## *Analog Telephony / Modem Couplers*

PHOTO PENDING

## DESCRIPTION

The REMtech Magnetics ESMIT-3576 is a “Dry” Encapsulated SMT Modem Isolation Transformer suitable for up to V.90 (56 kbps) analog modem applications compliant with International safety norms.

ESMIT-3576 was designed as an optimum trade-off between Insertion Loss due to coil resistance and 56K distortion performance at 0 dBm, while also a small SMT footprint and maximum 10 mm height for pick and place. A great solution for boards with limited footprint space.

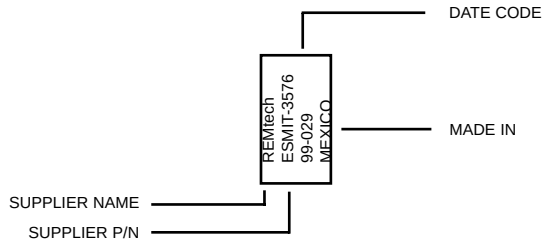
## FEATURES

- Suitable for modem speeds up to V.90 (56 kbps).
- Total Harmonic Distortion measures -76 dB at 0 dBm. Rated -92 dB typ. @ 600 Hz, -10 dBm and -80 dB typ. @ 150 Hz, -3 dBm.
- Insertion Loss rated 2.90 dB typ. @ 2000 Hz.
- Complies with IEC60950 Reinforced safety norms.
- Uses minimal external components for impedance matching to 600 Ohms telephone lines.
- Uses minimal external components for impedance matching to pan-European CTR-21 telephone lines.
- Ultra-small PCB footprint (19.0 mm x 9.6 mm).
- Very Low-Profile (10.0 mm).
- SMT pin configuration.

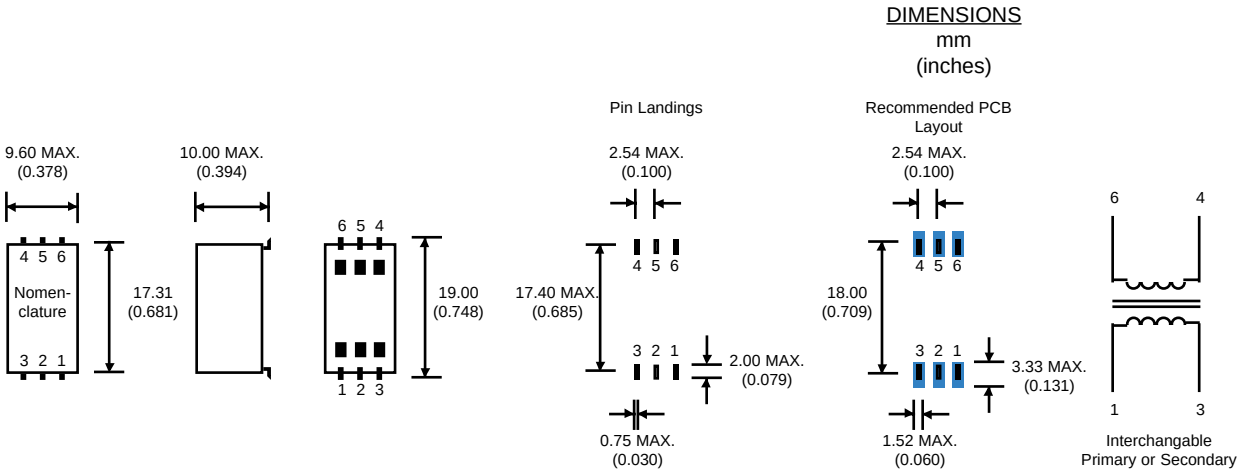
## PRODUCT COMPLIANCE

| | |
|---|---|
| UL / C-UL recognized file number: | E171120 |
| BSI certificate number(s): | Pending |
| BABT certificate of recognition: | Pending |

## NOMENCLATURE (Fig. 1)




## MECHANICAL DIMENSIONS (Fig. 2)




Literature Number: DSA.ESMIT-3576

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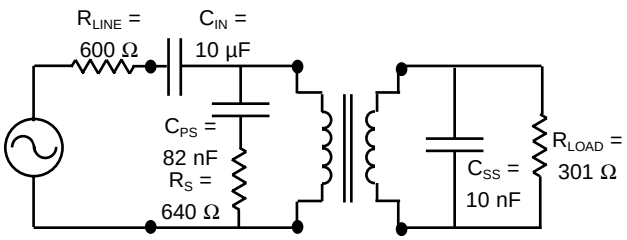
## ELECTRICAL PERFORMANCE SPECIFICATIONS

Electrical Performance Specifications ($T_A$ = 25 °C unless otherwise specified)

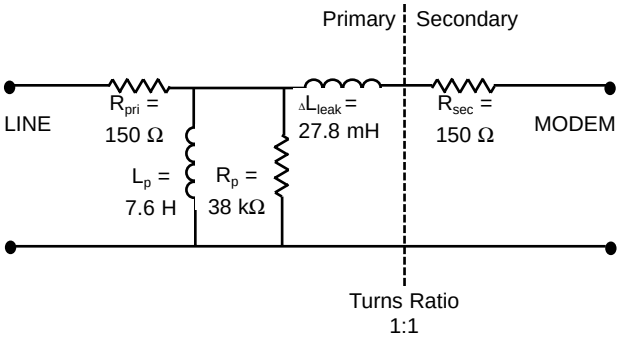
| PARAMETERS | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| Impedance | Reflected on Primary<br>With Load on Secondary | -<br>- | 600<br>301 | -<br>- | Ohms<br>Ohms |
| Total Harmonic Distortion | @ 600 Hz, -10 dBm<br>@ 150 Hz, -3 dBm | -<br>- | -92 or better<br>-80 or better | -??<br>-?? | dB<br>dB |
| Insertion Loss | Per IEEE method; @ 2000 Hz | - | 2.90 | 3.50 | dB |
| Return Loss | 200 Hz - 4000 Hz<br>Per 600 Ohm Match (Fig. 3)<br>Per CTR21 Pan-Euro Match (Fig. 10) | <br>18<br>25 | <br>-<br>- | <br>-<br>- | <br>dB<br>dB |
| Dielectric Breakdown Isolation<br>Production methods applied: | Safety Standard tested 1 Min.<br>HiPot Voltage<br>Duration<br>Trip Leakage Current | 3000<br>3750<br>2<br>- | -<br>-<br>-<br>- | -<br>-<br>-<br>200 | Vrms<br>Vrms<br>Sec<br>µA |
| Frequency Response | 200 Hz - 4000 Hz | - | ±1.60 | - | dB |
| Longitudinal Balance | Per FCC part 68.310<br>60 Hz - 1000 Hz<br>1000 Hz - 4000 Hz | <br>60<br>40 | <br>-<br>- | <br>-<br>- | <br>dB<br>dB |
| DC Resistance @ 20°C, ±10% | Primary Winding<br>Secondary Winding | -<br>- | 150<br>150 | -<br>- | Ohms<br>Ohms |
| DC Current in Primary | - | - | 0 | - | mADC |
| Turns Ratio | Primary to Secondary; ±2% | - | 1:1 | - | Turns |
| Operating Temperature | - | -40 | - | 105 | °C |
| Storage Temperature | - | -40 | - | 125 | °C |
| Soldering Temperature | 10 Sec. Max. | - | - | 260 | °C |

## 600 OHM MATCH (Fig. 3)




## SCHEMATIC EQUIVALENT (Fig. 4)

(Typical Transformer Model @ 1 V, 1 kHz)




SPICE model shows initial measurements of engineering sample. See page 5 note.



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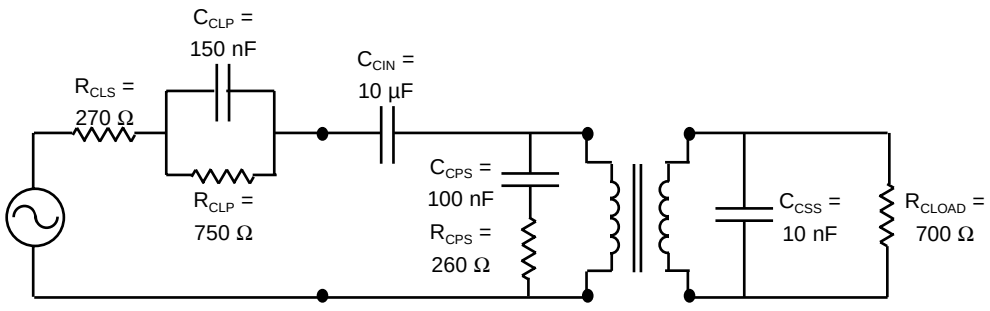
## STANDARD PACKAGING (Fig. 9)

Standard packaging will be provided in tape-and-reel. Selection of the reel, and therefore user drawing, is pending.

## PAN-EUROPEAN CTR21 MATCH (Fig. 10)

(Application circuits available on request for specific national match requirements.)

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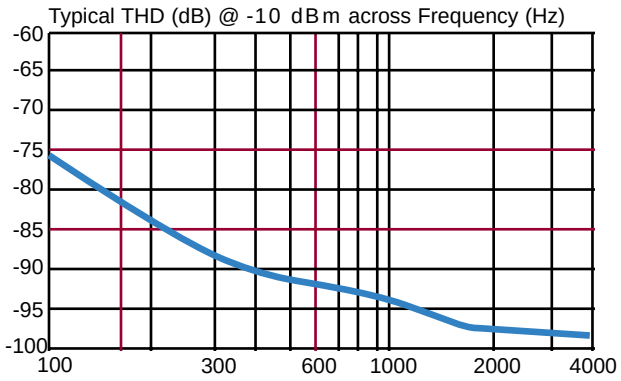
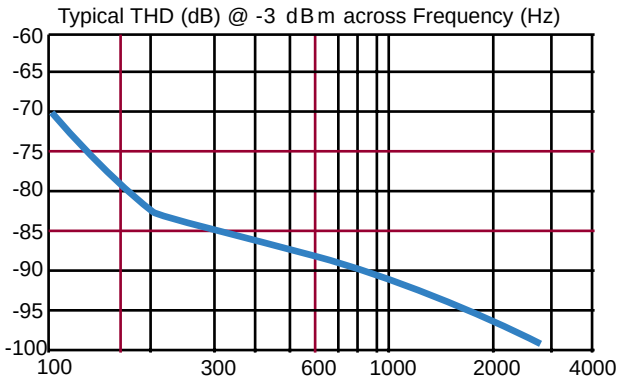
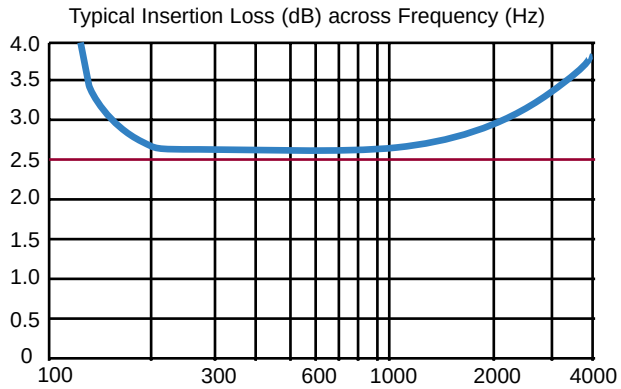
# PERFORMANCE DATA

## TOTAL HARMONIC DISTORTION (Fig. 5)

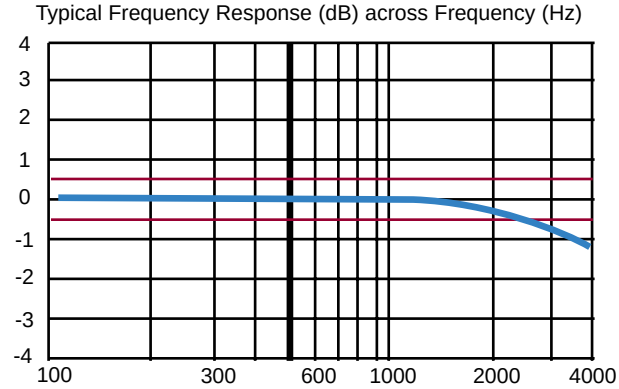


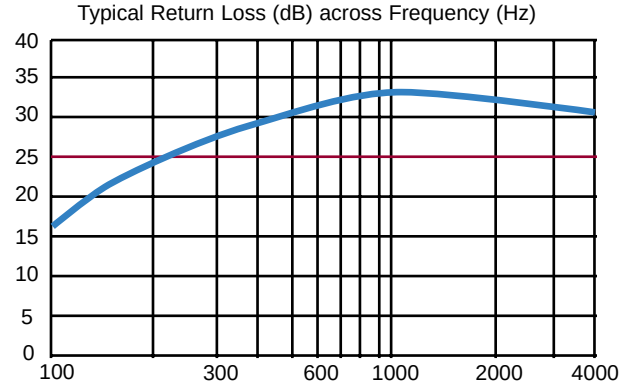

## INSERTION LOSS (Fig. 6)

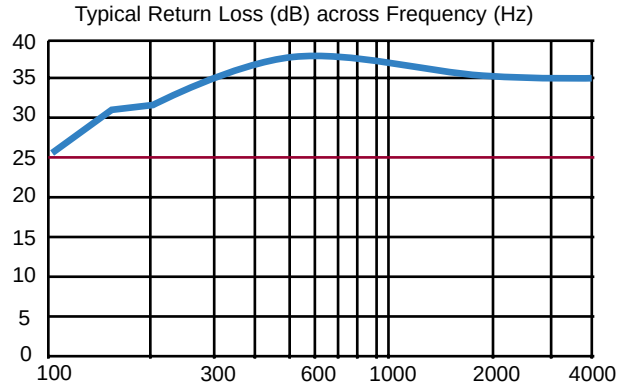



## FREQUENCY RESPONSE (Fig. 7)




## RETURN LOSS (Fig. 8)




(Measured per CTR21 Match depicted in Fig. 10)



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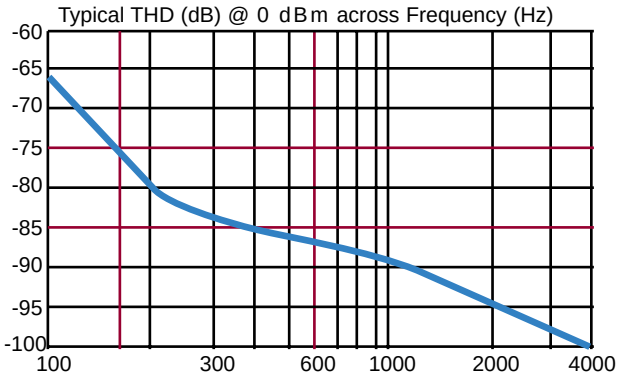
# ADDITIONAL DATA

## TOTAL HARMONIC DISTORTION (Fig. 5)




Distortion rating is expected to improve as this devices moves into production by a few dB or more for the following two reasons:

1. Engineering samples made using stereolithography-based bobbins did not allow space for a final layer of core lamination due to the fact stereolithography does not maintain mechanical dimensions well.
2. All layers of core laminations in test devices were cut by laser. Laser edge burrs tend to create gaps between the laminations, which lessens inductance and distortion ratings.

The above two improvements in production material will increase both Distortion and Shunt Inductance ratings.

## SCHEMATIC EQUIVALENT (Fig. 4)

| Frequency (f in Hz) | Shunt Inductance ($L_p$ in H) | Shunt Loss ($R_p$ in kΩ) | Leakage Inductance ($\Delta L_{leak}$ in mH) |
|---|---|---|---|
| 100 | 18.973 | 18.025 | 30.98 |
| 150 | 16.914 | 20.889 | 29.58 |
| 200 | 15.284 | 23.026 | 28.72 |
| 250 | 14.042 | 24.958 | 28.40 |
| 300 | 13.052 | 26.472 | 28.21 |
| 350 | 12.272 | 27.774 | 28.10 |
| 400 | 11.602 | 28.950 | 28.02 |
| 450 | 11.038 | 29.998 | 27.97 |
| 500 | 10.539 | 30.974 | 27.93 |
| 550 | 10.097 | 31.876 | 27.90 |
| 600 | 9.704 | 32.730 | 27.87 |
| 650 | 9.351 | 33.535 | 27.85 |
| 700 | 9.028 | 34.305 | 27.84 |
| 750 | 8.735 | 35.038 | 27.82 |
| 800 | 8.459 | 35.750 | 27.81 |
| 850 | 8.211 | 36.434 | 27.80 |
| 900 | 7.982 | 37.090 | 27.79 |
| **1000** | **7.569** | **38.362** | **27.78** |
| 1500 | 6.145 | 43.894 | 27.74 |
| 2000 | 5.286 | 48.585 | 27.72 |
| 2500 | 4.735 | 52.605 | 27.70 |
| 3000 | 4.351 | 56.240 | 27.69 |
| 3500 | 4.069 | 59.540 | 27.68 |
| 4000 | 3.860 | 62.570 | 27.68 |

The table immediately left shows SPICE variables across a frequency sweep.

DC Resistances of coils, $R_{pri}$ and $R_{sec}$, are 150 ohms ±10%, and do not vary significantly with frequency.

After production samples are available, the SPICE parameters will be re-estimated across a larger quantity of devices. As a result of such further testing, the updated SPICE model will indicate the following statistics in order to deal with lot-to-lot variations in core lamination material::

1. Shunt Inductance ($L_p$) will be indicated at two standard deviations ***below*** average of the samples because higher values are better.
2. Shunt Loss ($R_p$) will be indicated at two standard deviations ***below*** average of the samples because higher values are better.
3. Leakage Inductance ($\Delta L_{leak}$) will be indicated at two standard deviations ***above*** average of the samples because lower values are better.

At the time of this Preliminary Specification, an insufficient number of sample devices have been created in order to provide the above standard deviation statistics. The table immediately left shows the direct measurements of a representative engineering sample.

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