



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 $\frac{\text{inches}}{\text{mm}}$

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 $+85^{\circ}\text{C}$ with I_{rms} current, $+85^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ with derated current

Storage temperature Component: -40°C to $+125^{\circ}\text{C}$.

Tape and reel packaging: -40°C to $+80^{\circ}\text{C}$

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

Resistance to soldering heat Max three 40 second reflows at $+260^{\circ}\text{C}$, parts cooled to room temperature between cycles

Moisture Sensitivity Level (MSL) 1 (unlimited floor life at $<30^{\circ}\text{C}$ / 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 ¹ | Inductance ² (μH) | DCR max ³ (Ohms) | SRF typ ⁴ (MHz) | Coupling coefficient typ | Leakage inductance ⁵ typ (μH) | Isat ⁶ (A) | Irms (A) | |
|--------------------------|---------------------------------|--------------------------------|-------------------------------|--------------------------|---|--------------------------|----------------------------|--------------------------|
| | | | | | | | both windings ⁷ | one winding ⁸ |
| 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 (Δt) = 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.



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Coupled Inductors – MSD1278 Series

Typical L vs Current



Typical L vs Frequency



Current Derating



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