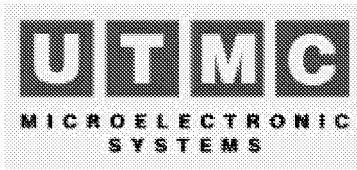# UT63M14x MIL-STD-1553A/B Bus Transceiver

Data Sheet

December 1998

## FEATURES

❏ 5-volt only operation (±10%)

❏ Completely monolithic bipolar technology

❏ Fit and functionally compatible to industry standard transceiver

❏ Idle low transmitter inputs and receiver outputs

❏ Dual-channel 50-mil center 24-lead Flatpack

❏ Dual-channel 100-mil center 36-pin DIP

❏ Full military operating temperature range, -55°C to +125°C, screened to QML Q or QML V requirements

❏ Radiation hardened to 1.0E6 rads(Si)

❏ Supports MIL-STD-1760 (UT63M145) and MIL-STD-1553 (UT63M147)

❏ Standard Microcircuit Drawing (SMD) 5962-93226 available

## INTRODUCTION

The monolithic UT63M14x Transceivers are complete transmitter and receiver pairs for MIL-STD-1553A and 1553B applications. Encoder and decoder interfaces are idle low.

The receiver section of the UT63M14x series accepts biphase-modulated Manchester II bipolar data from a MIL-STD-1553 data bus and produces TTL-level signal data at its RXOUT and $\overline{\text{RXOUT}}$ outputs. An external RXEN input enables or disables the receiver outputs.
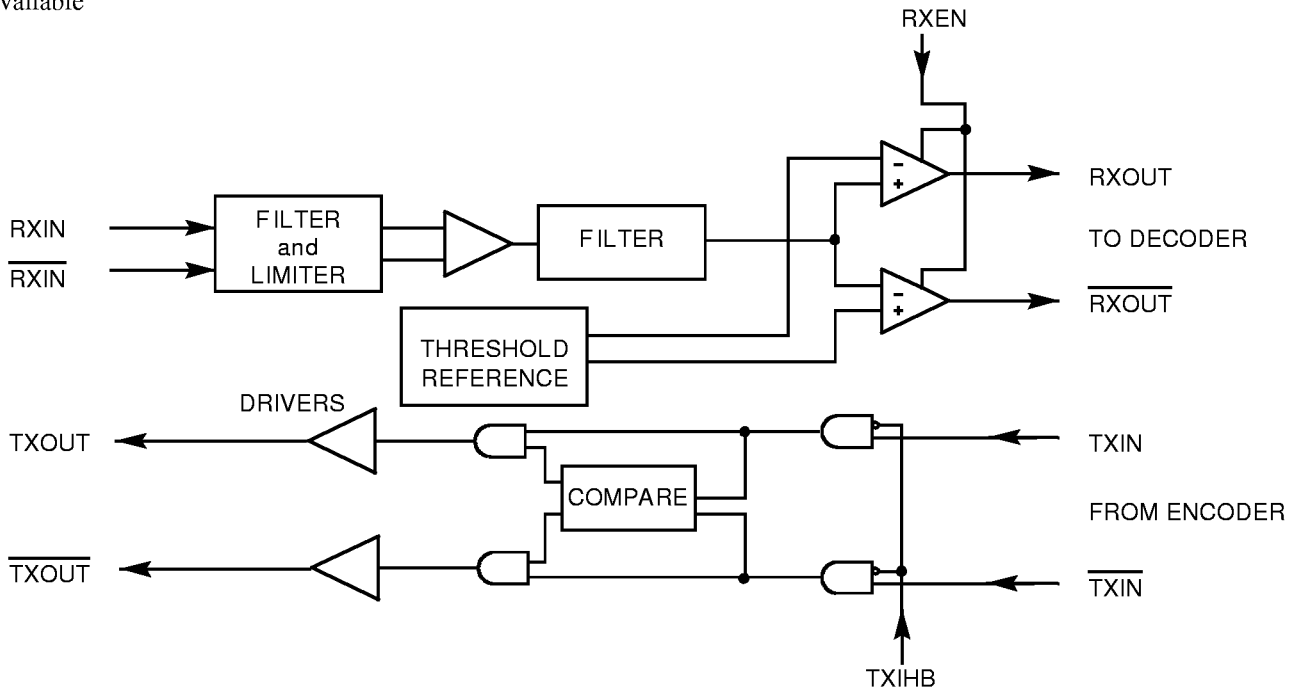


Figure 1. Functional Block Diagram

The transmitter section accepts biphase TTL-level signal data at its TXIN and $\overline{\text{TXIN}}$ and produces MIL-STD-1553 data signals. The transmitter's output voltage is typically 12 $V_{PP, L-L}$. Activating the TXIHB input or setting both data inputs to the same logic level disables the transmitter outputs.

The UT63M14x series offers complete transmitter and receiver pairs packaged in a dual-channel 36-pin DIP or 24-lead flatpack configurations designed for use in any MIL-STD-1553 application.

Legend for TYPE field:

TI   =   TTL input
TO   =   TTL output
DO   =   Differential output
DI   =   Differential input
DIO  =   Differential input/output
( )  =   Channel designator
[ ]  =   24-lead flatpack

TRANSMITTER

| NAME | PIN NUMBER | TYPE | DESCRIPTION |
|---|---|---|---|
| TXOUT [1] (A) | 1 [1] | DO [DIO] | Transmitter outputs: TXOUT and $\overline{\text{TXOUT}}$ are differential data signals. |
| TXOUT (B) | 10 [7] | DO [DIO] | |
| $\overline{\text{TXOUT}}$ [1] (A) | 2 [2] | DO [DIO] | $\overline{\text{TXOUT}}$ is the half-cycle complement of TXOUT. |
| $\overline{\text{TXOUT}}$ (B) | 11 [8] | DO [DIO] | |
| TXIHB (A) | 34 [22] | TI | Transmitter inhibit: This is an active high input signal. |
| TXIHB (B) | 25 [16] | TI | |
| TXIN (A) | 35 [23] | TI | Transmitter input: TXIN and $\overline{\text{TXIN}}$ are complementary TTL-level Manchester II encoder inputs. |
| TXIN (B) | 26 [17] | TI | |
| $\overline{\text{TXIN}}$ (A) | 36 [24] | TI | $\overline{\text{TXIN}}$ is the complement of TXIN input. |
| $\overline{\text{TXIN}}$ (B) | 27 [18] | TI | |

Note:
1. The 24-lead flatpack internally connects TXOUT to RXIN (CHA, CHB) and $\overline{\text{TXOUT}}$ to $\overline{\text{RXIN}}$ ($\overline{\text{CHA}}$, $\overline{\text{CHB}}$) for each channel.

2

RECEIVER

| NAME | PIN NUMBER | TYPE | DESCRIPTION |
|---|---|---|---|
| RXOUT (A) | 5 [4] | TO | Receiver outputs: RXOUT and $\overline{\text{RXOUT}}$ are complementary Manchester II decoder outputs. |
| RXOUT (B) | 14 [10] | TO | |
| $\overline{\text{RXOUT}}$ (A) | 8 [6] | TO | $\overline{\text{RXOUT}}$ is the complement of RXOUT output. |
| $\overline{\text{RXOUT}}$ (B) | 17 [12] | TO | |
| RXEN (A) | 6 [5] | TI | Receiver enable/disable: This is an active high input signal. |
| RXEN (B) | 15 [11] | TI | |
| RXIN [1] (A) | 29 [1] | DI [DIO] | Receiver input: RXIN and $\overline{\text{RXIN}}$ are biphase-modulated Manchester II bipolar inputs from MIL-STD-1553 data bus. |
| RXIN (B) | 20 [7] | DI [DIO] | |
| $\overline{\text{RXIN}}$ [1] (A) | 30 [2] | DI [DIO] | $\overline{\text{RXIN}}$ is the half-cycle complement of RXIN input. |
| $\overline{\text{RXIN}}$ (B) | 21 [8] | DI [DIO] | |

Note:
1. The 24-lead flatpack internally connects TXOUT to RXIN (CHA, CHB) and $\overline{\text{TXOUT}}$ to $\overline{\text{RXIN}}$ ($\overline{\text{CHA}}$, $\overline{\text{CHB}}$) for each channel.

POWER AND GROUND

| NAME | PIN NUMBER | TYPE | DESCRIPTION |
|---|---|---|---|
| $V_{CC}$ (A) | 33 [20] | PWR | +5 $V_{DC}$ power ($\pm10\%$) |
| $V_{CC}$ (B) | 24 [14] | PWR | |
| GND (A) | 3, 7, 31 [3,19,21] | GND | Ground reference |
| GND (B) | 12, 16, 22 [9,13,15] | GND | |

Figure 2a (36-pin):

Left side (pins 1-18):
- 1 TXOUT
- 2 $\overline{\text{TXOUT}}$
- 3 GND
- 4 NC
- 5 RXOUT
- 6 RXEN
- 7 GND
- 8 $\overline{\text{RXOUT}}$
- 9 NC

CHANNEL A

- 10 TXOUT
- 11 $\overline{\text{TXOUT}}$
- 12 GND
- 13 NC
- 14 RXOUT
- 15 RXEN
- 16 GND
- 17 $\overline{\text{RXOUT}}$
- 18 NC

CHANNEL B

Right side (pins 36-19):
- 36 $\overline{\text{TXIN}}$
- 35 TXIN
- 34 TXIHB
- 33 $V_{CC}$
- 32 NC
- 31 GND
- 30 $\overline{\text{RXIN}}$
- 29 RXIN
- 28 NC
- 27 $\overline{\text{TXIN}}$
- 26 TXIN
- 25 TXIHB
- 24 $V_{CC}$
- 23 NC
- 22 GND
- 21 $\overline{\text{RXIN}}$
- 20 RXIN
- 19 NC
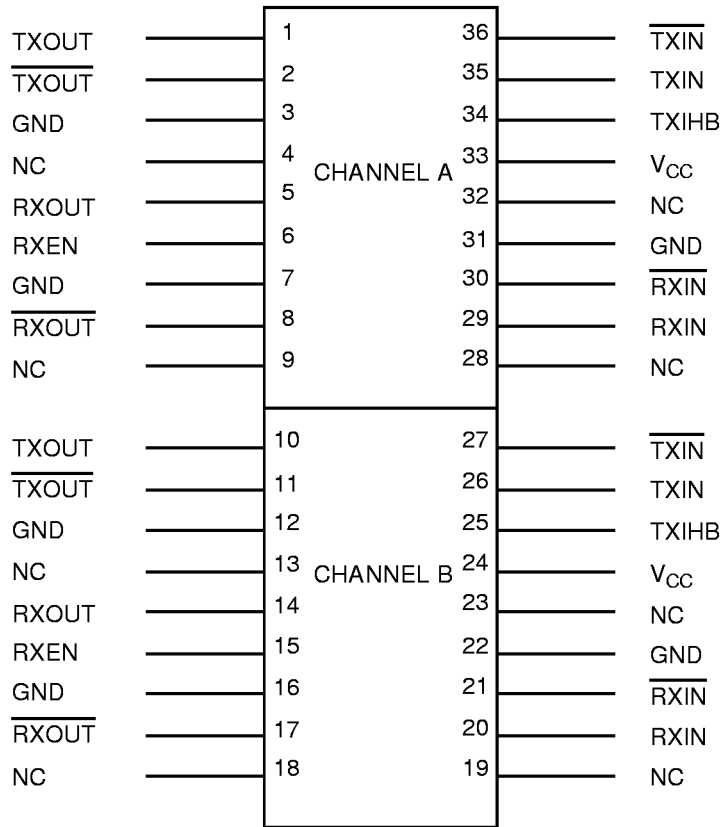
Figure 2a. Functional Pin Diagram -- Dual Channel (36)

Figure 2b (24-pin):

Left side (pins 1-12):
- 1 CHA
- 2 $\overline{\text{CHA}}$
- 3 GND
- 4 RXOUT
- 5 RXEN
- 6 $\overline{\text{RXOUT}}$

CHANNEL A

- 7 CHB
- 8 $\overline{\text{CHB}}$
- 9 GND
- 10 RXOUT
- 11 RXEN
- 12 $\overline{\text{RXOUT}}$

CHANNEL B

Right side (pins 24-13):
- 24 $\overline{\text{TXIN}}$
- 23 TXIN
- 22 TXIHB
- 21 GND
- 20 $V_{CC}$
- 19 GND
- 18 $\overline{\text{TXIN}}$
- 17 TXIN
- 16 TXIHB
- 15 GND
- 14 $V_{CC}$
- 13 GND
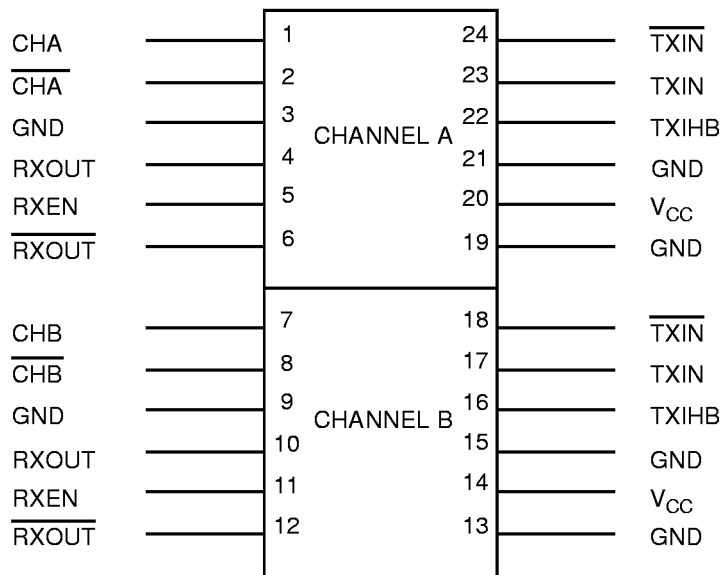
Figure 2b. Functional Pin Diagram -- Dual Channel (24) [1]

Note:
1. The 24-lead flatpack internally connects TXOUT to RXIN (CHA, CHB) and $\overline{\text{TXOUT}}$ to $\overline{\text{RXIN}}$ ($\overline{\text{CHA}}$, $\overline{\text{CHB}}$) for each channel.

4

## TRANSMITTER

The transmitter section accepts Manchester II biphase TTL data and converts this data into differential phase-modulated current drive. Transmitter current drivers are coupled to a MIL-STD-1553 data bus via a transformer driven from the TXOUT and $\overline{\text{TXOUT}}$ terminals. Transmitter output terminals' non-transmitting state is enabled by asserting TXIHB (logic "1"), or by placing both TXIN and $\overline{\text{TXIN}}$ at the same logic level. Table 1, Transmit Operating Mode, lists the functions for the output data in reference to the state of TXIHB. Figure 3 shows typical transmitter waveforms.

## RECEIVER

The receiver section accepts biphase differential data from a MIL-STD-1553 data bus at its RXIN and $\overline{\text{RXIN}}$ inputs. The receiver converts input data to biphase Manchester II TTL format and is available for decoding at the RXOUT and $\overline{\text{RXOUT}}$ terminals. The outputs RXOUT and $\overline{\text{RXOUT}}$ represent positive and negative excursions (respectively) of the inputs RXIN and $\overline{\text{RXIN}}$. Figure 4 shows typical receiver output waveforms.

### Table 1. Transmit Operating Mode

| TXIN | $\overline{\text{TXIN}}$ | TXIHB | TXOUT |
|------|------|-------|-------|
| x[1] | x | 1 | Off[2] |
| 0 | 0 | x | Off[3] |
| 0 | 1 | 0 | On |
| 1 | 0 | 0 | On |
| 1 | 1 | x | Off[3] |

Notes:
1. x = Don't care.
2. Transmitter output terminals are in the non-transmitting mode during Off-time.
3. Transmitter output terminals are in the non-transmitting mode during Off-time, independent of TXIHB status.
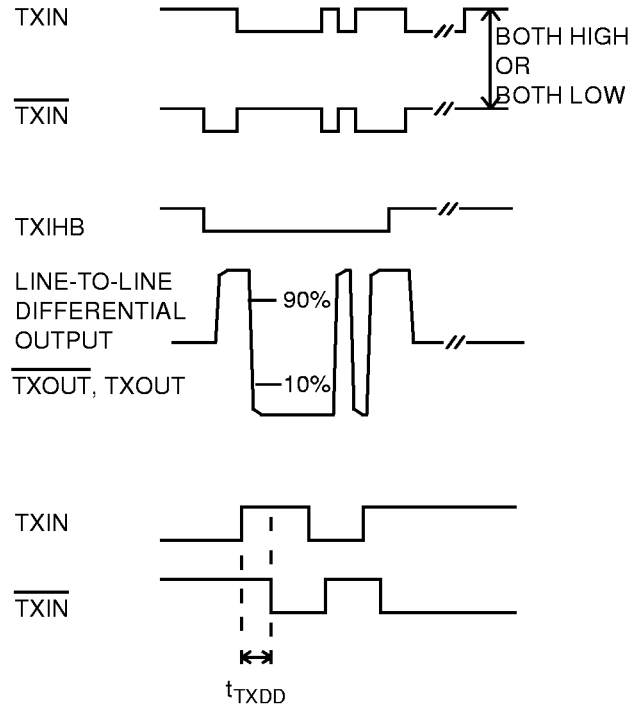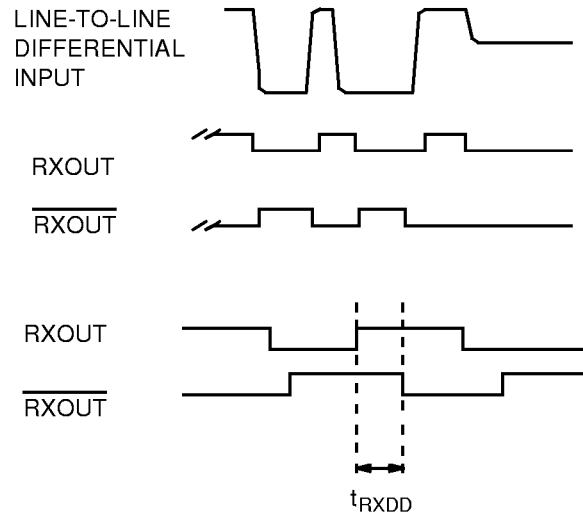


Figure 3. Typical Transmitter Wave



Figure 4. Typical Receiver Waveforms

## DATA BUS INTERFACE [1]

The designer can connect the UT63M14x to the data bus via a short-stub (direct-coupling) connection or a long-stub (transformer-coupling) connection. Use a short-stub connection when the distance from the isolation transformer to the data bus does not exceed a one-foot maximum. Use a long-stub connection when the distance from the isolation transformer exceeds the one-foot maximum and is less than twenty feet. Figure 5 shows various examples of bus coupling configurations. The UT63M14x series transceivers are designed to function with MIL-STD-1553A and 1553B compatible transformers.

**Note**:
1. The 24-lead flatpack internally connects TXOUT to RXIN and $\overline{\text{TXOUT}}$ to $\overline{\text{RXIN}}$ for each channel.

## RECOMMENDED THERMAL PROTECTION

All packages should mount to or contact a heat removal rail located in the printed circuit board. To insure proper heat transfer between the package and the heat removal rail, use a thermally-conductive material between the package and the heat removal rail. Use a material such as Mereco XLN-589 or equivalent to insure heat transfer between the package and heat removal rail.
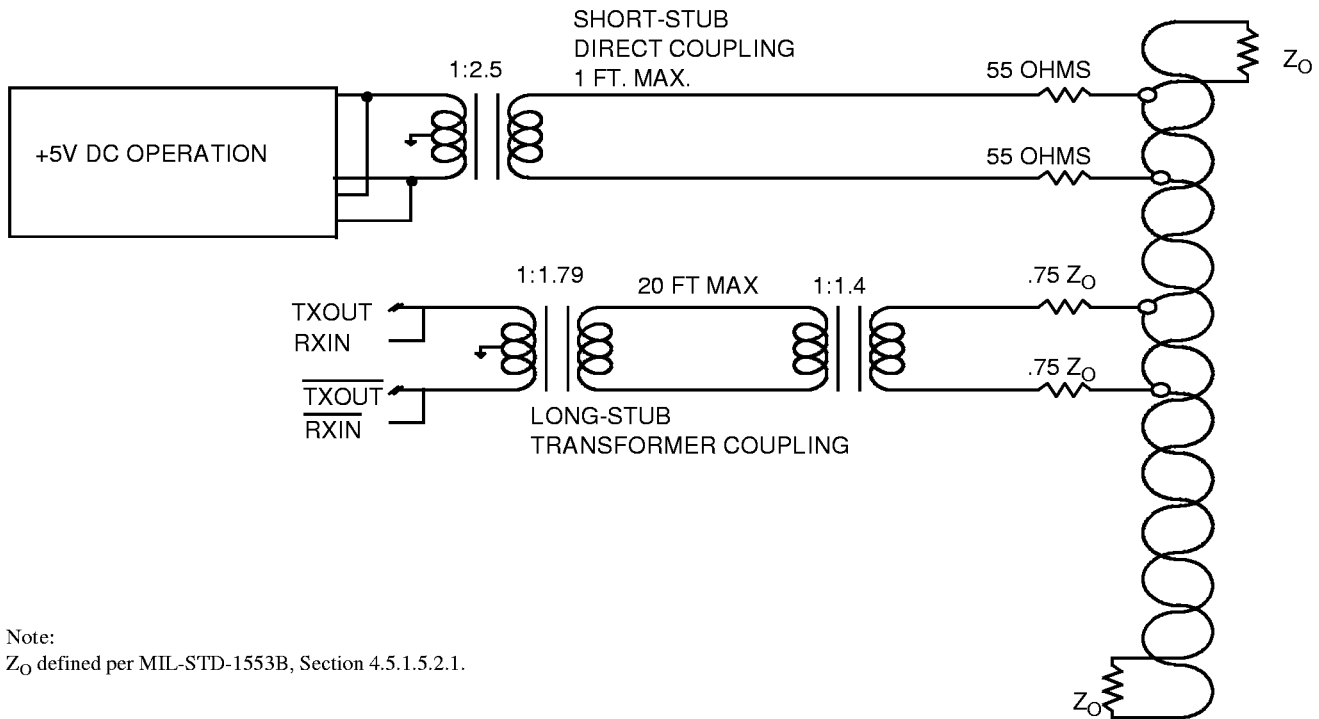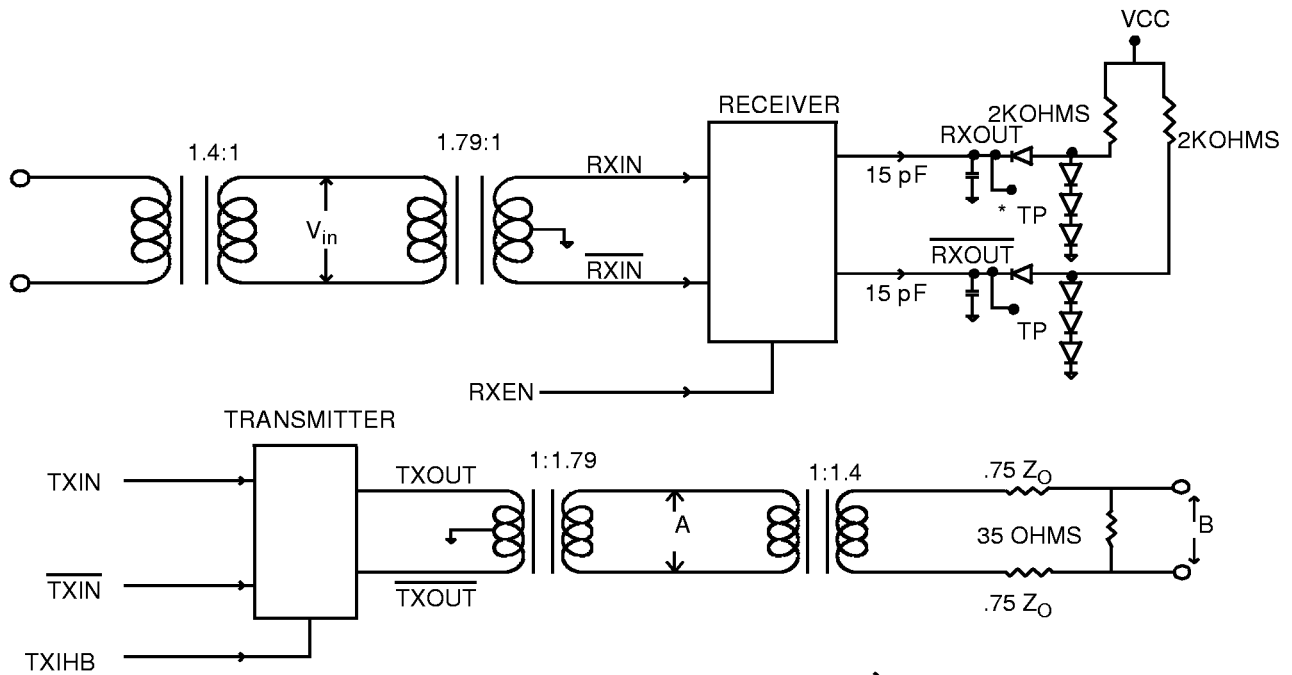


Note:
$Z_O$ defined per MIL-STD-1553B, Section 4.5.1.5.2.1.

Figure 5. Bus Coupling Configuration
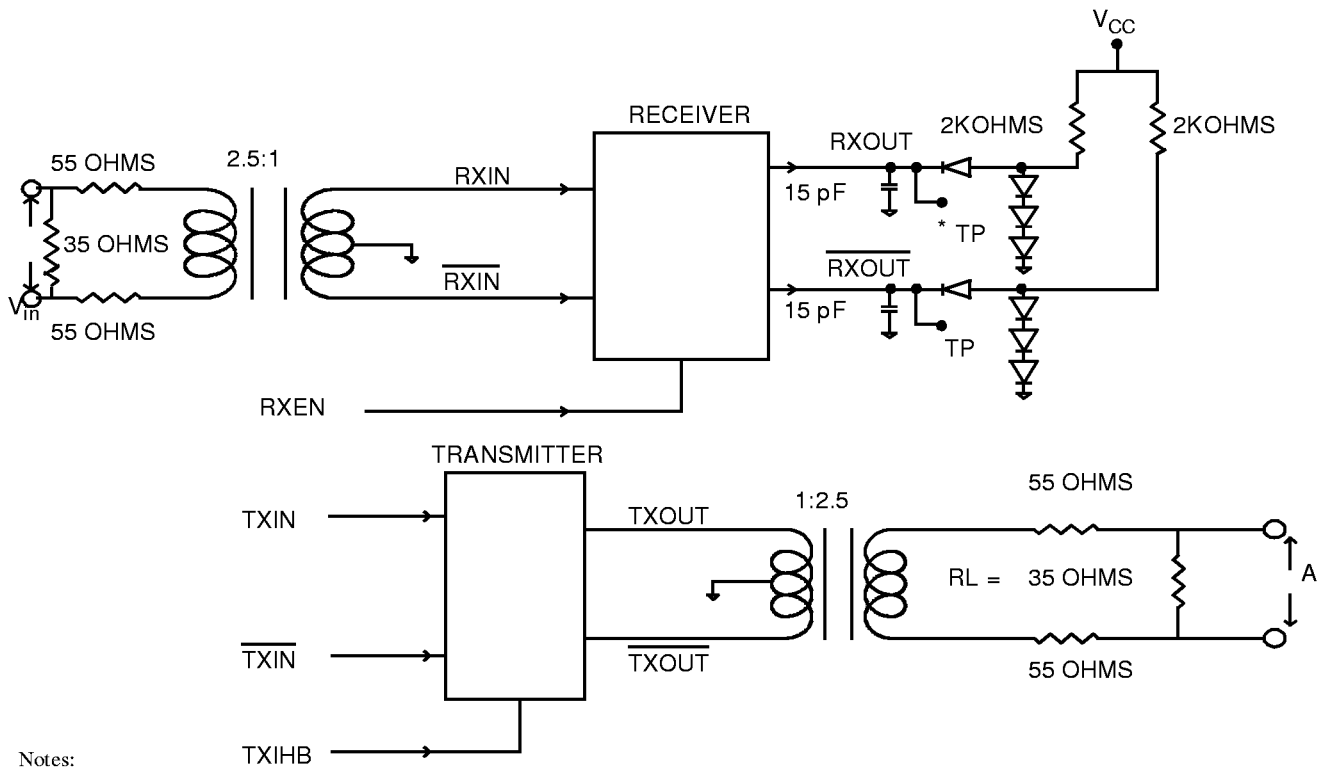
**Notes:**
1. TP = Test point.
2. RL removed for terminal input impedance test.
3. TXOUT and RXIN tied together.
   $\overline{\text{TXOUT}}$ and $\overline{\text{RXIN}}$ tied together.

Figure 6. Direct Coupled Transceiver with Load



**Notes:**
1. TP = Test point.
2. RL removed for terminal impedance test.
3. TXOUT and RXIN tied together.
   $\overline{\text{TXOUT}}$ and $\overline{\text{RXIN}}$ tied together.

Figure 7. Transformer Coupled Transceiver with Load

7
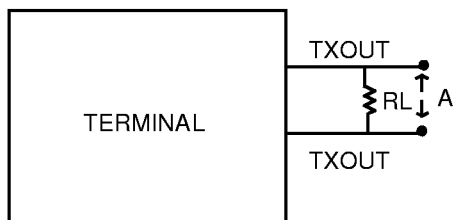
Notes:
1. Transformer Coupled Stub:
   Terminal is defined as transceiver plus isolation transformer. Point A is defined in figure 7.
2. Direct Coupled Stub:
   Terminal is defined as transceiver plus isolation transformer and fault resistors. Point A is defined in figure 6.

Figure 8. Transceiver Test Circuit MIL-STD-1553

## ABSOLUTE MAXIMUM RATINGS [1]

| PARAMETER | LIMITS | UNIT |
|---|---|---|
| $V_{CC}$ | -0.3 to +7.0 | V |
| Input voltage range (receiver) | 10 | $V_{PP, L-L}$ |
| Logic input voltage range | -0.3 to +5.5 | V |
| Power dissipation 100% duty cycle (per channel) | 3.6 | W |
| Thermal impedance junction to case[2] | 6.0 | °C/W |
| Maximum junction temperature | 175 | °C |
| Storage temperature | -65 to +150 | °C |
| Receiver common mode input voltage range | -5.0 to +5.0 | V |

Notes:
1. Stress outside the listed absolute maximum rating may cause permanent damage to the devices. This is a stress rating only, and functional operation of the device at these or any other conditions beyond limits indicated in the operational sections of this specification is not recommended. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. Mounting per MIL-STD-883, Method 1012.

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER | LIMITS | UNIT |
|---|---|---|
| Supply voltage range | 4.50 to +5.50 | V |
| Logic input voltage range | 0 to +5.0 | V |
| Receiver differential voltage | 8.0 | $V_{P-P}$ |
| Receiver common mode voltage range | ±4.0 | V |
| Driver peak output current | 600 | mA |
| Serial data rate | 0.3 to 1 | MHz |
| Case operating temperature range ($T_C$) | -55 to +125 | °C |

## DC ELECTRICAL CHARACTERISTICS [1]

$V_{CC} = 5.0V \pm 10\%$

$-55°C < T_C < +125°C$

| SYMBOL | PARAMETER | MINIMUM | MAXIMUM | UNIT | CONDITION |
|---|---|---|---|---|---|
| $V_{IL}$ | Input low voltage | | 0.8 | V | RXEN, TXIHB, TXIN, $\overline{TXIN}$ |
| $V_{IH}$ | Input high voltage | 2.0 | | V | RXEN, TXIHB, TXIN, $\overline{TXIN}$ |
| $I_{IL}$ | Input low current | -0.1 | | mA | $V_{IL} = 0.4V$; RXEN, TXIHB, TXIN, $\overline{TXIN}$ |
| $I_{IH}$ | Input high current | -40 | 40 | μA | $V_{IH} = 2.7V$; RXEN, TXIHB, TXIN, $\overline{TXIN}$ |
| $V_{OL}$ | Output low voltage | | .55 | V | $I_{OL} = 4mA$; RXOUT, $\overline{RXOUT}$ |
| $V_{OH}$ | Output high voltage | 2.4 | | V | $I_{OH} = 0.4mA$; RXOUT, $\overline{RXOUT}$ |
| $I_{CC}$ | $V_{CC}$ supply current | | 22<br>190<br>360<br>590<br>680 | mA<br>mA<br>mA<br>mA<br>mA | 0% duty cycle (non-transmitting)<br>25% duty cycle ($f = 1MHz$)<br>50% duty cycle ($f = 1MHz$)<br>87.5% duty cycle ($f = 1MHz$)<br>100% duty cycle ($f = 1MHz$)[2] |

Note:
1. All tests guaranteed per test figure 6.
2. Guaranteed but not tested.

RECEIVER ELECTRICAL CHARACTERISTICS [1]

$V_{CC} = 5.0V \pm 10\%$

$-55°C < T_C < +125°C$

| SYMBOL | PARAMETER | MINIMUM | MAXIMUM | UNIT | CONDITION |
|---|---|---|---|---|---|
| $C_{IN}$[2] | Input capacitance | | 10 | pF | RXEN; input $f$ = 1MHz @ 0V |
| $C_{OUT}$[2] | Output capacitance | | 20 | pF | RXOUT, $\overline{RXOUT}$; $f$ = 1MHz @ 0V |
| $V_{IC}$[2] | Common mode input voltage | -5 | 5 | V | Direct-coupled stub; input 1.2 $V_{PP}$, 200ns rise/fall time $\pm$25ns, $f$ = 1MHz |
| $V_{TH}$ | Input threshold voltage[4] (no response) | | 0.20 | $V_{PP,L-L}$ | Transformer-coupled stub; input at $f$ = 1MHz, rise/fall time 200ns at (Receiver output $0 \rightarrow 1$ transition) |
| | Input threshold voltage (no response) | | 0.28 | $V_{PP,L-L}$ | Direct-coupled stub; input at $f$ = 1MHz, rise/fall time 200ns at (Receiver output $0 \rightarrow 1$ transition) |
| | Input threshold voltage[4] (response) | 0.86 | 14.0 | $V_{PP,L-L}$ | Transformer-coupled stub; input at $f$ = 1MHz, rise/fall time 200ns at (Receiver output $0 \rightarrow 1$ transition) |
| | Input threshold voltage (response) | 1.20 | $20.0^2$ | $V_{PP,L-L}$ | Direct-coupled stub; input at $f$ = 1MHz, rise/fall time 200ns at (Receiver output $0 \rightarrow 1$ transition) |
| $CMRR$[2] | Common mode rejection ratio | Pass/Fail [3] | | N/A | |

Notes:
1. All tests guaranteed per test figure 6.
2. Guaranteed by device characterization. Capacitance is measured only for initial qualification and after any process or design changes which may affect input or output capacitance.
3. Pass/fail criteria per the test method described in MIL-HDBK-1553 Appendix A, RT Validation Test Plan, Section 5.1.2.2, Common Mode Rejection.
4. Guaranteed by design.

TRANSMITTER ELECTRICAL CHARACTERISTICS [1]

$V_{CC} = 5.0V \pm 10\%$

$-55°C < T_C < +125°C$

| SYMBOL | PARAMETER | MINIMUM | MAXIMUM | UNIT | CONDITION |
|---|---|---|---|---|---|
| $V_O$ | Output voltage swing per MIL-STD-1553B [2,3] (see figure 9) | 18 | 27 | $V_{PP,L-L}$ | Transformer-coupled stub, Figure 8, Point A; input $f$ = 1MHz, $R_L$ = 70 ohms |
| | per MIL-STD-1553B (see figure 9) | 6.0 | 9.0 | $V_{PP,L-L}$ | Direct-coupled stub, Figure 8, Point A; input $f$ = 1MHz, $R_L$ = 35 ohms |
| | per MIL-STD-1553A [2] (see figure 9) | 6.0 | 20 | $V_{PP,L-L}$ | Figure 7, Point A; input $f$ = 1MHz, $R_L$ = 35 ohms |
| $V_{NS}$ [2] | Output noise voltage differential (see figure 9) | | 14 | mV-RMS $_{L-L}$ | Transformer-coupled stub, Figure 8, Point A; input $f$ = DC to 10MHz, $R_L$ = 70 ohms |
| | | | 5 | mV-RMS $_{L-L}$ | Direct-coupled stub, Figure 8, Point A; input $f$ = DC to 10MHz, $R_L$ = 35 ohms |
| $V_{OS}$ [2] | Output symmetry (see figure 9) | -250 | +250 | $mV_{PP,L-L}$ | Transformer-coupled stub, Figure 8, Point A; $R_L$ = 140 ohms, measurement taken 2.5μs after end of transmission |
| | | -90 | +90 | $mV_{PP,L-L}$ | Direct-coupled stub, Figure 8, Point A; $R_L$ = 35 ohms, measurement taken 2.5μs after end of transmission |
| $V_{DIS}$ | Output voltage distortion (overshoot or ring) (see figure 9) | -900 | +900 | $mV_{peak,L-L}$ | Transformer-coupled stub, Figure 8, Point A; $R_L$ = 70 ohms |
| | | -300 | +300 | $mV_{peak,L-L}$ | Direct-coupled stub, Figure 8, Point A; $R_L$ = 35 ohms |
| $C_{IN}$ [2] | Input capacitance | | 15 | pF | TXIHB, TXIN, $\overline{TXIN}$; input $f$ = 1MHz @ 0V |
| $T_{IZ}$ [2] | Terminal input impedance | 1 | | Kohm | Transformer-coupled stub, Figure 7, Point A; input $f$ = 75KHz to 1MHZ (power on or power off; non-transmitting, $R_L$ removed from circuit). |
| | | 2 | | Kohm | Direct-coupled stub, Figure 6, Point A; input $f$ = 75KHz to 1MHZ (power on or power off; non-transmitting, $R_L$ removed from circuit). |

Notes:
1. All tests guaranteed per test figure 6.
2. Guaranteed by device characterization. Capacitance is measured only for initial qualification and after any process or design changes which may affect input or output capacitance.
3. For MIL-STD-1760, 22 Vp-p, L-L min.

AC ELECTRICAL CHARACTERISTICS [1]
$V_{CC} = 5.0V \pm 10\%$
$-55°C < T_C < +125°C$

| SYMBOL | PARAMETER | MINIMUM | MAXIMUM | UNIT | CONDITION |
|---|---|---|---|---|---|
| $t_R, t_F$ | Transmitter output rise/ fall time (see figure 10) | 100 | 300 | ns | Input $f$ = 1MHz 50% duty cycle: direct-coupled $R_L$ = 35 ohms output at 10% through 90% points TXOUT, $\overline{TXOUT}$. Figure 10. |
| $t_{RXDD}$ | RXOUT delay | -200 | 200 | ns | RXOUT to $\overline{RXOUT}$, Figure 4. |
| $t_{TXDD}$ [3] | TXIN skew | -25 | 25 | ns | TXIN to $\overline{TXIN}$, Figure 3. |
| $t_{RZCD}$ | Zero crossing distortion (see figure 11) | -150 | 150 | ns | Direct-coupled stub; input $f$ = 1MHz, 3 $V_{PP}$ (skew INPUT $\pm$150ns), rise/fall time 200ns. |
| $t_{TZCS}$ [2] | Zero crossing stability (see figure 11) | -25 | 25 | ns | Input TXIN and $\overline{TXIN}$ should create Transmitter output zero crossings at 500ns, 1000ns, 1500ns, and 2000ns. These zero crossings should not deviate more than $\pm$25ns. |
| $t_{RDXOFF}$ [3,4] | Transmitter off; delay from inhibit active | | 100 | ns | TXIN and $\overline{TXIN}$ toggling @ 1MHz; TXIHB transitions from logic zero to one, see figure 12. |
| $t_{DXON}$ [3,5] | Transmitter on; delay from inhibit inactive | | 150 | ns | TXIN and $\overline{TXIN}$ toggling @ 1MHz; TXIHB transitions from logic one to zero, see figure 13. |
| $t_{RCVOFF}$ [3] | Receiver off | | 50 | ns | Receiver turn off time, see figure 13. |
| $t_{RCVON}$ [3] | Receiver on | | 50 | ns | Receiver turn on time, see figure 13. |
| $t_{RCVPD}$ [3] | Receiver propagation | | 450 | ns | Receiver propagation delay, see figure 13. |
| $t_{XMITPD}$ [3] | Transmitter propagation | | 200 | ns | Transmitter propagation delay, see figure 12. |

Notes:
1. All tests guaranteed per test figure 6.
2. Guaranteed by device characterization.
3. Supplied as a design limit but not guaranteed or tested.
4. Delay time from transmit inhibit (1.5V) rising to transmit off (280mV).
5. Delay time from transmit inhibit (1.5V) falling to transmit off (1.2V).

Table 2. Transformer Requirements

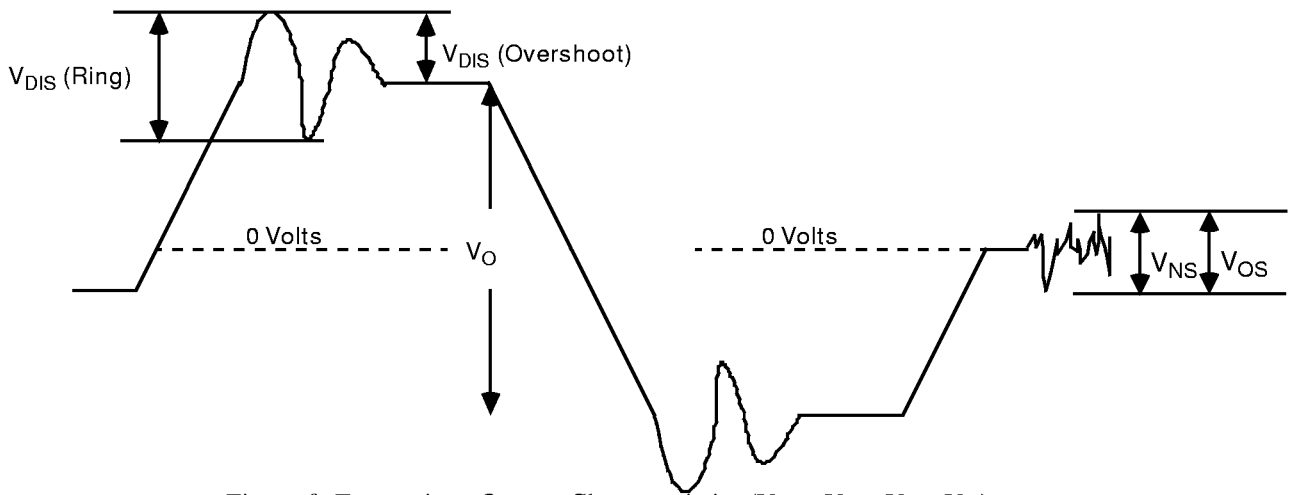| COUPLING TECHNIQUE | $\pm 5V_{DC}$ |
|---|---|
| DIRECT-COUPLED: Isolation Transformer Ratio | 2.5:1 |
| TRANSFORMER-COUPLED: Isolation Transformer Ratio | 1.79:1 |
| Coupling Transformer Ratio | 1:1.4 |

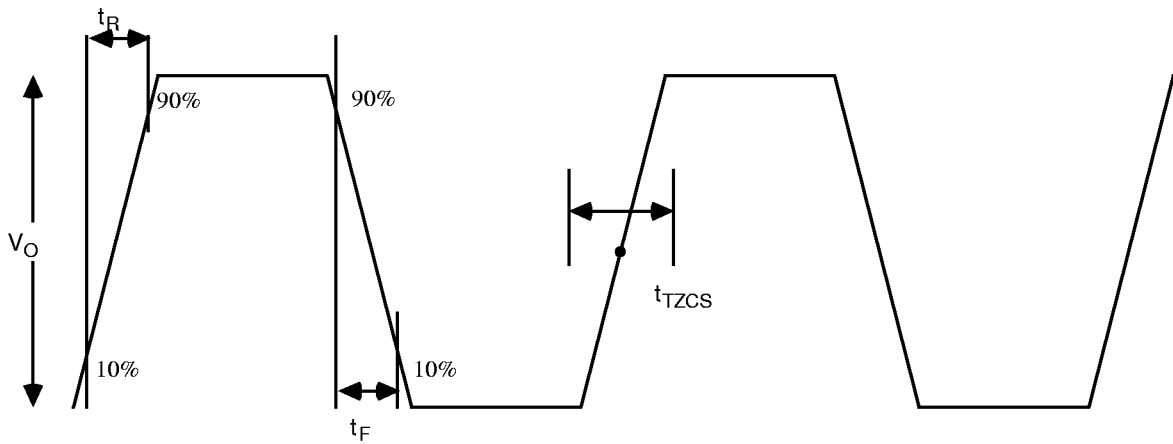Figure 9. Transmitter Output Characteristics ($V_{DIS}$, $V_{OS}$, $V_{NS}$, $V_O$)



Figure 10. Transmitter Output Zero Crossing Stability, Rise Time, Fall Time ($t_{TZCS}$, $t_R$, $t_F$)



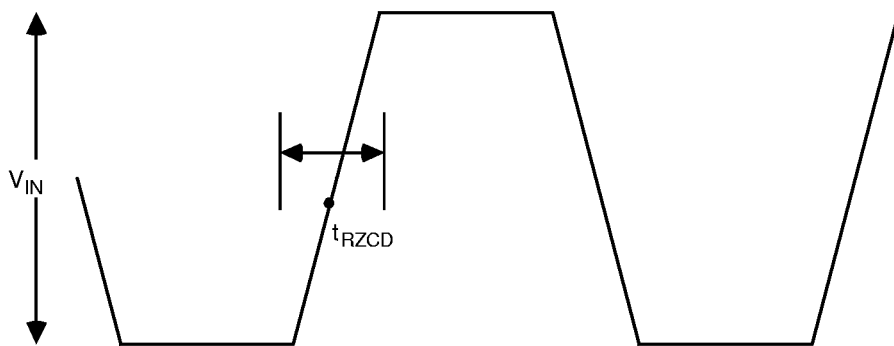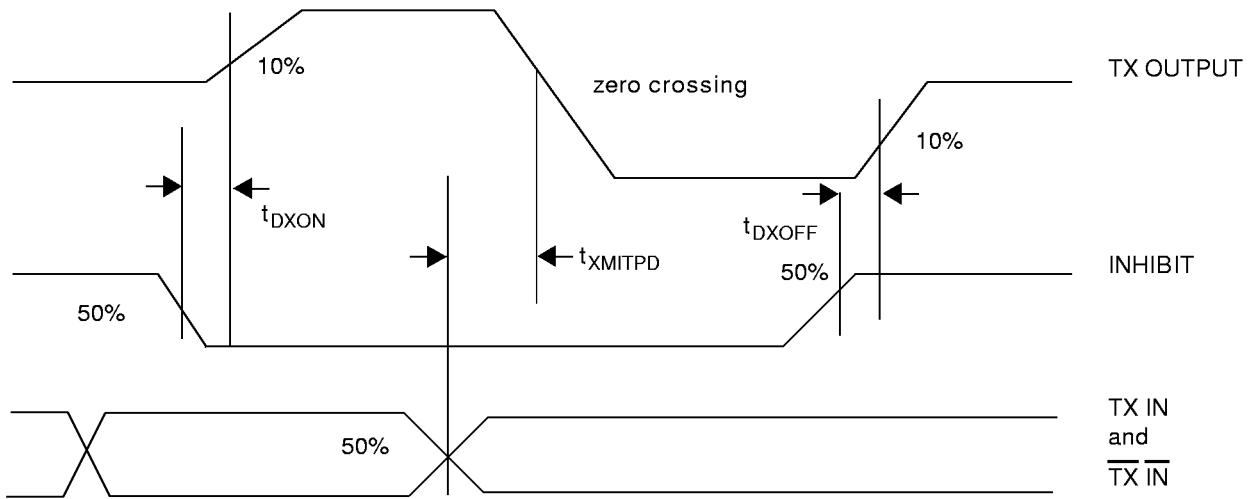Figure 11. Receiver Input Zero Crossing Distortion ($t_{RZCD}$)

TX OUTPUT

10%

zero crossing

10%

$t_{DXON}$

$t_{DXOFF}$

$t_{XMITPD}$

INHIBIT

50%

50%

50%

TX IN
and
$\overline{\text{TX IN}}$

Figure 12. Transmitter Timing

RX INPUT

zero crossing

RXEN

$t_{RCVPD}$

50%

50%

RXEN

$t_{RCVON}$

$t_{RCVOFF}$

50%

50%

50%

RX OUT
and
$\overline{\text{RX OUT}}$

Figure 13. Receiving Timing

LEAD 1 INDICATOR

.810 MAX.

0.016 ±.002

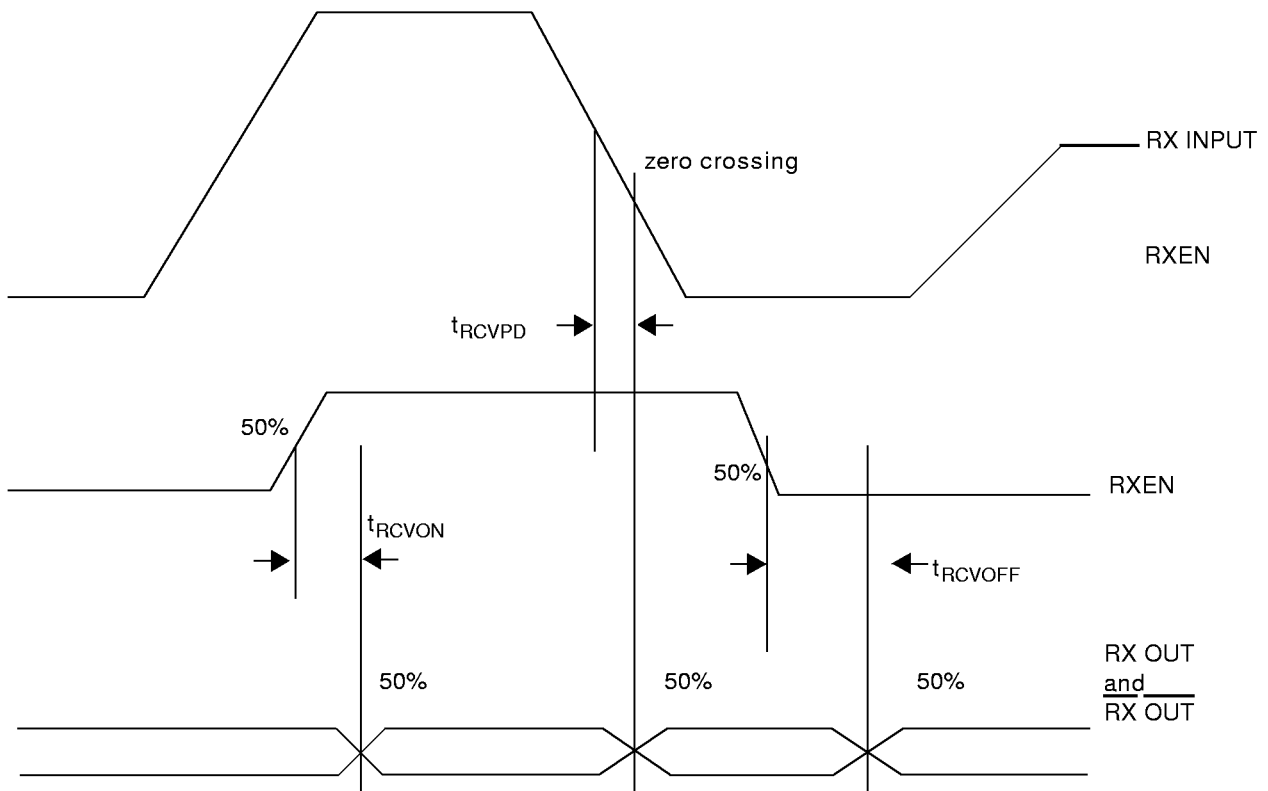.600 MAX.

.400 MIN.

.050

0.130 MAX.

.010 + .002 - .001

0.070 ±0.010
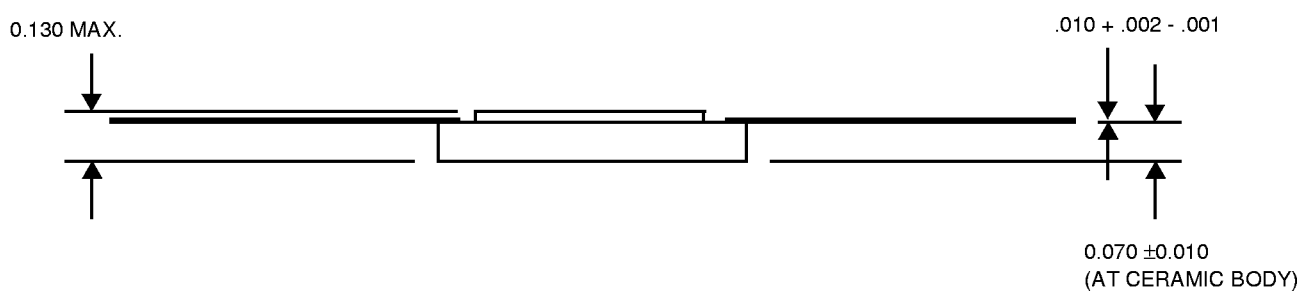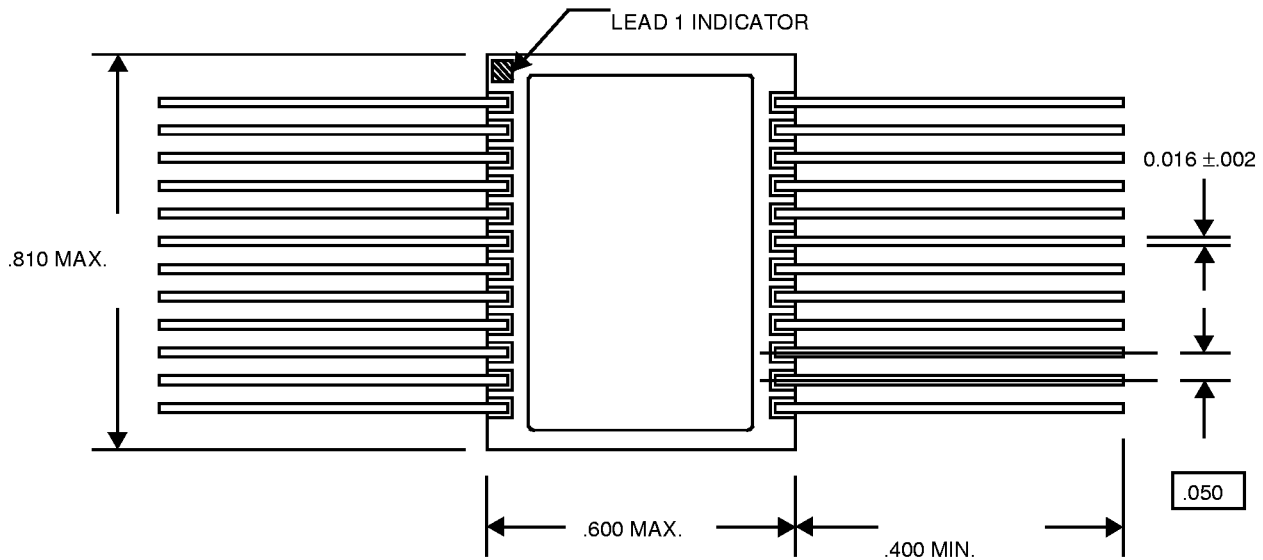(AT CERAMIC BODY)

Notes:
1. Package material: opaque ceramic.
2. All package plating finishes are per MIL-PRF-38535.
3. It is recommended that package ceramic be mounted to a heat removal rail located in the
   printed circuit board.  A thermally conductive material should be used.
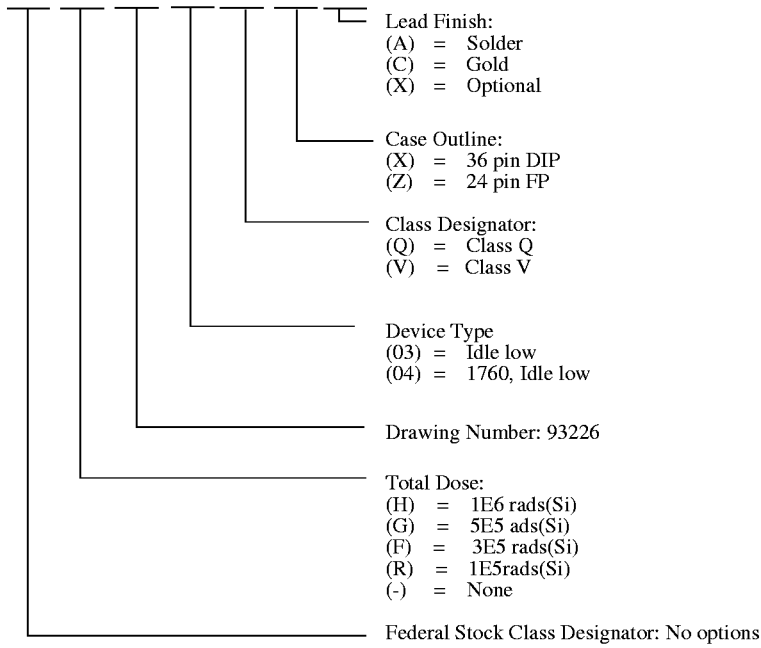
Figure 15. 24-Lead Flatpack, Dual Cavity
(50-mil lead spacing)

# ORDERING INFORMATION
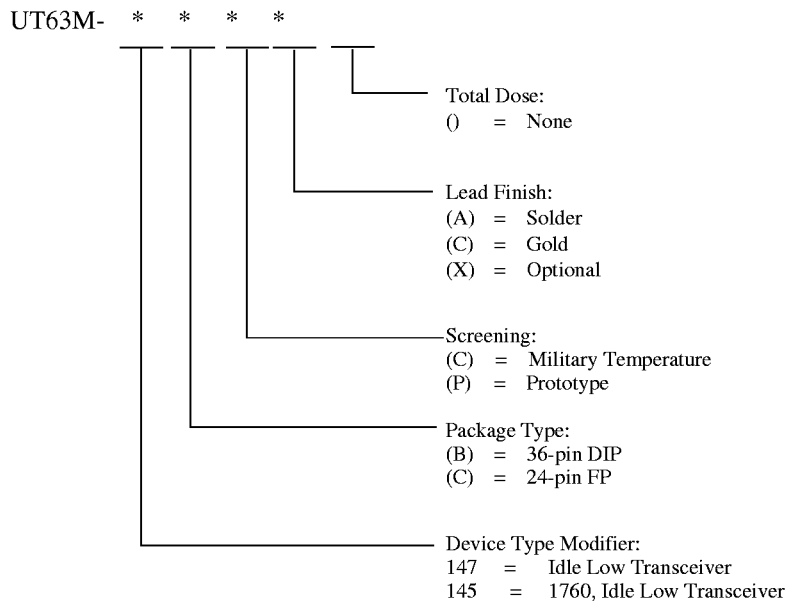
## UT63M Monolithic Transceiver, 5V Operation: SMD

```
5962    *    93226  *    *    *    *
```

Lead Finish:
(A)   =   Solder
(C)   =   Gold
(X)   =   Optional

Case Outline:
(X)   =   36 pin DIP
(Z)   =   24 pin FP

Class Designator:
(Q)   =   Class Q
(V)   =   Class V

Device Type
(03)  =   Idle low
(04)  =   1760, Idle low

Drawing Number: 93226

Total Dose:
(H)   =   1E6 rads(Si)
(G)   =   5E5 ads(Si)
(F)   =   3E5 rads(Si)
(R)   =   1E5rads(Si)
(-)   =   None

Federal Stock Class Designator: No options

Notes:
1. Lead finish (A, C, or X) must be specified.
2. If an "X" is specified when ordering, part marking will match the lead finish and will be either "A" (solder) or "C" (gold).
3. Total dose must be specified for all QML Q and QML V devices.
4. Neutron irradiation limits will be added when available.

UT63M Monolithic Transceiver, 5V Operation

UT63M- * * * *

Total Dose:
() = None

Lead Finish:
(A) = Solder
(C) = Gold
(X) = Optional

Screening:
(C) = Military Temperature
(P) = Prototype

Package Type:
(B) = 36-pin DIP
(C) = 24-pin FP

Device Type Modifier:
147 = Idle Low Transceiver
145 = 1760, Idle Low Transceiver

Notes:
1. Lead finish (A, C, or X) must be specified.
2. If an "X" is specified when ordering, part marking will match the lead finish and will be either "A" (solder) or "C" (gold).
3. Military Temperature range flow per UTMC's manufacturing flows document. Devices have 48 hours of burn-in and are tested at -55°C, room temperature, and 125°C. Radiation characteristics are neither tested nor guaranteed and may not be specified.
4. Prototype flow per UTMC Manufacturing Flows Technical Description. Devices have prototype assembly and are tested at 25°C only. Radiation characteristics are neither tested nor guaranteed and may not be specified. Lead finish is at UTMC's option and an "X" must be specified when ordering.