



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



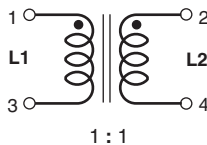
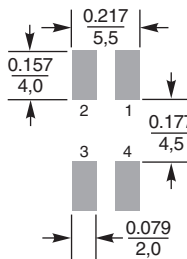
Parts manufactured prior to Sept. 2007 were marked with only the dash number.



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

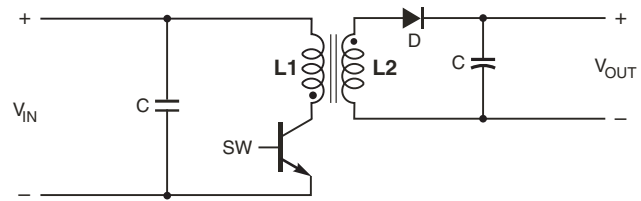
### Recommended Land Pattern



Tight coupling ( $k \geq 0.94$ ) and 500 V isolation make the MSD1278 series of 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> ( $\mu$ H)	DCR max <sup>3</sup> (Ohms)	SRF typ <sup>4</sup> (MHz)	Coupling coefficient typ	Leakage inductance <sup>5</sup> typ ( $\mu$ H)	Isat <sup>6</sup> (A)	Irms (A)	
							both windings <sup>7</sup>	one winding <sup>8</sup>
MSD1278-472ML_	4.7 $\pm$ 20%	0.038	32.0	0.98	0.22	14.9	3.16	4.47
MSD1278-562ML_	5.6 $\pm$ 20%	0.046	25.0	0.98	0.23	13.4	2.87	4.06
MSD1278-682ML_	6.8 $\pm$ 20%	0.048	24.0	0.98	0.22	13.1	2.81	3.98
MSD1278-822ML_	8.2 $\pm$ 20%	0.050	18.0	0.98	0.34	10.8	2.76	3.90
MSD1278-103ML_	10 $\pm$ 20%	0.058	16.5	0.98	0.34	10.5	2.56	3.62
MSD1278-123ML_	12 $\pm$ 20%	0.062	14.5	0.98	0.36	9.6	2.48	3.50
MSD1278-153ML_	15 $\pm$ 20%	0.072	11.8	0.99	0.41	9.1	2.30	3.25
MSD1278-183ML_	18 $\pm$ 20%	0.080	10.5	0.99	0.37	8.0	2.18	3.08
MSD1278-223ML_	22 $\pm$ 20%	0.096	9.0	0.99	0.41	6.8	1.99	2.81
MSD1278-273ML_	27 $\pm$ 20%	0.120	8.4	0.99	0.43	6.5	1.78	2.52
MSD1278-333ML_	33 $\pm$ 20%	0.150	7.6	0.99	0.56	5.6	1.59	2.25
MSD1278-393ML_	39 $\pm$ 20%	0.160	6.5	0.99	0.64	5.5	1.54	2.18
MSD1278-473ML_	47 $\pm$ 20%	0.180	6.0	0.99	0.70	5.2	1.45	2.05
MSD1278-563ML_	56 $\pm$ 20%	0.190	5.6	0.99	0.76	4.5	1.41	2.00
MSD1278-683ML_	68 $\pm$ 20%	0.210	5.0	0.99	0.88	4.1	1.35	1.90
MSD1278-823ML_	82 $\pm$ 20%	0.280	4.1	0.99	0.85	3.8	1.16	1.65
MSD1278-104ML_	100 $\pm$ 20%	0.300	3.6	>0.99	0.90	3.4	1.13	1.59
MSD1278-124KL_	120 $\pm$ 10%	0.410	3.2	0.99	1.31	3.2	0.96	1.36
MSD1278-154KL_	150 $\pm$ 10%	0.460	3.0	>0.99	1.46	2.8	0.91	1.29
MSD1278-184KL_	180 $\pm$ 10%	0.510	2.7	>0.99	0.93	2.5	0.86	1.22
MSD1278-224KL_	220 $\pm$ 10%	0.690	2.5	>0.99	1.54	2.3	0.74	1.05
MSD1278-274KL_	270 $\pm$ 10%	0.900	2.1	>0.99	1.17	2.1	0.65	0.92
MSD1278-334KL_	330 $\pm$ 10%	1.02	2.0	0.99	4.14	1.9	0.61	0.86
MSD1278-394KL_	390 $\pm$ 10%	1.12	1.8	>0.99	1.64	1.7	0.58	0.82
MSD1278-474KL_	470 $\pm$ 10%	1.43	1.6	>0.99	0.25	1.6	0.50	0.70
MSD1278-564KL_	560 $\pm$ 10%	1.69	1.5	>0.99	2.68	1.5	0.47	0.67
MSD1278-684KL_	680 $\pm$ 10%	2.29	1.4	>0.99	2.11	1.3	0.41	0.58
MSD1278-824KL_	820 $\pm$ 10%	2.55	1.3	>0.99	2.39	1.2	0.39	0.55
MSD1278-105KL_	1000 $\pm$ 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

