**PRODUCT DATA SHEET**

# MICROPROFILE LINE MATCHING TRANSFORMER

# P2781

## Features

* Surface Mount
* Lead-free (Pb-free)
* RoHS compliant
* 7mm seated height
* Vacuum encapsulated
* IEC 60950 and UL 60950 certified
* UL Recognized Component

## Applications

* Telecommunications
* V.22bis and V.32bis modems
* Line matching
* Portable computers
* Instrumentation

## DESCRIPTION

P2781 is a microprofile transformer for applications where high performance and safety isolation to international standards are required in an extremely small case size.

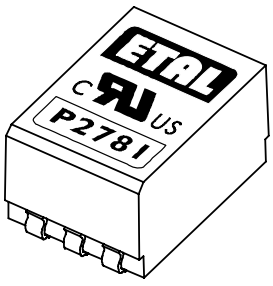
Designed specifically as a surface mount device, the P2781 features a 7mm seated height and is vacuum encapsulated and tested to 6500VDC. The part is compliant with RoHS Directive 2002/95/EC, and suitable for lead-free and conventional placement and reflow.

Despite the subminiature size, the performance is the equal of that of much larger components. The P2781 offers reinforced insulation, is ideal for voice telecommunications and for data communications to medium speed, and can be matched to both 600Ω and complex impedance telephone lines.

At moderate transmit power levels (e.g. -10dBm) performance to V.32bis may be achieved.

In instrumentation applications, the P2781 offers a wideband frequency response from 50Hz to 40kHz.

P2781 is certified to IEC 60950 and UL 60950. P2781 is a UL Recognized Component, and is supported by an IEC CB Test Certificate.




Pb
RoHS
COMPLIANT

## SPECIFICATIONS

### Electrical

At T = 25°C and as circuit Fig. 1 unless otherwise stated.

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Insertion Loss | f = 2kHz, $R_L$ = 600Ω<br>f = 2kHz, $R_L$ = 430Ω | -<br>- | -<br>- | 2.0<br>4.0 | dB<br>dB |
| Frequency response | -3dB LF cutoff<br>-3dB HF cutoff<br>200Hz - 4kHz | -<br>-<br>- | 50<br>40<br>- | -<br>-<br>±0.2 | Hz<br>kHz<br>dB |
| Return Loss | 200Hz - 4kHz | 18 | - | - | dB |
| Distortion (1) | f = 450Hz<br>0dBm in line<br>3rd Harmonic | - | -60 | -54 | dBm |
| Balance | DC - 5kHz<br>Method TG25 | 80 | - | - | dB |
| Saturation | Excitation 50Hz<br>250Vrms<br>Output voltage<br>across line | -<br>- | -<br>- | 10<br>65 | Vrms<br>Vpeak |
| Voltage<br>Isolation (2) | 50Hz<br>DC | 3.88<br>5.5 | - | - | kVrms<br>kV |
| Operating range:<br>Functional<br>Storage(5)<br>Humidity | Ambient temperature | <br>-25<br>-40<br>- | <br>-<br>-<br>- | <br>+85<br>+125<br>95 | <br>°C<br>°C<br>%R.H. |

Lumped equivalent circuit parameters as Fig. 1

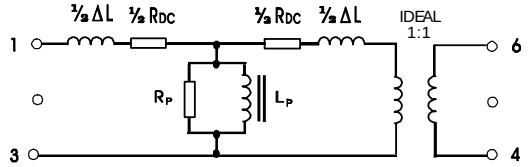
| | | | | | |
|---|---|---|---|---|---|
| DC resistance, $R_{DC}$(3) | Sum of windings | 205 | - | 245 | Ω |
| Leakage inductance ΔL | | 4.2 | - | 4.9 | mH |
| Shunt inductance Lp(4) | 10mV 200Hz<br>10mV 1kHz | 1.4<br>- | -<br>1.8 | 3.5<br>- | H<br>H |
| Shunt loss Rp(4) | 10mV 200Hz<br>10mV 1kHz | 5<br>- | -<br>10 | 15<br>- | kΩ<br>kΩ |

**Notes**

1. Third harmonic typically exceeds other harmonics by 20dB.
2. Components 100% tested at 6.5 kVDC.
3. **Caution:** do not pass DC through windings. Telephone line current, etc. must be diverted using choke or semiconductor line hold circuit.
4. At signal levels greater than 100mV, Lp will increase and Rp will decrease slightly but the effect is usually favourable to the return loss characteristic.
5. Excludes shipping materials. Components are dry-packed and sealed as shipped. Handle in accordance with IPC/JEDEC J-STD-033 procedure for components classified as IPC/JEDEC J-STD-020 Moisture Sensitivity Level 5a.

Equivalent Circuit

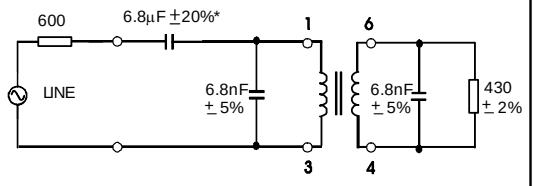
Fig 1



## PERFORMANCE

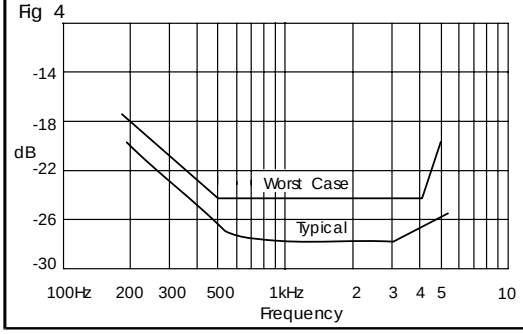
600Ω MATCH

Recommended Circuit
Fig 2

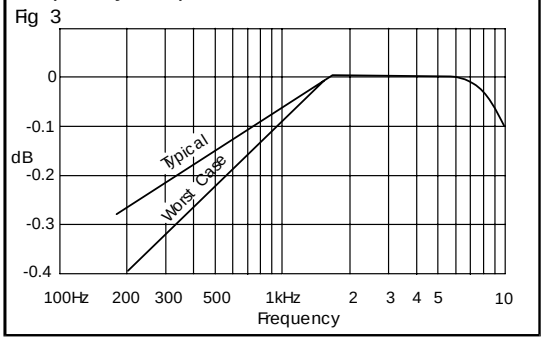



* If return loss > 16dB, 300Hz - 4kHz is acceptable, blocking capacitor may be relaxed to 4.7µF +50% −20%

Return Loss
Fig 4

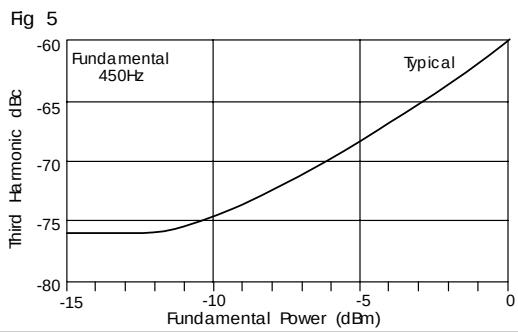



Frequency Response
Fig 3




Frequency response driven by terminal equipment (voltage scource with 430Ω series resistance) measured across 600Ω is within ±0.2dB 200Hz to 4kHz

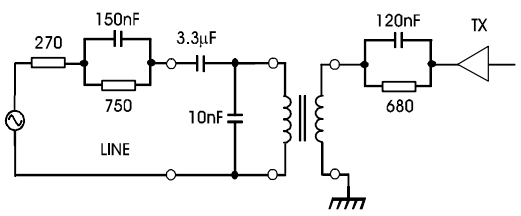
Third Harmonic Distortion vs. Signal Level
Fig 5



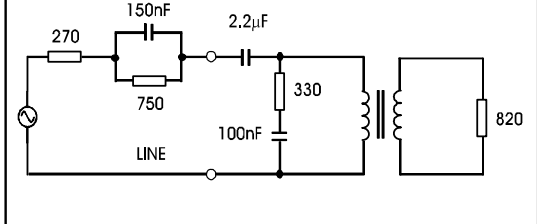

Note:
To obtain harmonic distortion power in dBm, add fundamental power in dBm to third harmonic in dBc e.g. at -10dBm power in line at 450Hz, third harmonic power is -10 + (-74) = -84dBm typical.

EUROPEAN CTR21 COMPLEX MATCH

Recommended Circuit
Fig 6

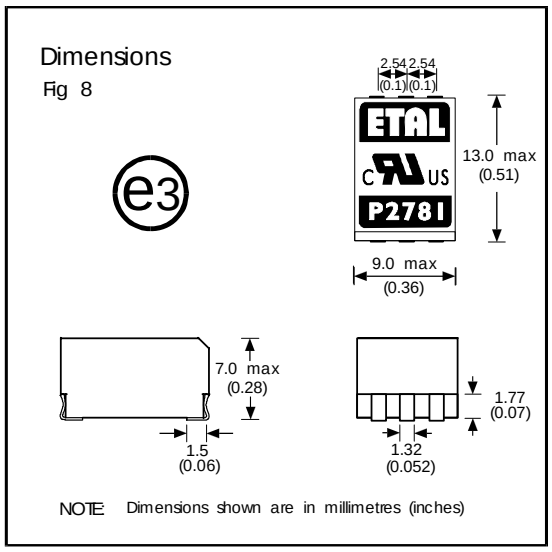


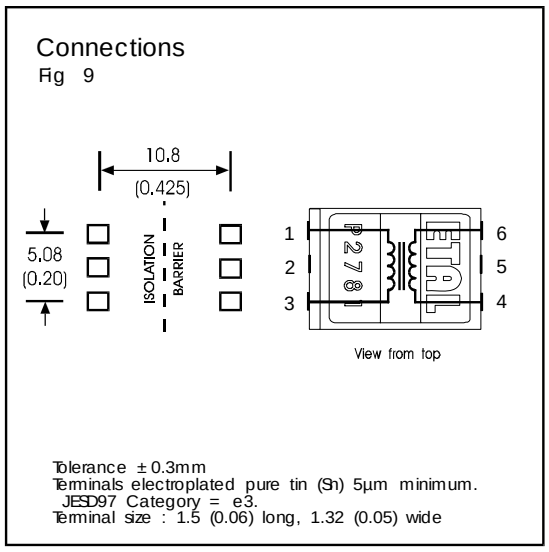

Recommended Circuit
Fig 7




The circuit of Fig. 6 gives good TX and RX flatness (±0.3dBm 200Hz - 4kHz). An alternative arrangement, using existing PCB sites, is shown in Fig. 7. Note, however, that TX flatness will be degraded with the topology.

## CONSTRUCTION




Dimensions shown are in millimetres (inches).
Geometric centres of outline and pad grid coincide within a tolerance circle of 0.3mmØ.
Windings may be used interchangeably as primary or secondary.

## SAFETY

Manufactured from materials conforming to flammability requirements of UL94V-0.
Distance through reinforced insulation 0.4mm minimum.
Creepage and clearances in circuit are 7mm minimum where PCB pads do not exceed 3mmØ.
Construction complies with IEC 60950-1, EN 60950-1 and UL 60950-1, reinforced insulation, 250Vrms maximum working voltage.

## CERTIFICATION

Certified by BSI to IEC 60950 Third Edition (1999) (IEC CB Test Certificate No. GB592W) sub-clauses 1.5, 1.5.1, 1.5.2, 2.9, 2.9.1, 2.9.2, 2.9.3, 2.9.4, 2.9.5, 2.10, 2.10.1, 2.10.2, 2.10.3, 2.10.3.1, 2.10.3.2, 2.10.4, 2.10.5, 2.10.5.1, 2.10.7, 2.10.8, 4.7, 4.7.3, 4.7.3.1, 4.7.3.4, (Flammability Class V-0) ,5.2, 5.2.1, and 5.2.2 for a maximum working voltage of 250Vrms, nominal mains supply voltage not exceeding 250Vrms and a maximum operating temperature of +85°C in Pollution Degree 2 environment, reinforced insulation.

Recognized under the Component Recognition Program of Underwriters Laboratories Inc. to US and Canadian requirements CAN/CSA C22.2 No. 60950-1-03/UL60950-1, First Edition, based on IEC 60950-1, First Edition, maximum working voltage 250Vrms, Pollution Degree 2, reinforced insulation.

UL File number E203175.

Additionally, Profec Technologies certifies all transformers as providing voltage isolation of 3.88kVrms, 5.5kV DC minimum. All shipments are supported by a Certificate of Conformity to current applicable safety standards.

## ABSOLUTE MAXIMUM RATINGS

(Ratings of components independent of circuit).

| | |
|---|---|
| Short term isolation voltage (2s) | 4.6 kVrms, 6.5kVDC |
| DC current | 100μA |
| Storage temperature | -40°C to +125°C |
| Soldering temperature Profile peak | 260°C 10s |

Recommended peak body temperature 245°C in accordance with IPC/JEDEC J-STD-033.

## COPYRIGHT

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British Patent No. 2283195
US Patent No. 5879598
European Patent No. 0725719

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## ORDERING CODE

P2781□□

TR = Tape and Reel
(Blank) = Bulk in tubes.

Carrier tape width 24mm,
500 parts per 13" reel.

E203175

ISO 9001
FM 25326

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