



**NEW!**

# Coupled Inductors - MSD1278T

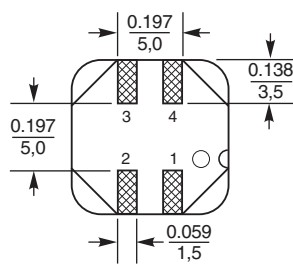
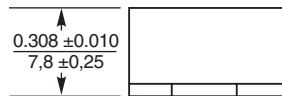
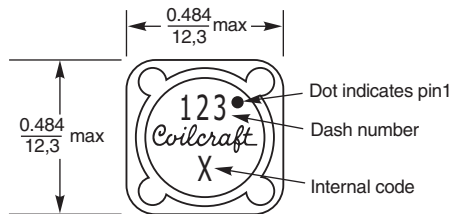
For high temperature SEPIC applications  
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The MSD1278T series of coupled inductors was designed for high temperature applications – up to 125°C. The excellent coupling coefficient ( $k \geq 0.94$ ) makes it ideal for use in SEPIC applications. In SEPIC topologies, the required inductance for each winding in a coupled inductor is half the value needed for two separate inductors, allowing selection of a part with lower DCR and higher current handling.

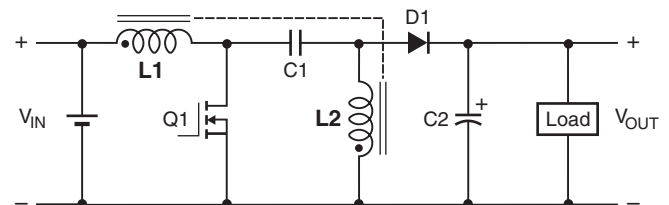
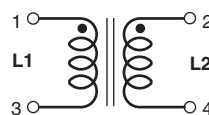
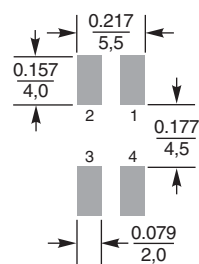
These inductors provide high inductance, high efficiency and excellent current handling in a rugged, low cost part. They are well suited for use as VRM inductors in high-current DC-DC and VRM/VRD controllers.

They can also be used as two single inductors connected in series or parallel, as a common mode choke or as a 1 : 1 transformer.



Dimensions are in inches/mm

**Recommended Land Pattern**



**Typical SEPIC schematic**

Refer to Application Note, Document 639, "Selecting Coupled Inductors for SEPIC Applications"

**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 +125°C with I<sub>rms</sub> current, +125°C to +165°C with derated current

**Storage temperature** Component: -40°C to +165°C. Packaging: -40°C to +80°C

**Winding to winding 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



Specifications subject to change without notice. Please check our website for latest information.

Document 704-1 Revised 08/31/09

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# High Temperature Coupled Inductors for SEPIC – MSD1278T

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Part number <sup>1</sup>	Inductance <sup>2</sup> ( $\mu$ H)	DCR max <sup>3</sup> (Ohms)	SRF typ <sup>4</sup> (MHz)	Isat (A) <sup>5</sup>			Irms (A)	
				10% drop	20% drop	30% drop	both windings <sup>6</sup>	one winding <sup>7</sup>
MSD1278T-472ML_	4.7 $\pm$ 20%	0.040	33.0	13.90	15.20	16.36	3.16	4.47
MSD1278T-562ML_	5.6 $\pm$ 20%	0.046	30.0	13.38	14.86	15.74	2.87	4.06
MSD1278T-682ML_	6.8 $\pm$ 20%	0.048	23.0	12.10	13.56	14.20	2.81	3.98
MSD1278T-822ML_	8.2 $\pm$ 20%	0.055	20.0	10.30	11.52	12.20	2.76	3.90
MSD1278T-103ML_	10 $\pm$ 20%	0.058	17.0	8.80	10.00	10.66	2.56	3.62
MSD1278T-123ML_	12 $\pm$ 20%	0.062	15.0	8.20	9.18	9.74	2.48	3.50
MSD1278T-153ML_	15 $\pm$ 20%	0.072	13.0	7.40	8.36	9.03	2.30	3.25
MSD1278T-183ML_	18 $\pm$ 20%	0.080	12.0	6.50	7.38	7.86	2.18	3.08
MSD1278T-223ML_	22 $\pm$ 20%	0.096	11.0	6.00	6.80	7.26	1.99	2.81
MSD1278T-273ML_	27 $\pm$ 20%	0.120	10.0	5.80	6.56	7.02	1.78	2.52
MSD1278T-333ML_	33 $\pm$ 20%	0.150	9.5	5.50	6.10	6.52	1.59	2.25
MSD1278T-393ML_	39 $\pm$ 20%	0.161	8.5	4.70	5.26	5.60	1.54	2.18
MSD1278T-473ML_	47 $\pm$ 20%	0.180	7.5	3.70	4.34	4.60	1.45	2.05
MSD1278T-563ML_	56 $\pm$ 20%	0.190	7.0	3.60	4.18	4.50	1.41	2.00
MSD1278T-683ML_	68 $\pm$ 20%	0.210	6.5	3.50	4.04	4.32	1.35	1.90
MSD1278T-823ML_	82 $\pm$ 20%	0.280	5.0	3.30	3.72	4.02	1.16	1.65
MSD1278T-104ML_	100 $\pm$ 20%	0.300	4.5	2.80	3.24	3.46	1.13	1.59
MSD1278T-124KL_	120 $\pm$ 10%	0.410	4.3	2.60	2.94	3.16	0.96	1.36
MSD1278T-154KL_	150 $\pm$ 10%	0.460	4.1	2.20	2.54	2.70	0.91	1.29
MSD1278T-184KL_	180 $\pm$ 10%	0.510	4.0	2.10	2.42	2.58	0.86	1.22
MSD1278T-224KL_	220 $\pm$ 10%	0.690	3.4	1.90	2.16	2.28	0.74	1.05
MSD1278T-274KL_	270 $\pm$ 10%	0.900	3.1	1.70	1.94	2.10	0.65	0.92
MSD1278T-334KL_	330 $\pm$ 10%	1.02	2.9	1.50	1.70	1.84	0.61	0.86
MSD1278T-394KL_	390 $\pm$ 10%	1.12	2.7	1.40	1.60	1.70	0.58	0.82
MSD1278T-474KL_	470 $\pm$ 10%	1.53	2.2	1.30	1.50	1.60	0.50	0.70
MSD1278T-564KL_	560 $\pm$ 10%	1.69	2.0	1.20	1.34	1.46	0.47	0.67
MSD1278T-684KL_	680 $\pm$ 10%	2.29	1.7	1.00	1.08	1.22	0.41	0.58
MSD1278T-824KL_	820 $\pm$ 10%	2.55	1.4	0.900	1.04	1.18	0.39	0.55
MSD1278T-105KL_	1000 $\pm$ 10%	2.87	1.3	0.850	0.948	1.05	0.37	0.52

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

MSD1278T-105KL **D**

**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 A dc 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.
- DC current, at which the inductance drops the specified amount 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.** MSD1278T-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.** MSD1278T-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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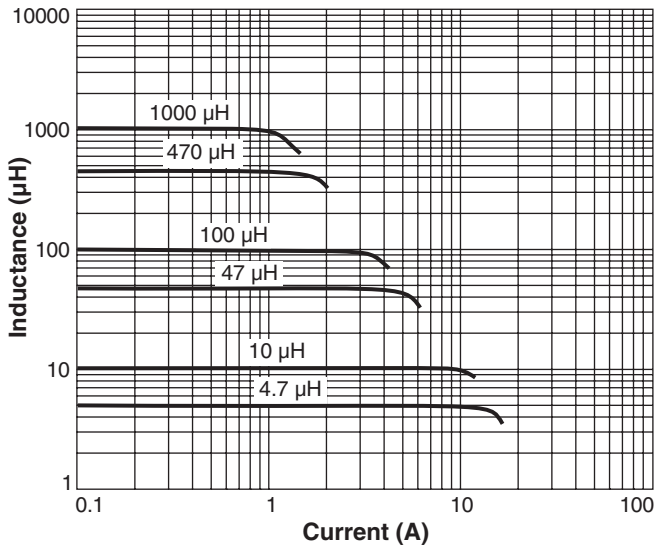


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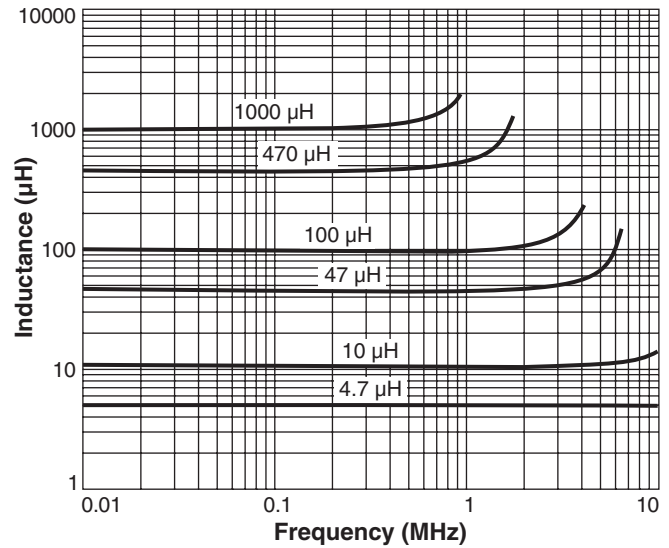
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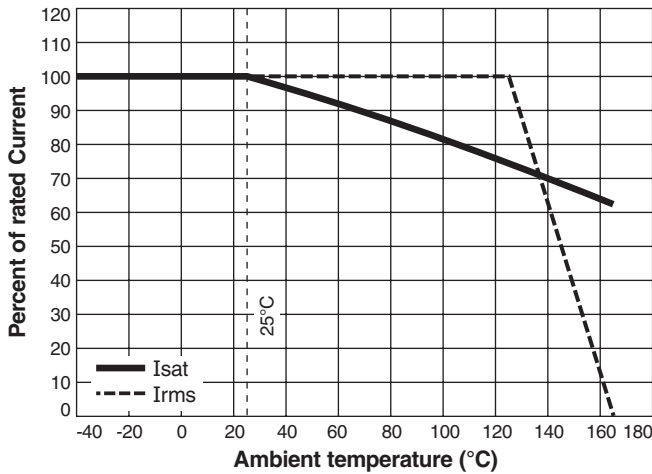
Typical L vs Current



Typical L vs Frequency



Current Derating



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Document 704-3 Revised 08/31/09

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