



# Coupled Inductors - MSD1278 For Flyback, SEPIC and other Applications



Parts manufactured prior to Sept. 2007 were marked with only the dash number.



\* For optional tin-lead and tin-silver-copper terminations, dimensions are for the mounted part. Dimensions before mounting can be an additional 0.012 inch (0,3 mm).

Dimensions are in inches/mm

### Recommended Land Pattern



Tight coupling ( $k \geq 0.98$ ) and 500 V isolation make the MSD1278 series of shielded coupled inductors ideal for use in a variety of circuits including flyback, multi-output buck and SEPIC.

These inductors provide high inductance, high efficiency and excellent current handling in a rugged, low cost part.

They can also be used as two single inductors connected in series or parallel or as a common mode choke.



Typical Flyback Converter



Typical Buck Converter with auxiliary output



Typical SEPIC schematic

Designer's Kit C400 contains 3 each of all values.

**Core material** Ferrite

**Terminations** RoHS compliant matte tin over nickel over phos bronze. Other terminations available at additional cost.

**Weight:** 3.7 – 4.4 g

**Ambient temperature** -40°C to +85°C with Irms current, +85°C to +125°C with derated current

**Storage temperature** Component: -40°C to +125°C.

Tape and reel packaging: -40°C to +80°C

**Winding-to-winding and winding-to-core isolation** 500 Vrms

**Resistance to soldering heat** Max three 40 second reflows at +260°C, parts cooled to room temperature between cycles

**Moisture Sensitivity Level (MSL)** 1 (unlimited floor life at <30°C / 85% relative humidity)

**Failures in Time (FIT) / Mean Time Between Failures (MTBF)**

38 per billion hours / 26,315,789 hours, calculated per Telcordia SR-332

**Packaging** 500/13" reel; Plastic tape: 24 mm wide, 0.4 mm thick, 16 mm pocket spacing, 8.1 mm pocket depth

**PCB washing** Only pure water or alcohol recommended



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# Coupled Inductors – MSD1278 Series

| Part number <sup>1</sup> | Inductance <sup>2</sup><br>(μH) | DCR max <sup>3</sup><br>(Ohms) | SRF typ <sup>4</sup><br>(MHz) | Coupling coefficient typ | Leakage inductance <sup>5</sup><br>typ (μH) | Isat <sup>6</sup><br>(A) | Irms (A)                   |                          |
|--------------------------|---------------------------------|--------------------------------|-------------------------------|--------------------------|---|--------------------------|----------------------------|--------------------------|
|                          |                                 |                                |                               |                          |   |                          | both windings <sup>7</sup> | one winding <sup>8</sup> |
| MSD1278-472ML_           | 4.7 ±20%                        | 0.038                          | 32.0                          | 0.98                     | 0.22  | 14.9                     | 3.16                       | 4.47                     |
| MSD1278-562ML_           | 5.6 ±20%                        | 0.046                          | 25.0                          | 0.98                     | 0.23  | 13.4                     | 2.87                       | 4.06                     |
| MSD1278-682ML_           | 6.8 ±20%                        | 0.048                          | 24.0                          | 0.98                     | 0.22  | 13.1                     | 2.81                       | 3.98                     |
| MSD1278-822ML_           | 8.2 ±20%                        | 0.050                          | 18.0                          | 0.98                     | 0.34  | 10.8                     | 2.76                       | 3.90                     |
| MSD1278-103ML_           | 10 ±20%                         | 0.058                          | 16.5                          | 0.98                     | 0.34  | 10.5                     | 2.56                       | 3.62                     |
| MSD1278-123ML_           | 12 ±20%                         | 0.062                          | 14.5                          | 0.98                     | 0.36  | 9.6                      | 2.48                       | 3.50                     |
| MSD1278-153ML_           | 15 ±20%                         | 0.072                          | 11.8                          | 0.99                     | 0.41  | 9.1                      | 2.30                       | 3.25                     |
| MSD1278-183ML_           | 18 ±20%                         | 0.080                          | 10.5                          | 0.99                     | 0.37  | 8.0                      | 2.18                       | 3.08                     |
| MSD1278-223ML_           | 22 ±20%                         | 0.096                          | 9.0                           | 0.99                     | 0.41  | 6.8                      | 1.99                       | 2.81                     |
| MSD1278-273ML_           | 27 ±20%                         | 0.120                          | 8.4                           | 0.99                     | 0.43  | 6.5                      | 1.78                       | 2.52                     |
| MSD1278-333ML_           | 33 ±20%                         | 0.150                          | 7.6                           | 0.99                     | 0.56  | 5.6                      | 1.59                       | 2.25                     |
| MSD1278-393ML_           | 39 ±20%                         | 0.160                          | 6.5                           | 0.99                     | 0.64  | 5.5                      | 1.54                       | 2.18                     |
| MSD1278-473ML_           | 47 ±20%                         | 0.180                          | 6.0                           | 0.99                     | 0.70  | 5.2                      | 1.45                       | 2.05                     |
| MSD1278-563ML_           | 56 ±20%                         | 0.190                          | 5.6                           | 0.99                     | 0.76  | 4.5                      | 1.41                       | 2.00                     |
| MSD1278-683ML_           | 68 ±20%                         | 0.210                          | 5.0                           | 0.99                     | 0.88  | 4.1                      | 1.35                       | 1.90                     |
| MSD1278-823ML_           | 82 ±20%                         | 0.280                          | 4.1                           | 0.99                     | 0.85  | 3.8                      | 1.16                       | 1.65                     |
| MSD1278-104ML_           | 100 ±20%                        | 0.300                          | 3.6                           | >0.99                    | 0.90  | 3.4                      | 1.13                       | 1.59                     |
| MSD1278-124KL_           | 120 ±10%                        | 0.410                          | 3.2                           | 0.99                     | 1.31  | 3.2                      | 0.96                       | 1.36                     |
| MSD1278-154KL_           | 150 ±10%                        | 0.460                          | 3.0                           | >0.99                    | 1.46  | 2.8                      | 0.91                       | 1.29                     |
| MSD1278-184KL_           | 180 ±10%                        | 0.510                          | 2.7                           | >0.99                    | 0.93  | 2.5                      | 0.86                       | 1.22                     |
| MSD1278-224KL_           | 220 ±10%                        | 0.690                          | 2.5                           | >0.99                    | 1.54  | 2.3                      | 0.74                       | 1.05                     |
| MSD1278-274KL_           | 270 ±10%                        | 0.900                          | 2.1                           | >0.99                    | 1.17  | 2.1                      | 0.65                       | 0.92                     |
| MSD1278-334KL_           | 330 ±10%                        | 1.02                           | 2.0                           | 0.99                     | 4.14  | 1.9                      | 0.61                       | 0.86                     |
| MSD1278-394KL_           | 390 ±10%                        | 1.12                           | 1.8                           | >0.99                    | 1.64  | 1.7                      | 0.58                       | 0.82                     |
| MSD1278-474KL_           | 470 ±10%                        | 1.43                           | 1.6                           | >0.99                    | 0.25  | 1.6                      | 0.50                       | 0.70                     |
| MSD1278-564KL_           | 560 ±10%                        | 1.69                           | 1.5                           | >0.99                    | 2.68  | 1.5                      | 0.47                       | 0.67                     |
| MSD1278-684KL_           | 680 ±10%                        | 2.29                           | 1.4                           | >0.99                    | 2.11  | 1.3                      | 0.41                       | 0.58                     |
| MSD1278-824KL_           | 820 ±10%                        | 2.55                           | 1.3                           | >0.99                    | 2.39  | 1.2                      | 0.39                       | 0.55                     |
| MSD1278-105KL_           | 1000 ±10%                       | 2.83                           | 1.1                           | >0.99                    | 4.28  | 1.1                      | 0.37                       | 0.52                     |

1. When ordering, please specify **termination** and **packaging** code:

### MSD1278-105KLD

**Termination:** L = RoHS compliant matte tin over nickel over phos bronze  
Special order: T = RoHS tin-silver-copper (95.5/4/0.5) or S = non-RoHS tin-lead (63/37).

**Packaging:** D = 13" machine-ready reel. EIA-481 embossed plastic tape (500 parts per full reel).

B = Less than full reel. In tape, but not machine ready. To have a leader and trailer added (\$25 charge), use code letter D instead.

- Inductance shown for each winding, measured at 100 kHz, 0.1 Vrms, 0 Adc on an Agilent/HP 4284A LCR meter or equivalent. When leads are connected in parallel, inductance is the same value. When leads are connected in series, inductance is four times the value.
  - DCR is for each winding. When leads are connected in parallel, DCR is half the value. When leads are connected in series, DCR is twice the value.
  - SRF measured using an Agilent/HP 4191A or equivalent. When leads are connected in parallel, SRF is the same value.
  - Leakage inductance is for L1 and is measured with L2 shorted.
  - DC current, at which the inductance drops 30% (typ) from its value without current. It is the sum of the current flowing in both windings.
  - Equal current when applied to each winding simultaneously that causes a 40°C temperature rise from 25°C ambient. See temperature rise calculation.
  - Maximum current when applied to one winding that causes a 40°C temperature rise from 25°C ambient. See temperature rise calculation.
  - Electrical specifications at 25°C.
- Refer to Doc 639 "Selecting Coupled Inductors for SEPIC Applications."  
Refer to Doc 362 "Soldering Surface Mount Components" before soldering.

### Temperature rise calculation based on specified Irms

Winding power loss =  $(I_{L1}^2 + I_{L2}^2) \times \text{DCR}$  in Watts (W)

Temperature rise ( $\Delta t$ ) = Winding power loss  $\times \frac{52.6^\circ\text{C}}{\text{W}}$

$$\Delta t = (I_{L1}^2 + I_{L2}^2) \times \text{DCR} \times \frac{52.6^\circ\text{C}}{\text{W}}$$

**Example 1.** MSD1278-153ML (Equal current in each winding)

Winding power loss =  $(2.3^2 + 2.3^2) \times 0.072 = 0.761 \text{ W}$

$$\Delta t = 0.761 \text{ W} \times \frac{52.6^\circ\text{C}}{\text{W}} = 40^\circ\text{C}$$

**Example 2.** MSD1278-153ML ( $I_{L1} = 2.4 \text{ A}$ ,  $I_{L2} = 1.3 \text{ A}$ )

Winding power loss =  $(2.4^2 + 1.3^2) \times 0.072 = 0.536 \text{ W}$

$$\Delta t = 0.536 \text{ W} \times \frac{52.6^\circ\text{C}}{\text{W}} = 28.2^\circ\text{C}$$

### Coupled Inductor Core and Winding Loss Calculator

This web-based utility allows you to enter frequency, peak-to-peak (ripple) current, and Irms current to predict temperature rise and overall losses, including core loss. Visit [www.coilcraft.com/coupledloss](http://www.coilcraft.com/coupledloss).



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# Coupled Inductors – MSD1278 Series

## Typical L vs Current



## Typical L vs Frequency



## Current Derating



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