linearly to applicable "Standby" value at zero duty cycle.
Note 5: Based upon operating junction temperature of 160°C for hottest device. For lower operating junction temperatures, reduce maximum duty cycle accordingly.

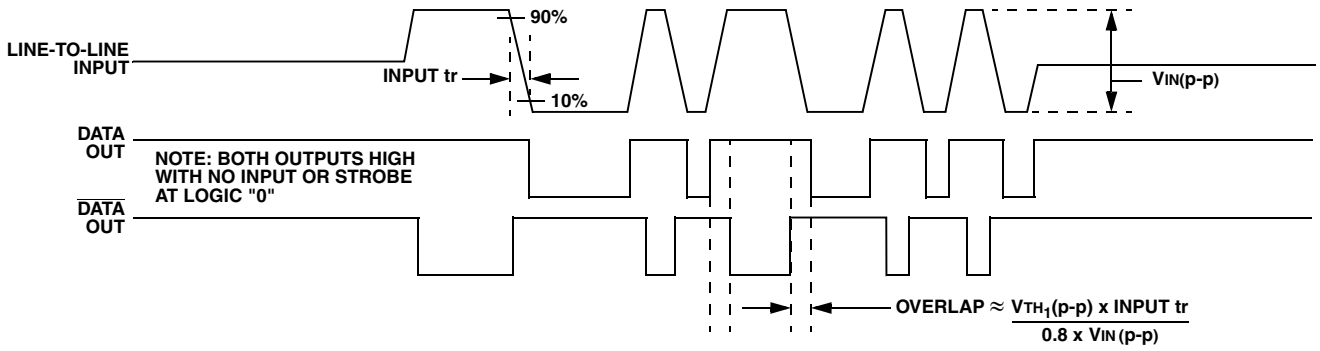


FIGURE 2 – Receiver Logic Waveforms

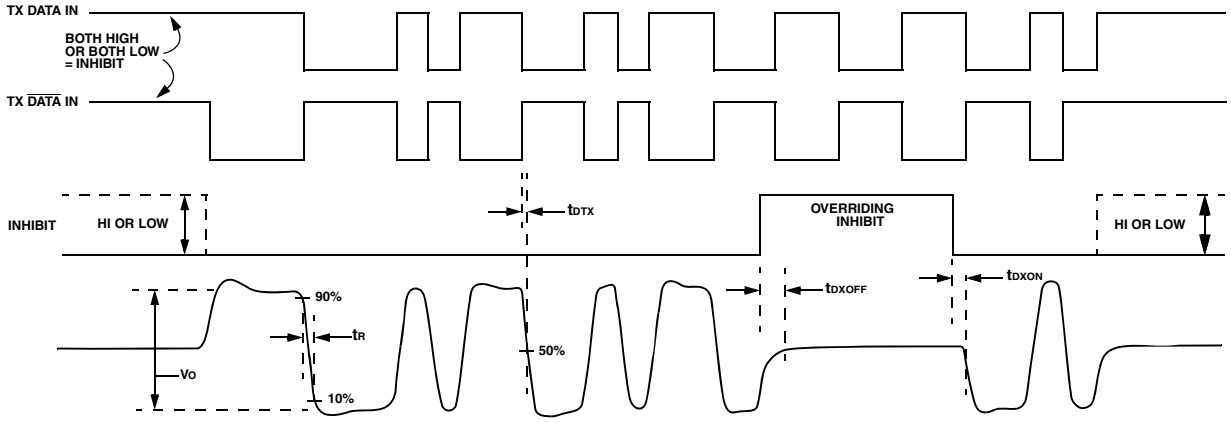


FIGURE 3 – Driver Logic Waveforms

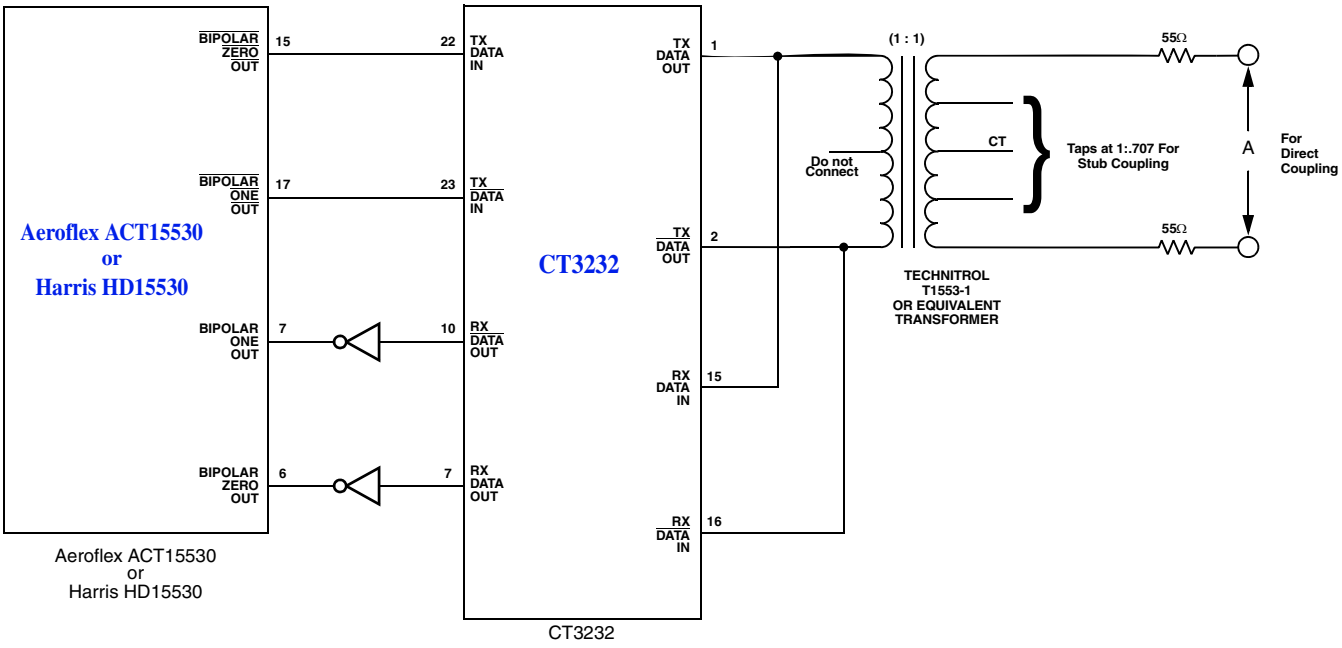
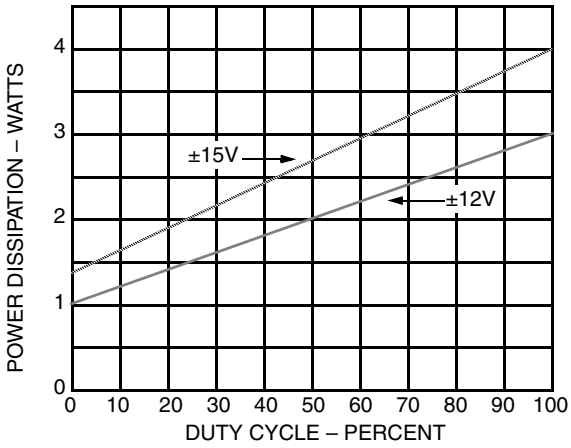


FIGURE 4 – Typical Input / Output Connections

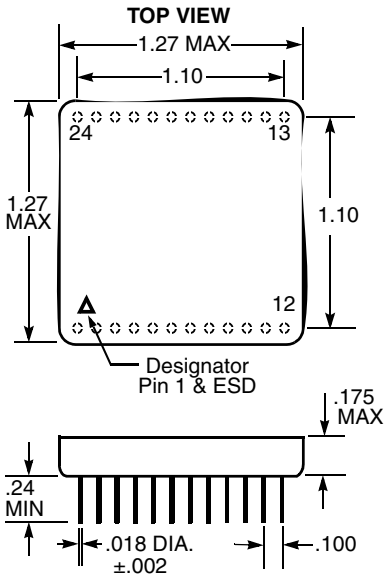


$$\% \text{ Duty Cycle} = \frac{\text{Transmit Time}}{\text{Transmit \& Receive Time}} \times 100$$

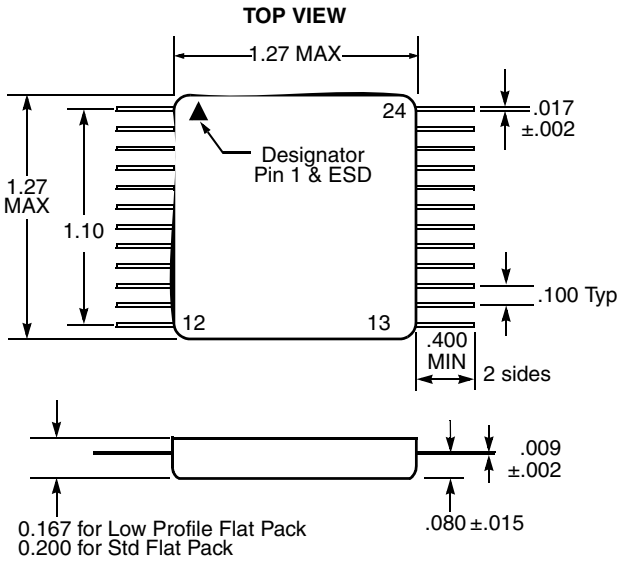
Note: Case Temperature must be held to +100°C Maximum for 100% Duty Cycle. for Operation at Case Temperature of +125°C, See "Power and Thermal Data".

FIGURE 5 – Typical Power Dissipation (Total Hybrid)

PLUG-IN PACKAGE



FLAT PACKAGE



Notes: 1. Dimensions shown are in inches.
2. Pins are equally spaced at .100 ±.002 tolerance non-cumulative each row.

FIGURE 6 – Package Outline Drawings

Pin #	Function	Pin #	Function
1	Tx Data Out	13	+VCCRX
2	Tx $\overline{\text{Data}}$ Out	14	NC
3	Ground C	15	Rx Data In
4	+VCCTX	16	Rx $\overline{\text{Data}}$ In
5	Ext. Data Threshold	17	Ground A
6	Int. Data Threshold	18	Case
7	Rx Data Out	19	-VEERX
8	Strobe	20	+VCCL (+5V)
9	Ground B	21	Tx Inhibit
10	Rx $\overline{\text{Data}}$ Out	22	Tx Data In
11	Int. $\overline{\text{Data}}$ Threshold	23	Tx $\overline{\text{Data}}$ In
12	Ext. $\overline{\text{Data}}$ Threshold	24	-VEETX

TABLE I – CT3232 Pin Out Description (Plug-In & Flat Package)

ORDERING INFORMATION

Model Number	Screening	Package
CT3232M	Military Temperature, -55°C to +125°C, Screened to the Individual Test Methods of MIL-STD-883	Plug-In
CT3232MFP		Flat Package

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