HOLT INTEGRATED CIRCUITS INC.

AN-500

5V MIL-STD-1553 Transceiver Circuit Design Applications Note

July 2016

INTRODUCTION

Power supply decoupling, ESD and circuit board layout need to be carefully considered when designing with a high-current transceiver product. Figure 1 shows a typical application circuit for (one side of) the HI-1567 when used in a transformer coupled stub configuration.

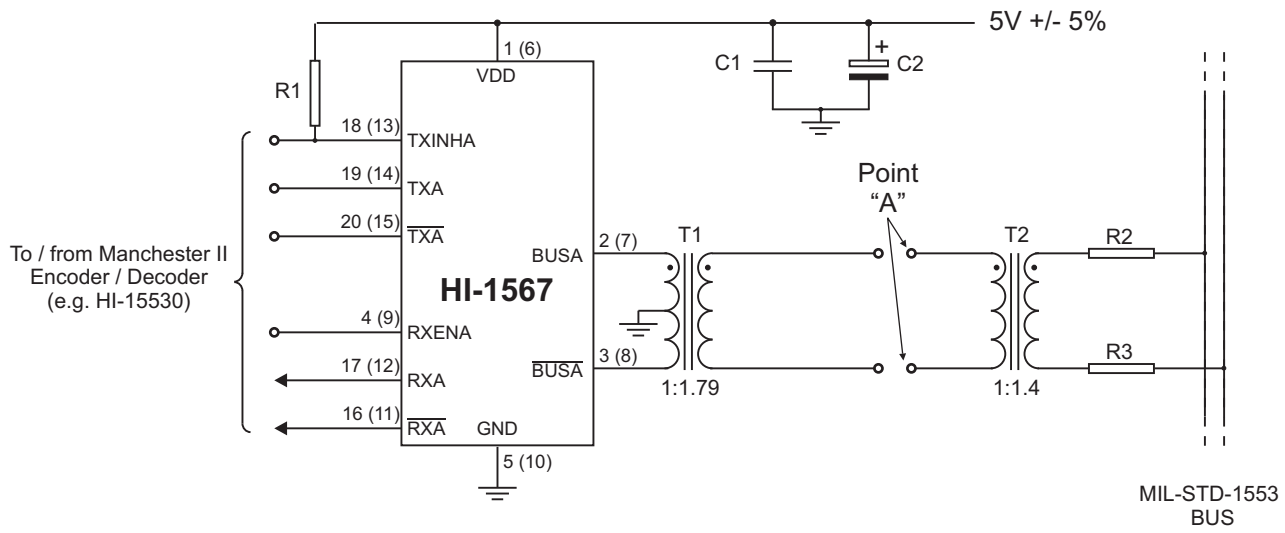
The guidelines described in this applications note apply to all Holt 5V MIL-STD-1553 transceiver products:

HI-1565
HI-1566
HI-1567
HI-1568
HI-1569
HI-1570

POWER SUPPLIES

These transceivers operate from a single 5V power supply. Separate power and ground pins are provided for each on-chip transceiver A and B. Note that VDDA and VDDB are connected together internally. GNDA and GNDB are independent. To power down either the A or B side transceiver, its corresponding GND supply should be removed.

The parts are supplied in either a ceramic DIP or plastic, thermally enhanced, small-outline (ESOIC) package. The ESOIC package has a metal heat sink incorporated into the base of the part. The heat sink should be soldered to a thermally dissipative pad on the printed circuit board for optimum thermal performance. The heat sink is electrically isolated and may be soldered to any convenient power or ground plane.



RECOMMENDED COMPONENTS

R1	10 KΩ	0.25W
R2, R3	55 Ω	1W
C1	0.1 µF ceramic	
C2	10 µF Low ESR Tantalum	
T1	Premier Magnetics PM-DB2725EX or equivalent	
T2	Premier Magnetics PM-DB2702 or equivalent	

Figure 1. Typical Application Circuit (HI-1567 shown as an example)

A MIL-STD-1553 transceiver is a high current switching device. When transmitting, supply and output switching currents of typically 500 mA are present. The frequency component of switching currents is in the range of DC to approximately 2 Mhz.

Decoupling capacitors C1 and C2 should be placed as close to the device as possible.

Power supply traces to the device should be as wide as possible. There should be no significant voltage drop created along the high current 5V and GND paths. Separate ground traces are recommended to the chip and to the transformer (T1) center tap.

To minimize output noise and maintain terminal input impedance requirements, T1 should be placed as close to the chip as possible. Avoid running digital signals adjacent to the transformer traces.

ESD PROTECTION

These transceivers are high-speed CMOS devices. ESD protection at the BUS / $\overline{\text{BUS}}$ pins has been verified to exceed 8KV per MIL-STD-883 method 3015. Ensure that ESD handling precautions are observed when handling unprotected devices.

OVER-CURRENT SHUT-DOWN

Holt's MIL-STD-1553 transceivers feature on-chip over-current shut-down circuits. In the event that a bus is short-circuited, the transmitter will detect an over-current condition and will partially shut down. The over-current circuit will test for the bus to be returned to a normal load condition every few milliseconds and automatically re-enable the transmitter once the bus fault condition is cleared. This shut down feature protects the terminal from excessive supply drain conditions which can occur for example if the transmitter inputs are held in a One, Zero or One/Zero state.

OUTPUT SYMMETRY

For correct operation of MIL-STD-1553 data bus systems it is vital to ensure that no dc offset is introduced onto the system bus by an asymmetric transmitter. Each bi-phase sync or data bit must have an equal period of high and low time. To achieve this, propagation delay paths and output drivers on the HI-1567 are carefully matched. The user must ensure that the logic "1" pulse widths applied to TXA and $\overline{\text{TXA}}$ are exactly equal and that the mid-bit transitions on these two inputs are coincident.

Introducing a dc offset onto a MIL-STD-1553 data-bus may cause receiver detection errors at the end of long messages.

REVISION HISTORY

Document	Rev.	Date	Description of Change
AN-500	G	07/28/16	Added HI-1565 and HI-1566 to applicable devices on pg.1