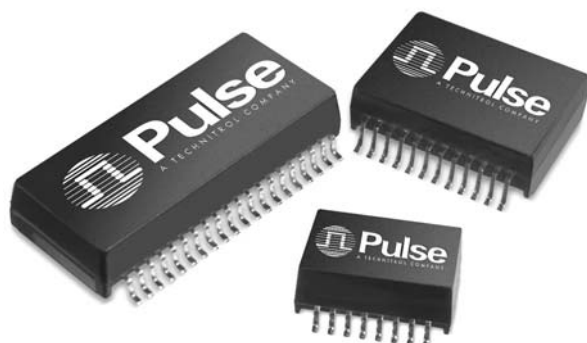


Star Magnetics™ 10/100 and Gigabit Ethernet with PoE* Option

*Power over Ethernet



- Ⓢ Manufacturing design complies with IEEE 802.3 and ANSI X3.263 standards
- Ⓢ Designed for IR oven and convection oven SMT line soldering processes to 235°C
- Ⓢ Compact footprint
- Ⓢ RoHS compliant parts available

NOTE: For RoHS compliant products add the suffix "NL" to the end of the part number. See note 6.

Electrical Specifications @ 25°C — Operating Temperature 0°C to 70°C

Part Number/ Mbps		PoE	Turns Ratio		Number of Ports	Insertion Loss (dB MAX)				Return Loss (Z out = 100 Ω ±15%)				Crosstalk (adjacent channels, dB MIN)			Hipot (V _{RMS} /MIN)
10/100	Gigabit		TX	RX		0.1 MHz	1 MHz	100 MHz	125 MHz	30 MHz	60 MHz	80 MHz	100 MHz	30 MHz	60 MHz	100 MHz	
H0055 ¹	—	No	1:1	1:1	1	-2.5	—	-1.0	—	-16	-10	-10	—	-45	-40	-33	1500
H0056 ²	—	No	1:1	1:1	1	—	-0.8	-0.9	—	-16	-10	-10	—	-45	-40	-33	1500
H1259	—	No	1:1	1:1	4	-1.2	—	-1.4	—	-16	-10	-10	—	-45	-40	-33	1500
HX1259 ³	—	No	1:1	1:1	4	-1.2	—	-1.4	—	-16	-10	-10	—	-45	-40	-33	1500
H1260	—	No	1:1	1:1	1	-1.1	—	-1.1	—	-16	-10	-10	—	-35	-30	-30	1500
HX1260 ³	—	No	1:1	1:1	1	-1.1	—	-1.1	—	-16	-10	-10	—	-35	-30	-30	1500
H1265	—	No	1:1	1:1	1	-1.3	—	-1.0	—	-16	-10	-10	—	-40	-38	-33	1500
H1266	—	No	1:1	1:1	4	-1.2	—	-1.0	—	-16	-10	-10	—	-45	-40	-30	1500
H1278	—	No	1:1	1:1	1	-1.1	—	-1.0	—	-16	-10	-10	—	-45	-40	-33	1500
H1305	—	No	1:1	1:1	2	-1.2	—	-1.4	—	-16	-10	-10	—	-45	-40	-33	1500
HX1305 ³	—	No	1:1	1:1	2	-1.2	—	-1.4	—	-16	-10	-10	—	-45	-40	-33	1500
H2260 ⁴	—	Yes	1:1	1:1	1	-1.1	—	-1.1	—	-16	-10	-10	—	-35	-30	-30	1500
HX2260 ^{3,4}	—	Yes	1:1	1:1	1	-1.1	—	-1.1	—	-16	-10	-10	—	-35	-30	-30	1500
H2305 ⁴	—	Yes	1:1	1:1	2	-1.2	—	-1.4	—	-16	-10	-10	—	-45	-40	-33	1500
HX2305 ^{3,4}	—	Yes	1:1	1:1	2	-1.2	—	-1.4	—	-16	-10	-10	—	-45	-40	-33	1500
—	H5062	No	1:1	1:1	1	-1.1	—	-1.0	-2.0	-18	-12	-12	-10	-43	-37	-33	1500

1. H0055 is designed to meet 200 μH nom.
2. H0056 is designed to meet 300 μH nom.
3. Parts offer extended temperature of operation -40 to +85°C
4. These parts are compliant to IEEE802.3af Power over Ethernet (PoE) standard.
5. For **Tape & Reel packaging** add a "T" suffix to the end of the part number when ordering, e.g. H1260T
6. For **RoHS compliant product** add the suffix "NL" to the end of the part number, e.g. HX2260NL or for both Tape & Reel and RoHS, HX2260NLT.

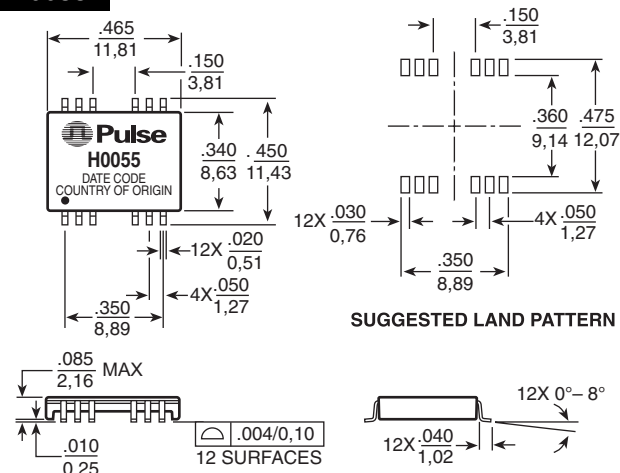
NOTE: "—" = not tested at that frequency.

Star Magnetics™ 10/100 and Gigabit Ethernet with PoE Option



Mechanicals

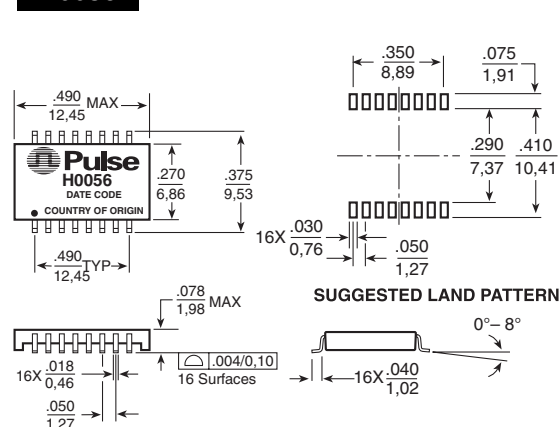
H0055



Weight355 grams
Tape & Reel . . .1000/reel
Tube40/tube

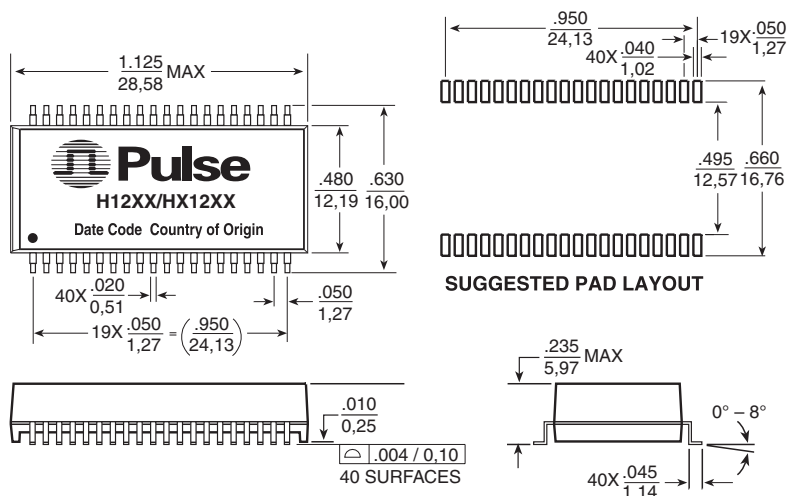
Dimensions: $\frac{\text{Inches}}{\text{mm}}$ Unless otherwise specified, all tolerances are $\pm \frac{.010}{0.25}$

H0056



Weight3 grams
Tape & Reel . . .2000/reel
Tube40/tube

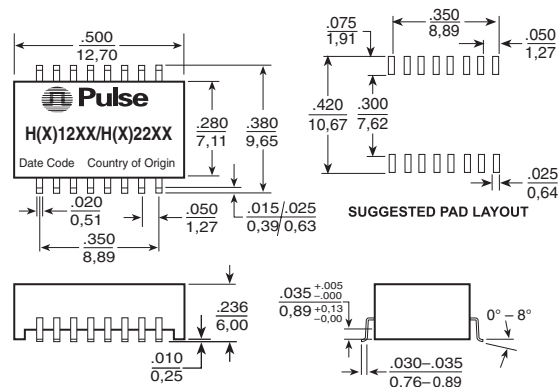
H1259, HX1259, H1266



Weight4.8 grams
Tape & Reel . . .250/reel
Tube15/tube

Dimensions: $\frac{\text{Inches}}{\text{mm}}$ Unless otherwise specified, all tolerances are $\pm \frac{.010}{0.25}$

H1260, HX1260, H2260, HX2260



Weight2.8 grams
Tube45/tube
Tape & Reel . . .600/reel

H1265

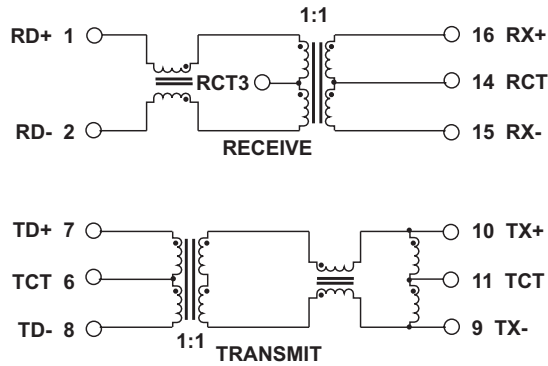


Star Magnetics™ 10/100 and Gigabit Ethernet with PoE Option

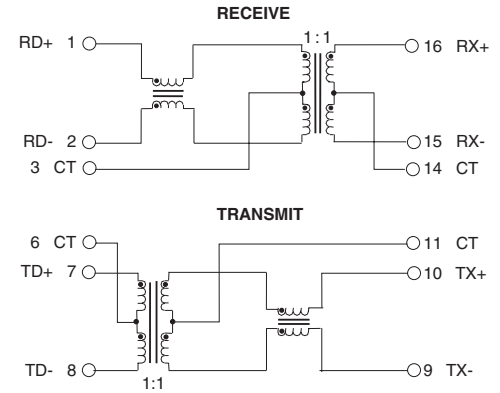


Schematics

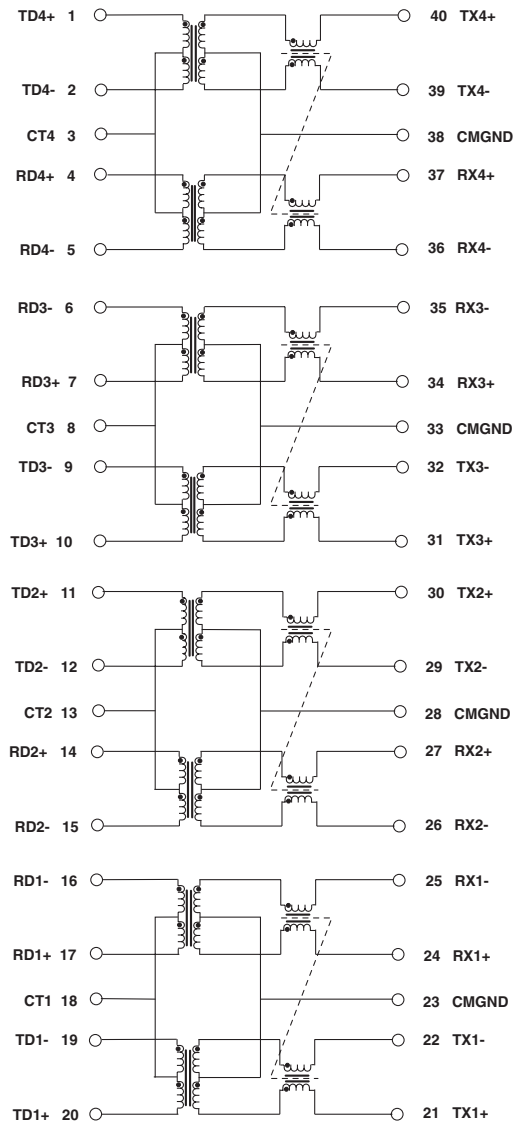
H0055



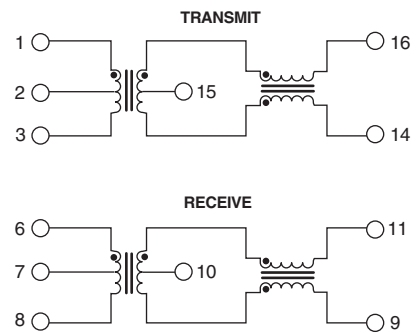
H0056



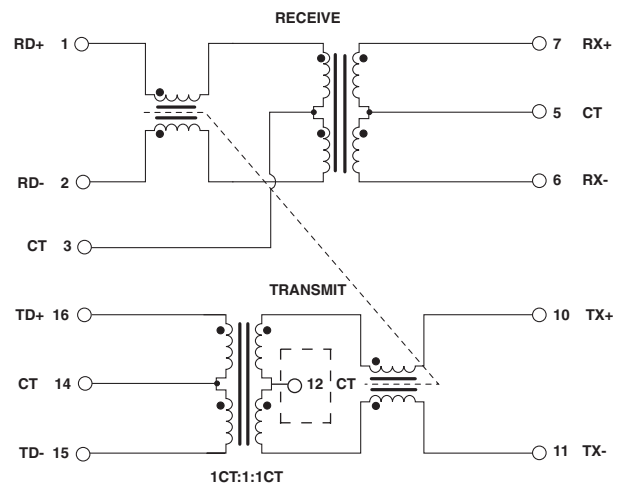
H1259, HX1259



H1260, HX1260



H1265



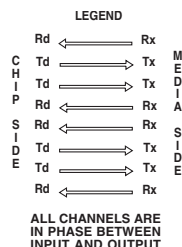
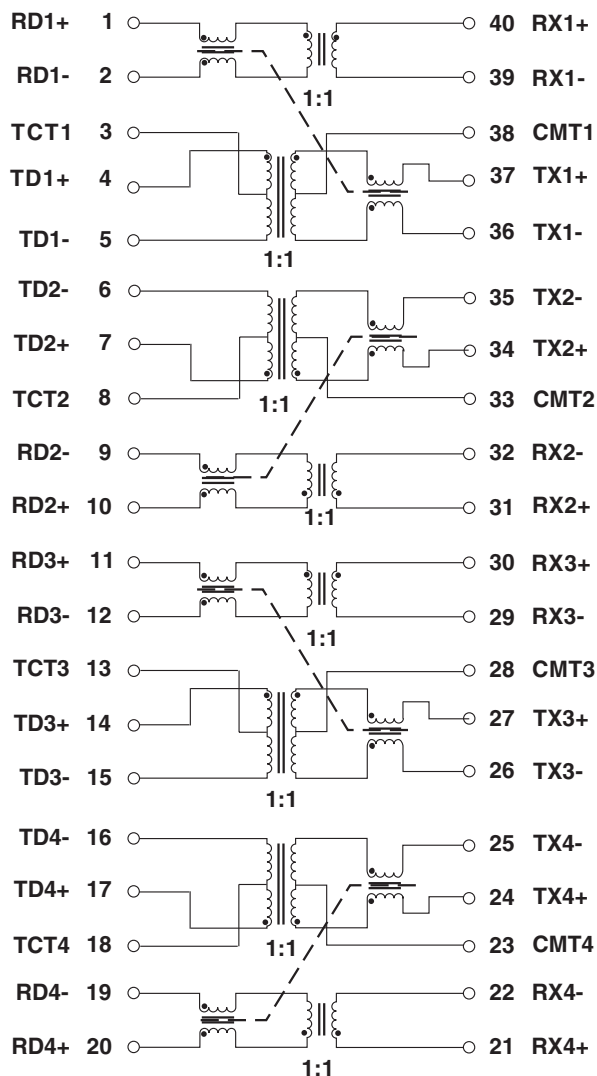
H1265: 3-core design (T3 same toroid core)

Star Magnetics™ 10/100 and Gigabit Ethernet with PoE Option

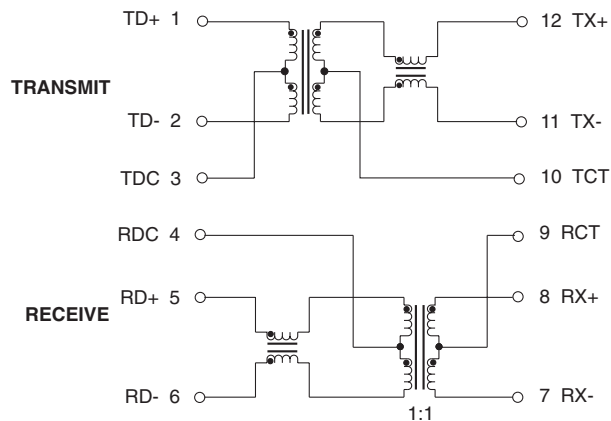


Schematics (continued)

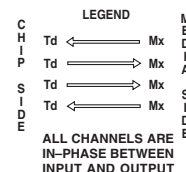
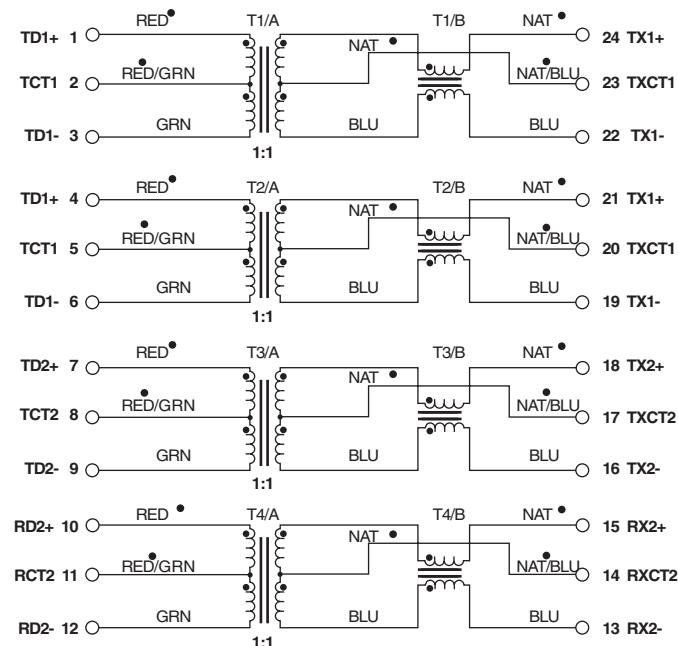
H1266



H1278



H1305, HX1305

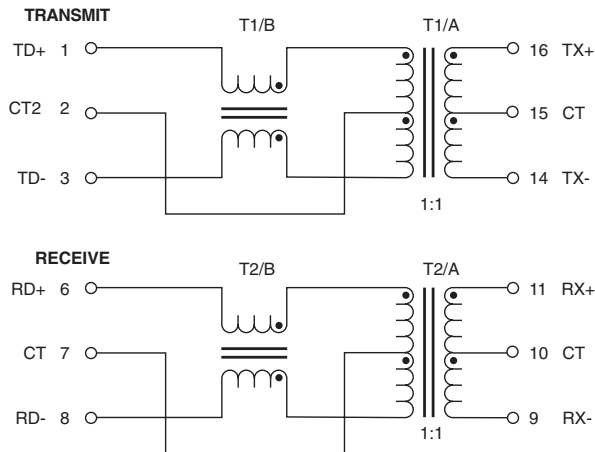


Star Magnetics™ 10/100 and Gigabit Ethernet with PoE Option

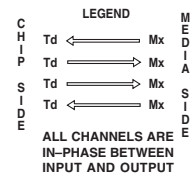
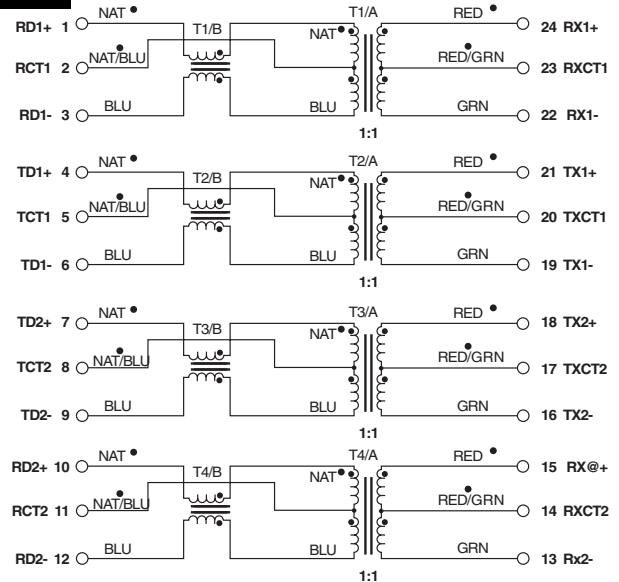


Schematics (continued)

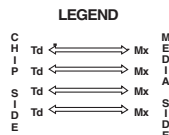
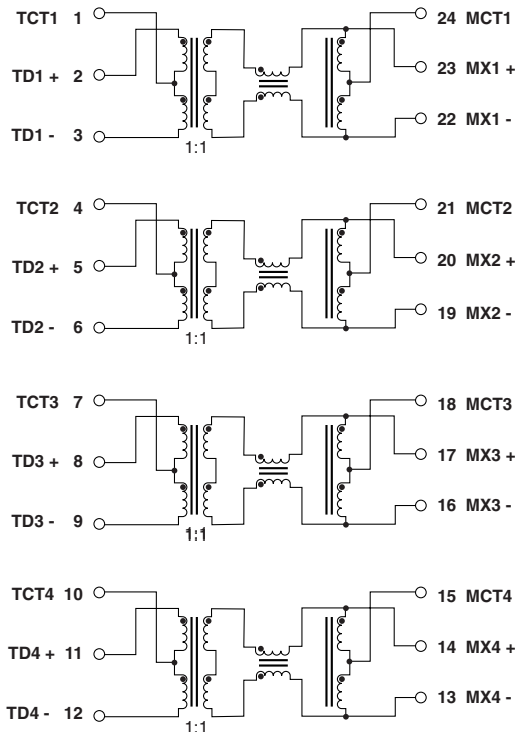
H2260, HX2260



H2305, HX2305



H5062



Star Magnetics™ 10/100 and Gigabit Ethernet with PoE Option



Single Port PoE Application Note

This line of discrete magnetics are specifically designed for the implementation of a 10Base-T, 100Base-TX and 1000Base-TX transmission over data-grade unshielded twisted pair cable (UTP-3, 5/5e, 6).

The magnetics provide excellent EMI filtering and are suitable for Desktop PCs, Embedded Systems and Multiport Applications. Pulse has worked closely with the leading IC manufacturers in providing these 10/100/1000 solutions, thereby assuring compatibility with each transceiver.

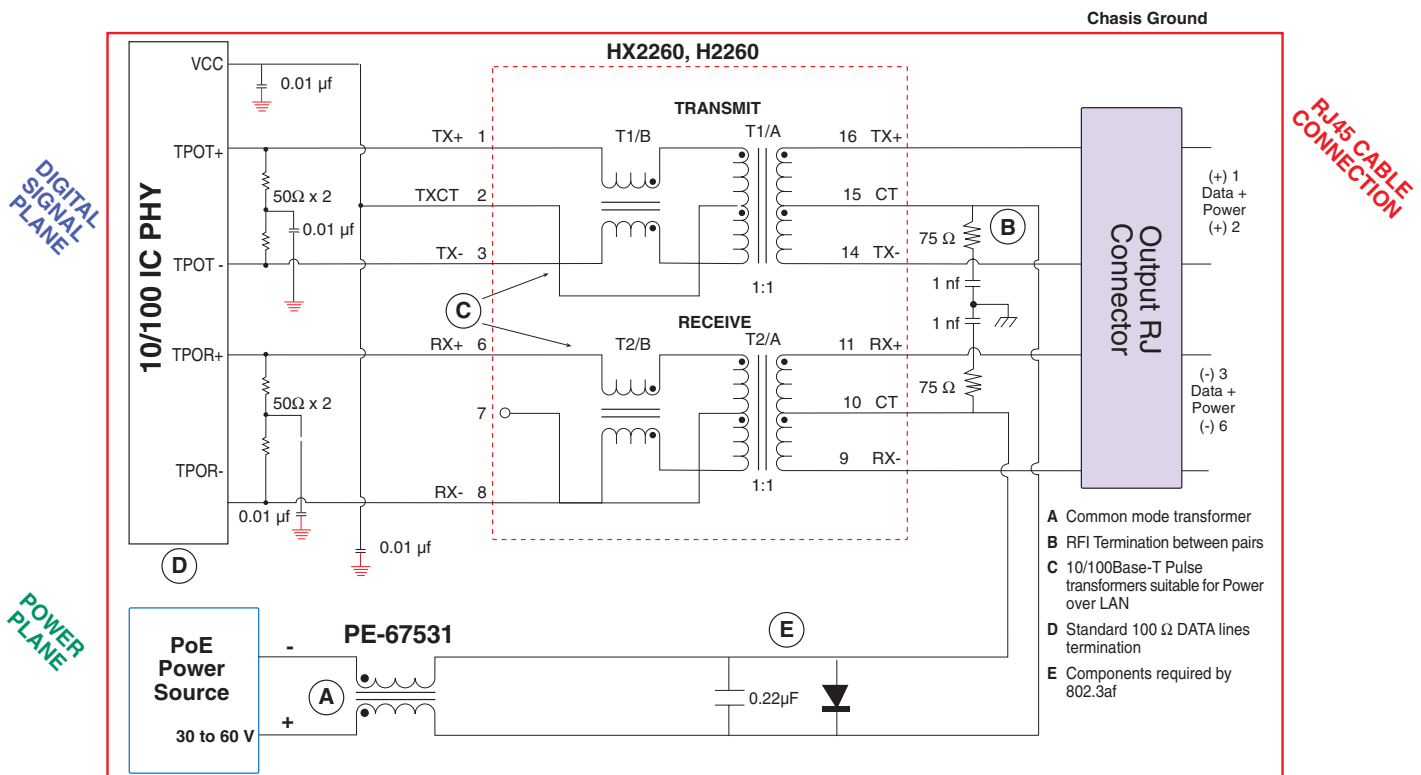
The Star Magnetics series, with the exception of the PCMCIA parts H0055/56, meet the stringent open circuit inductance requirements imposed by IEEE. When an 8mA DC current is applied across the transformer windings, the transformer

will provide at least 350μH. The transformers used in each module also provide 1500Vrms minimum isolation, wide bandwidth with minimal attenuation and fast rise times to minimize system level jitter.

The discrete magnetic products manufactured by Pulse are designed to meet all published specifications after exposure to surface mount soldering temperatures. The SMT design is robust enough to withstand leaded and lead-free soldering processing temperatures.

NOTE: The parts are packaged in tubes and Tape & Reel. Add the suffix "NL" for RoHS compliant parts (e.g. HX2260NL (tubes) or HX2260NLT (Tape & Reel)).

HX2260 Power Source Equipment (PSE) Application Circuit



PCB Layout Recommendations:

1. For maximum EMI suppression (electromagnetic interference) place the decoupling capacitors adjacent to Vcc and 50Ω connections.
2. Connections to ground should be as short as possible.
3. Connections between the 10/100 IC and the SMT connector should be direct and of minimum length.

The diagram illustrates the internal circuitry of a PoE HX2260, H2260 module, divided into two main planes: the Digital Signal Plane and the Power Plane.

Digital Signal Plane:

- 10/100 IC PHY:** The central component, with pins VCC, TPOT+, TPOT-, TPOR+, and TPOR-.
- TX (Transmit) Section:**
 - TX+ (pin 1) and TX- (pin 3) are connected to the TXCT (pin 2) and TX+ (pin 16) and TX- (pin 14) of the transformer.
 - TXCT (pin 2) is connected to TX+ (pin 16) and TX- (pin 14) of the transformer.
 - TX+ (pin 1) and TX- (pin 3) are connected to TX+ (pin 16) and TX- (pin 14) of the transformer.
- RX (Receive) Section:**
 - RX+ (pin 6) and RX- (pin 8) are connected to the RX+ (pin 11) and RX- (pin 9) of the transformer.
 - RX+ (pin 6) and RX- (pin 8) are connected to RX+ (pin 11) and RX- (pin 9) of the transformer.
 - RX+ (pin 6) and RX- (pin 8) are connected to RX+ (pin 11) and RX- (pin 9) of the transformer.
- Termination and Filtering:**
 - 75 Ω termination resistors are connected to RX+ (pin 11) and RX- (pin 9).
 - 1 nF capacitors are connected to RX+ (pin 11) and RX- (pin 9).
 - 0.01 μ F capacitors are connected to VCC and TPOT+.
 - 50 Ω x 2 resistors are connected to TPOT+ and TPOT-.
 - 50 Ω x 2 resistors are connected to TPOR+ and TPOR-.

Power Plane:

- PoE Power Receiving Device:** A device that receives power from the PoE switch and provides it to the PoE module.
- Full wave rectifying bridge (E):** A bridge rectifier that converts the AC power from the PoE switch into DC power for the PoE module.
- Output RJ45 Connector:** A connector that provides the PoE power to the PoE module.

Legend:

- B** RFI Termination between pairs
- C** 10/100Base-T Pulse transformers suitable for Power over LAN
- D** Standard 100 Ω DATA lines termination
- E** Full wave rectifying bridge for polarity changes 1, 2 and 3, 6 cable pairs

1. For maximum EMI suppression (electromagnetic interference) place the decoupling capacitors adjacent to Vcc and 50Ω connections.
2. Connections to ground should be as short as possible.
3. Connections between the 10/100 IC and the SMT connector should be direct (ideally no change in direction) and of minimum length.

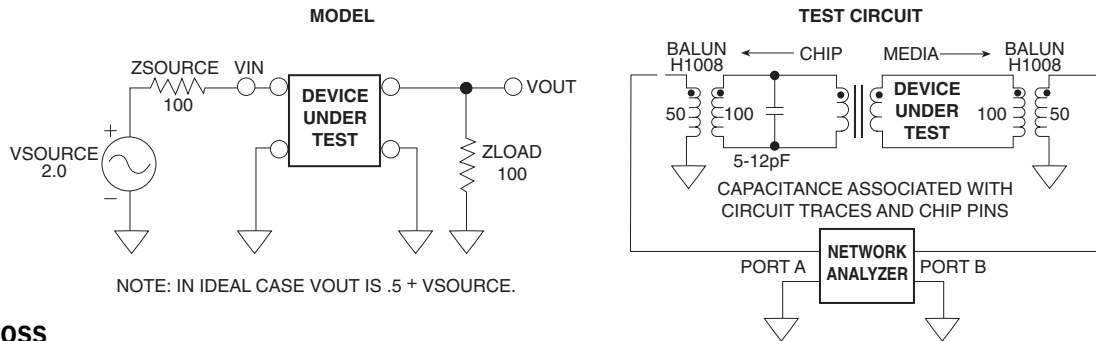
Device Under Test (DUT), Test Setup and Measurement

Insertion Loss

Simply stated, Insertion Loss is the measure of how much transfer loss, or attenuations, exists between a network's input and output terminals. In an ideal case the channel represented by the network has zero ohms and all power present at the network's input terminals transfers to the network's output terminals. The transfer function for Insertions Loss is the following equation:

$$IL_{dB} = 20 \cdot \text{LOG}_{10} \left(\frac{V_{OUT}}{V_{IN}} \right)$$

Figure 1

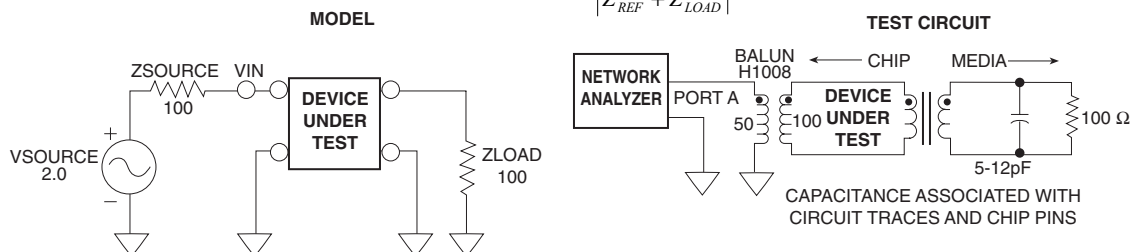


Return Loss

Return Loss is a measure of how well the device under test matches either the impedance of the stimulus or that of the output load. From the network analyzer's perspective, it is the ratio of the transmitted signal that's absorbed in the load with respect to the portion of the signal that's reflected back due to a miss-match. As with insertion loss the result is expressed in dB with a perfect match being the minimum value capable from the network analyzer. If the port opposite where the measurement is taken is either un-terminated (left open) or shorted, the result is 0 dB. Return Loss expressed as a formula is:

$$RL_{dB} = 20 \cdot \text{Log}_{10} \left| \frac{Z_{REF} - Z_{LOAD}}{Z_{REF} + Z_{LOAD}} \right|$$

Figure 2

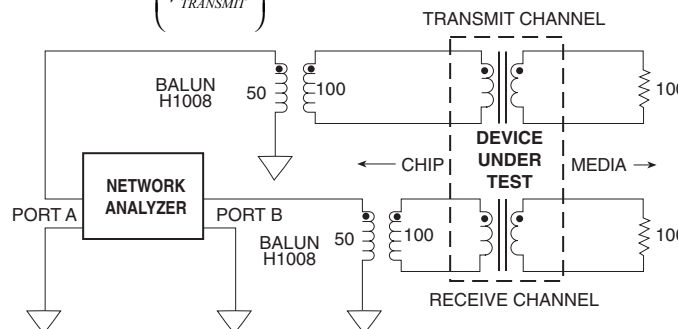


Crosstalk

Crosstalk is the amount of transmitted signal that is coupled into the receive channel. In other words it is a measure of the isolation between the transmitter and the receiver. This measurement equally applies to the isolation between any two adjacent channels. Expressed as a formula Crosstalk is:

$$Crosstalk_{dB} = 20 \cdot \text{Log}_{10} \left(\frac{V_{REC}}{V_{TRANSMIT}} \right)$$

Figure 3

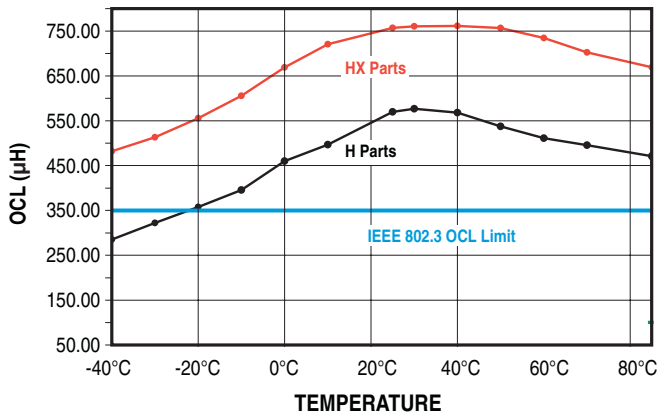


Star Magnetics™ 10/100 and Gigabit Ethernet with PoE Option

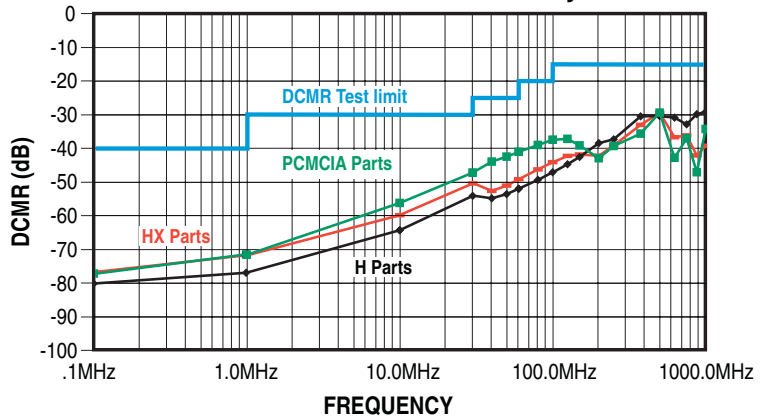


Typical Performance

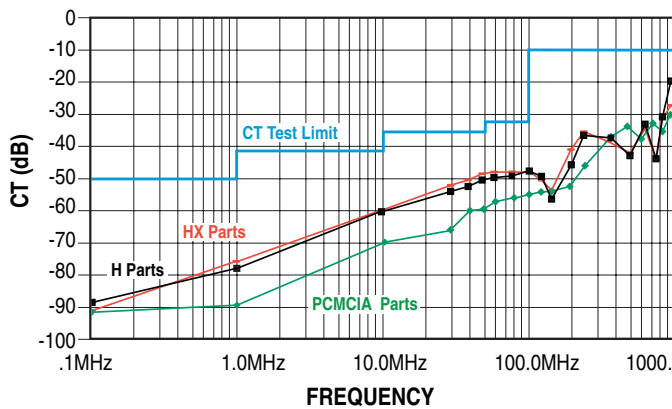
Open Circuit Inductance (OCL) vs. Temperature



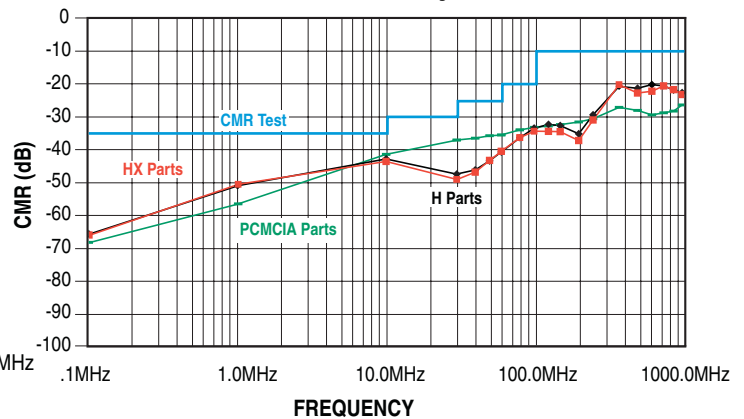
Differential to Common Mode Rejection



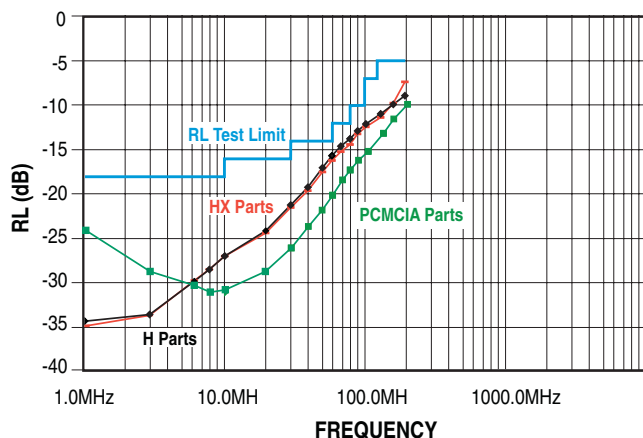
Crosstalk



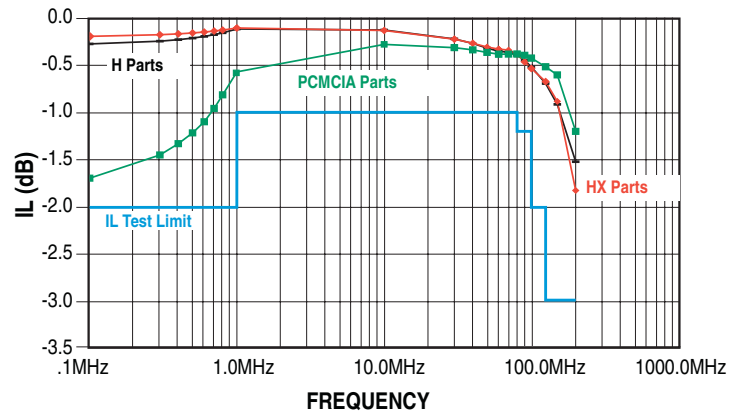
Common Mode Rejection



Return Loss



Insertion Loss

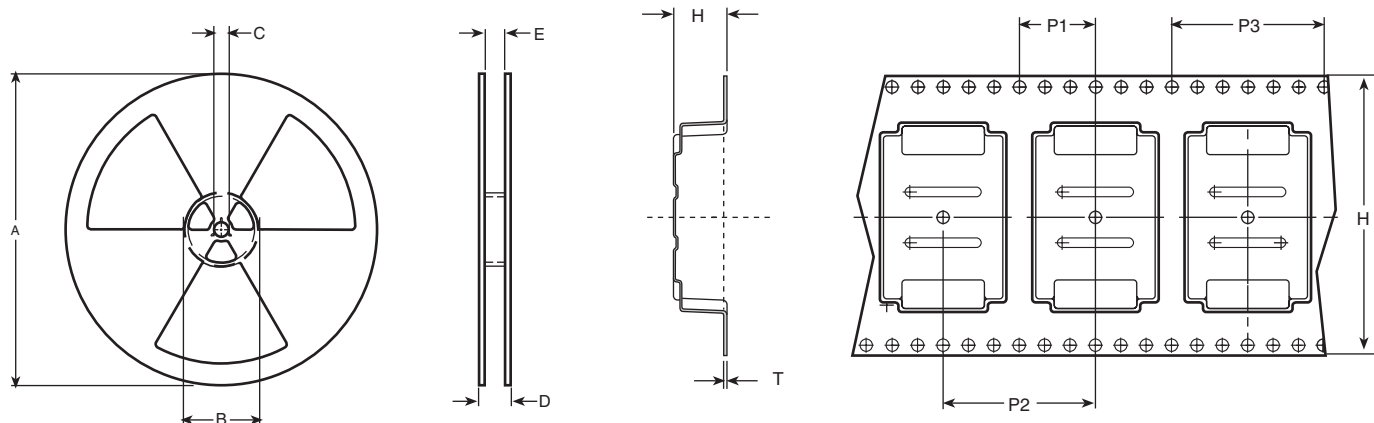


Star Magnetics™

10/100 and Gigabit Ethernet with PoE Option



Tape & Reel



Tape & Reel Specifications

Series	Parts Per Reel	Reel Dimensions (mm)					Tape Dimensions (mm)					
		A	B	C	D	E	W	P1	P2	P3	H	T
H0055	1000	30.2	101.6	13.0	30.4	24.4	24.0	2.0	16.0	4.0	3.7	0.4
H0056	2000	330.2	101.6	13.0	30.4	24.4	24.0	2.0	12.0	4.0	2.8	0.4
H1259	250	330.2	152.4	13.0	50.4	44.4	44.0	2.0	24.0	4.0	7.4	0.5
H1260	600	330.2	101.6	13.0	30.4	24.4	24.0	2.0	12.0	4.0	7.3	0.4
H1265	300	330.2	152.4	13.0	50.4	44.4	44.0	2.0	24.0	4.0	7.5	0.5
H1266	250	330.2	152.4	13.0	50.4	44.4	44.0	2.0	24.0	4.0	7.4	0.5
H1278	350	330.2	101.6	13.0	30.4	24.4	24.0	2.0	24.0	4.0	6.5	0.4
H1305	350	330.2	101.6	13.0	30.4	24.4	24.0	2.0	24.0	4.0	7.4	0.5
H2260	600	330.2	101.6	13.0	30.4	24.4	24.0	2.0	12.0	4.0	7.3	0.4
H2305	350	330.2	101.6	13.0	30.4	24.4	24.0	2.0	24.0	4.0	7.4	0.5
H5062	300	330.2	101.6	13.0	38.4	32.4	32.0	2.0	24.0	4.0	7.4	0.5
H5070	300	330.2	101.6	13.0	38.4	32.4	32.0	2.0	24.0	4.0	7.4	0.5

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