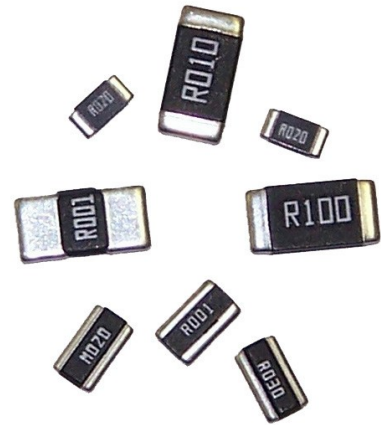


Low Resistance Metal Alloy Resistors

LRMA Series



Features:

- Resistance range 0.5mΩ to 750mΩ
- High temperature operation to 170°C
- Low thermal EMF version
- High power version
- Inverse version
- Current sensing for power electronics
- AEC-Q200 qualified



All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

Electrical Data

Version T (Standard)		LRMAT2010	LRMAT2512
Power rating @70°C	W	1.5	≤R01: 2, >R01: 1
Overload rating (5s)	W	7.5	≤R01: 10, >R01: 5
Resistance range	mΩ	2 to 50	1 to 100
Standard values ¹	mΩ	2, 5, 6, 10, 15, 20, 50	1, 1.5, 2, 3, 3.5, 4, 5, 6, 7, 8, 10, 11, 12, 15, 18, 20, 25, 30, 33, 35, 40, 50, 100
Resistance tolerance	%	0.5 ¹ , 1, 5	
TCR (25 to 125°C)	ppm/°C	≥R01: ±75, >R001 & <R01: ±100, ≤R001: ±275	
Ambient temperature	°C	-55 to 170	
Insulation resistance	MΩ	>100	
Element alloy		Cu-Ni	

Version P (Power)		LRMAP2512	
Power rating @70°C	W	≤R10: 3, >R10: 2	
Overload rating (5s)	W	≤R10: 15, >R10: 10	
Resistance range	mΩ	0.5 to 750	
Standard values ¹	mΩ	0.5, 0.75, 1, 1.1, 1.5, 2, 2.5, 3, 4, 5, 6, 6.8, 7, 8, 9, 10, 11, 12, 13, 15, 18, 20, 22, 25, 27, 30, 33, 39, 40, 45, 47, 50, 57, 60, 68, 70, 75, 80, 85, 90, 100, 120, 130, 140, 150, 180, 200, 220, 240, 250, 270, 280, 300, 330, 390, 400, 500, 750	
Resistance tolerance	%	0.5 ¹ , 1, 5	
TCR (25 to 125°C)	ppm/°C	≥R001: ±50, <R001: ±275	
Ambient temperature	°C	-55 to 170	
Insulation resistance	MΩ	>100	
Element alloy		Cu-Ni / Mn-Cu	

Version M (Low thermal EMF)	LRMAM0805	LRMAM1206	LRMAM2512
Power rating @70°C	W	1	≤R01: 2, >R01: 1
Overload rating (5s)	W	5	≤R01: 10, >R01: 5
Resistance range	mΩ	1 to 50	0.5 to 50
Standard values ¹	mΩ	1, 1.2, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 18, 20, 22, 25, 30, 39, 40, 50	0.5, 0.75, 1, 1.5, 2, 3.5, 5, 10, 20, 25, 30, 40, 50
Resistance tolerance	%	0.5 ¹ , 1, 5	
TCR (25 to 125°C)	ppm/°C	±100	≥R01: ±75, >R001 & <R01: ±100, ≤R001: ±275
Ambient temperature	°C	-55 to 170	
Insulation resistance	MΩ	>100	
Element alloy		Mn-Cu	

General Note

TT Electronics reserves the right to make changes in product specification without notice or liability.
All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

Electrical Data (continued)

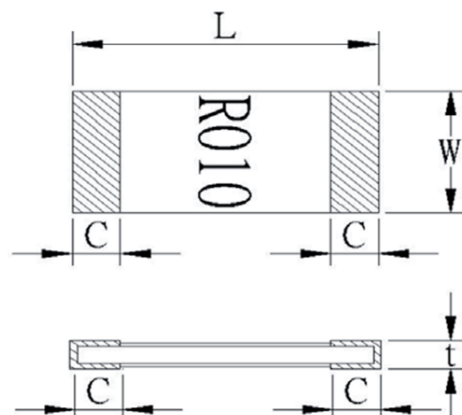
Version N (Inverse)		LRMAN0612	LRMAN0815	LRMAN1225
Power rating @70°C	W	1 ²		3
Overload rating (5s)	W	5		15
Resistance range	mΩ	1 to 10	1 to 30	2 to 40
Standard values ¹	mΩ	1, 3, 5, 10	1, 2, 3, 4, 5, 6, 8, 10, 15, 20, 25, 30	2, 3, 4, 5, 10, 15, 20, 25, 30, 40
Resistance tolerance	%	0.5 ¹ , 1, 5		
TCR (25 to 125°C)	ppm/°C	±100		
Ambient temperature	°C	-55 to 170		
Insulation resistance	MΩ	>100		
Element alloy		Cu-Ni / Mn-Cu		

Notes: 1. Non-standard values and 0.5% tolerance may be available for high volume requirements.

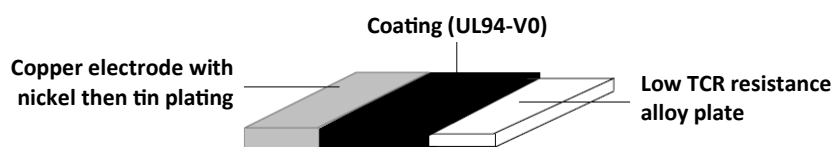
2. Requires 300mm² copper pad & trace area.

Physical Data

Dimensions in mm and weight in mg							Tolerances ±0.2mm unless stated
Type	Value (mΩ)	L	W	C	t	Wt. nom.	
LRMAT2010	All	5	2.5	0.6 ±0.3	0.6	36	
LRMAT2512	<1	6.4	3.2	2.6	0.6	62	
	≥1 & ≤3			2.2			
	>3			0.9			
LRMAP2512	<1	6.4	3.2	2.6	0.9	57	
	≥1 & ≤4			2.2			
	>4			0.9			
LRMAM0805	≤2	2 ±0.1	1.25 ±0.1	0.6	0.6	5.5	
	>2			0.4			
LRMAM1206	<2	3.2	1.6	1.1 ±0.3	0.75	18	
	≥2			0.5 ±0.3	0.6		
LRMAM2512	<1	6.4	3.2	2.6	0.6	62	
	≥1 & ≤3			2.2			
	>3			0.9			
LRMAN0612	All	1.7	3.2	0.4	0.6	13	
LRMAN0815	All	2.3	3.75 ±0.3	0.5	0.7	14	
LRMAN1225	All	3.2 ±0.3	6.4 ±0.3	0.5	0.9	70	



Construction



Marking

The components are marked with ohmic value, e.g. "R002"=2mΩ, "R010"=10 mΩ. Due to space restrictions, for LRMAM1206, "01" = 1mΩ is used, and for LRMAM0805, "2" = 2mΩ and "010" = 10mΩ are used.

Solvent Resistance

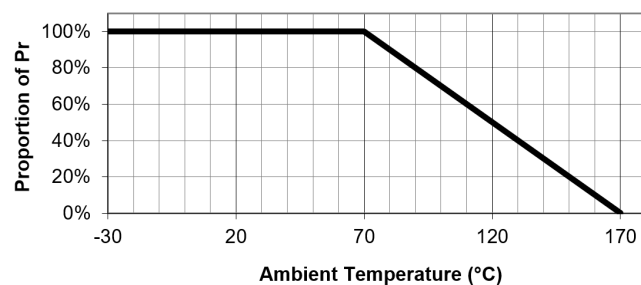
The component is resistant to all normal industrial cleaning solvents suitable for printed circuits.

Performance Data

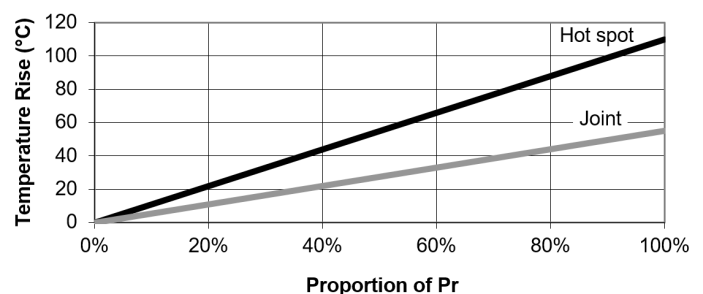
Test	Methods	Size:	Maximum		Typical
			0805	Others	All
Load at rated power	Cyclic load, 1000 hours at 70°C	$\pm\Delta R\%$	1.5	1	0.3
Short term overload	5x rated power for 5s	$\pm\Delta R\%$	0.5		0.15
Humidity	1000 hours, 85°C, 85%RH	$\pm\Delta R\%$	1	0.5	0.15
Temperature cycle	-40 to +125°C, 1000 cycles, 15-minute dwell	$\pm\Delta R\%$	1	0.5	0.15
Resistance to solder heat	260°C $\pm 5^\circ\text{C}$ for 20s $\pm 1\text{s}$	$\pm\Delta R\%$	0.5		0.3
Solderability	245°C $\pm 5^\circ\text{C}$ for 2s $\pm 0.5\text{s}$		>95% coverage		
Dry heat	1000 hours, 170°C	$\pm\Delta R\%$	1.5	0.5	0.3
Low temperature storage	1000 hours, -55°C	$\pm\Delta R\%$	0.5		0.15
Substrate bending	Board 1.6mm, fulcrum spacing 90mm, deflection 2mm	$\pm\Delta R\%$	1	0.5	0.3
Insulation resistance	1 minute, 100Vdc		>100M		
Sulphur resistance	ASTM B-809-95 (modified) 1000 hours, 105°C dry, visual inspection x10		Pass		

Thermal Performance & Mounting

Temperature Derating



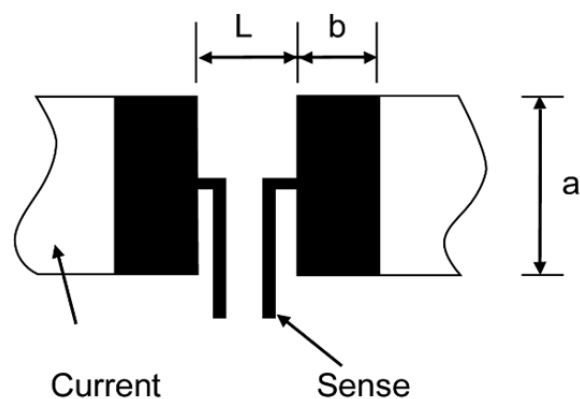
Typical Temperature Rise



The temperature rise shown is highly dependent on mounting conditions. Reference conditions assume 20µm copper with thermal vias to multiple layers. The self-heating in the current tracks should be kept negligible, or allowed for by temperature derating.

Reference Pad Dimensions (mm)

Type	Value (mΩ)	a	b	L
LRMAT2010	All	3.4	1.5	3.5
LRMAT2512	≤ 3	4	3.1	1.3
	> 3		2.1	4.1
LRMAP2512	≤ 4	4	3.1	1.3
	> 4		2.1	4.1
LRMAM0805	All	1.4	1.15	1.2
LRMAM1206	< 2	1.8	2.3	1
	≥ 2		1.7	1.6
LRMAM2512	≤ 3	4	3.1	1.3
	> 3		2.1	4.1
LRMAN0612	All	3.8	0.7	0.7
LRMAN0815	≤ 10	4.2	0.8	1.2
	> 10		1.5	0.9
LRMAN1225	All	7	1	2.3



Measurement Probe Positions

Standard 4-terminal probe pitches for measuring unmounted parts are 2 x 1.2mm (0612), 0.8 x 1.5mm (0805), 1.1 x 2.5mm (1206), 2.2 x 4.6mm (2010), 2.2 x 5.4mm (2512), and 5.4 x 2.3mm (1225). All probe location tolerances $\pm 0.02\text{mm}$. These resistors are designed to have the correct ohmic value when mounted on a PCB. Probed measurements may read higher values and mounting offsets may need to be established to account for this, especially with sub-milliohm values.

Packaging

Technical drawing of LRMA resistor tape showing dimensions and components. The drawing includes labels for Bottom Tape, Top Tape, Resistor, Emboss Tape, and Paper Tape. Dimensions are indicated by arrows and labels: ϕD_0 , ϕD_1 1.5min, ϕA , ϕB , ϕC , ϕD , ϕE , ϕF , ϕG , ϕH , ϕI , ϕJ , ϕK , ϕL , ϕM , ϕN , ϕO , ϕP , ϕQ , ϕR , ϕS , ϕT , ϕU , ϕV , ϕW , ϕX , ϕY , ϕZ , ϕAA , ϕAB , ϕAC , ϕAD , ϕAE , ϕAF , ϕAG , ϕAH , ϕAI , ϕAJ , ϕAK , ϕAL , ϕAM , ϕAN , ϕAO , ϕAP , ϕAQ , ϕAR , ϕAS , ϕAT , ϕAU , ϕAV , ϕAW , ϕAX , ϕAY , ϕAZ , ϕBA , ϕBB , ϕBC , ϕBD , ϕBE , ϕBF , ϕBG , ϕBH , ϕBI , ϕBJ , ϕBK , ϕBL , ϕBM , ϕBN , ϕBO , ϕBP , ϕBQ , ϕBR , ϕBS , ϕBT , ϕBU , ϕBV , ϕBW , ϕBX , ϕBY , ϕBZ , ϕCA , ϕCB , ϕCC , ϕCD , ϕCE , ϕCF , ϕCG , ϕCH , ϕCI , ϕCJ , ϕCK , ϕCL , ϕCM , ϕCN , ϕCO , ϕCP , ϕCQ , ϕCR , ϕCS , ϕCT , ϕCU , ϕCV , ϕCW , ϕCX , ϕCY , ϕCZ , ϕDA , ϕDB , ϕDC , ϕDD , ϕDE , ϕDF , ϕDG , ϕDH , ϕDI , ϕDJ , ϕDK , ϕDL , ϕDM , ϕDN , ϕDO , ϕDP , ϕDQ , ϕDR , ϕDS , ϕDT , ϕDU , ϕDV , ϕDW , ϕDX , ϕDY , ϕDZ , ϕEA , ϕEB , ϕEC , ϕED , ϕEE , ϕEF , ϕEG , ϕEH , ϕEI , ϕEJ , ϕEK , ϕEL , ϕEM , ϕEN , ϕEO , ϕEP , ϕEQ , ϕER , ϕES , ϕET , ϕEU , ϕEV , ϕEW , ϕEX , ϕEY , ϕEZ , ϕFA , ϕFB , ϕFC , ϕFD , ϕFE , ϕFF , ϕFG , ϕFH , ϕFI , ϕFJ , ϕFK , ϕFL , ϕFM , ϕFN , ϕFO , ϕFP , ϕFQ , ϕFR , ϕFS , ϕFT , ϕFU , ϕFV , ϕFW , ϕFX , ϕFY , ϕFZ , ϕGA , ϕGB , ϕGC , ϕGD , ϕGE , ϕGF , ϕGG , ϕGH , ϕGI , ϕGJ , ϕGK , ϕGL , ϕGM , ϕGN , ϕGO , ϕGP , ϕGQ , ϕGR , ϕGS , ϕGT , ϕGU , ϕGV , ϕGW , ϕGX , ϕGY , ϕGZ , ϕHA , ϕHB , ϕHC , ϕHD , ϕHE , ϕHF , ϕHG , ϕHH , ϕHI , ϕHJ , ϕHK , ϕHL , ϕHM , ϕHN , ϕHO , ϕHP , ϕHQ , ϕHR , ϕHS , ϕHT , ϕHU , ϕHV , ϕHW , ϕHX , ϕHY , ϕHZ , ϕIA , ϕIB , ϕIC , ϕID , ϕIE , ϕIF , ϕIG , ϕIH , ϕII , ϕIJ , ϕIK , ϕIL , ϕIM , ϕIN , ϕIO , ϕIP , ϕIQ , ϕIR , ϕIS , ϕIT , ϕIU , ϕIV , ϕIW , ϕIX , ϕIY , ϕIZ , ϕJA , ϕJB , ϕJC , ϕJD , ϕJE , ϕJF , ϕJG , ϕJH , ϕJI , ϕJJ , ϕJK , ϕJL , ϕJM , ϕJN , ϕJO , ϕJP , ϕJQ , ϕJR , ϕJS , ϕJT , ϕJU , ϕJV , ϕJW , ϕJX , ϕJY , ϕJZ , ϕKA , ϕKB , ϕKC , ϕKD , ϕKE , ϕKF , ϕKG , ϕKH , ϕKI , ϕKJ , ϕKK , ϕKL , ϕKM , ϕKN , ϕKO , ϕKP , ϕKQ , ϕKR , ϕKS , ϕKT , ϕKU , ϕKV , ϕKW , ϕKX , ϕKY , ϕKZ , ϕLA , ϕLB , ϕLC , ϕLD , ϕLE , ϕLF , ϕLG , ϕLH , ϕLI , ϕLJ , ϕLK , ϕLL , ϕLM , ϕLN , ϕLO , ϕLP , ϕLQ , ϕLR , ϕLS , ϕLT , ϕLU , ϕLV , ϕLW , ϕLX , ϕLY , ϕLZ , ϕMA , ϕMB , ϕMC , ϕMD , ϕME , ϕMF , ϕMG , ϕMH , ϕMI , ϕMJ , ϕMK , ϕML , ϕMM , ϕMN , ϕMO , ϕMP , ϕMQ , ϕMR , ϕMS , ϕMT , ϕMU , ϕMV , ϕMW , ϕMX , ϕMY , ϕMZ , ϕNA , ϕNB , ϕNC , ϕND , ϕNE , ϕNF , ϕNG , ϕNH , ϕNI , ϕNJ , ϕNK , ϕNL , ϕNM , ϕNN , ϕNO , ϕNP , ϕNQ , ϕNR , ϕNS , ϕNT , ϕNU , ϕNV , ϕNW , ϕNX , ϕNY , ϕNZ , ϕOA , ϕOB , ϕOC , ϕOD , ϕOE , ϕOF , ϕOG , ϕOH , ϕOI , ϕOJ , ϕOK , ϕOL , ϕOM , ϕON , ϕOO , ϕOP , ϕOQ , ϕOR , ϕOS , ϕOT , ϕOU , ϕOV , ϕOW , ϕOX , ϕOY , ϕOZ , ϕPA , ϕPB , ϕPC , ϕPD , ϕPE , ϕPF , ϕPG , ϕPH , ϕPI , ϕPJ , ϕPK , ϕPL , ϕPM , ϕPN , ϕPO , ϕPP , ϕPQ , ϕPR , ϕPS , ϕPT , ϕPU , ϕPV , ϕPW , ϕPX , ϕPY , ϕPZ , ϕQA , ϕQB , ϕQC , ϕQD , ϕQE , ϕQF , ϕQG , ϕQH , ϕQI , ϕQJ , ϕQK , ϕQL , ϕQM , ϕQN , ϕQO , ϕQP , ϕQQ , ϕQR , ϕQS , ϕQT , ϕQU , ϕQV , ϕQW , ϕQX , ϕQY , ϕQZ , ϕRA , ϕRB , ϕRC , ϕRD , ϕRE , ϕRF , ϕRG , ϕRH , ϕRI , ϕRJ , ϕRK , ϕRL , ϕRM , ϕRN , ϕRO , ϕRP , ϕRQ , ϕRR , ϕRS , ϕRT , ϕRU , ϕRV , ϕRW , ϕRX , ϕRY , ϕRZ , ϕSA , ϕSB , ϕSC , ϕSD , ϕSE , ϕSF , ϕSG , ϕSH , ϕSI , ϕSJ , ϕSK , ϕSL , ϕSM , ϕSN , ϕSO , ϕSP , ϕSQ , ϕSR , ϕSS , ϕST , ϕSU , ϕSV , ϕSW , ϕSX , ϕSY , ϕSZ , ϕTA , ϕTB , ϕTC , ϕTD , ϕTE , ϕTF , ϕTG , ϕTH , ϕTI , ϕTJ , ϕTK , ϕTL , ϕTM , ϕTN , ϕTO , ϕTP , ϕTQ , ϕTR , ϕTS , ϕTT , ϕTU , ϕTV , ϕTW , ϕTX , ϕTY , ϕTZ , ϕUA , ϕUB , ϕUC , ϕUD , ϕUE , ϕUF , ϕUG , ϕUH , ϕUI , ϕUJ , ϕUK , ϕUL , ϕUM , ϕUN , ϕUO , ϕUP , ϕUQ , ϕUR , ϕUS , ϕUT , ϕUY , ϕUV , ϕUW , ϕUX , ϕUZ , ϕVA , ϕVB , ϕVC , ϕVD , ϕVE , ϕVF , ϕVG , ϕVH , ϕVI , ϕVJ , ϕVK , ϕVL , ϕVM , ϕVN , ϕVO , ϕVP , ϕVQ , ϕVR , ϕVS , ϕVT , ϕVY , ϕVW , ϕVX , ϕVZ , ϕWA , ϕWB , ϕWC , ϕWD , ϕWE , ϕWF , ϕWG , ϕWH , ϕWI , ϕWJ , ϕWK , ϕWL , ϕWM , ϕWN , ϕWO , ϕWP , ϕWQ , ϕWR , ϕWS , ϕWT , ϕWY , ϕWW , ϕWX , ϕWZ , ϕXA , ϕXB , ϕXC , ϕXD , ϕXE , ϕXF , ϕXG , ϕXH , ϕXI , ϕXJ , ϕXK , ϕXL , ϕXM , ϕXN , ϕXO , ϕXP , ϕXQ , ϕXR , ϕXS , ϕXT , ϕXY , ϕXW , ϕXZ , ϕYA , ϕYB , ϕYC , ϕYD , ϕYE , ϕYF , ϕYG , ϕYH , ϕYI , ϕYJ , ϕYK , ϕYL , ϕYM , ϕYN , ϕYO , ϕYP , ϕYQ , ϕYR , ϕYS , ϕYT , ϕYW , ϕYZ , ϕZA , ϕZB , ϕZC , ϕZD , ϕZE , ϕZF , ϕZG , ϕZH , ϕZI , ϕZJ , ϕZK , ϕZL , ϕZM , ϕZN , ϕZO , ϕZP , ϕZQ , ϕZR , ϕZS , ϕZT , ϕZW , ϕZZ .

Technical drawing of LRMA resistor reel showing dimensions and components. The drawing includes labels for W_r , T_r , ϕC , ϕB , and ϕA .

All dimensions in mm

Size	Tape	A	B	W	F	E	P ₁	P ₂	P ₀	ϕD_0	t	ϕA	ϕB	ϕC	W _r	T _r	Qty
0805	Paper	1.6 ±0.15	2.4 ±0.2	8.0 ±0.2	3.5 ±0.05						0.84 ±0.1				9 ±1	11.4 ±1.1	5000
1206/0612		2.0 ±0.15	3.6 ±0.2														
0815	Embossed plastic	2.6 ±0.2	4.5 ±0.2	12 ±0.2	5.5 ±0.1	1.75 ±0.1	4.0 ±0.1	2.0 ±0.2	4.0 ±0.1	1.5 +0.1 /-0	1.1 ±0.1	178 ±2	60 ±1	13 ±1	13 ±1	15.4 ±2	4000
2010		2.8 ±0.2	5.3 ±0.2								0.85 ±0.15						
2512/1225		3.6 ±0.2	6.9 ±0.2														

Storage

Conditions: 5°C to 35°C and 40% to 75%RH

Shelf life: 2 years from manufacture

Processing

LRMA series resistors are suitable for both wave and IR reflow soldering. The recommended reflow profile for Pb-free SAC305 alloy (Sn 96.5%, Ag 3%, Cu 0.5%) soldering is as follows:

Pre-heat: 60s to 120s at 150°C to 180°C

Soldering: 20s to 40s at ≥230°C

Peak: 5s at 255°C to 260°C

Ordering Procedure

Example: LRMAM2512-R01FT4 (LRMA with low thermal EMF, 2512, 10 milliohms ±1%, Pb-free)

L	R	M	A	M	2	5	1	2	-1	R	0	1				F	T	4
1		2		3				4		5		6						

1	2		3	4	5	6		
Series	Version		Size	Value	Tolerance	Packing		
LRMA	T	Standard	0612	3 to 6 characters R = ohms	D = ±0.5%	Tape & reel		
	P	Power	0805		F = ±1%	T5	0612, 0805, 1206	5000/reel
	M	Low thermal EMF	0815		J = ±5%	T4	0815, 1225, 2010, 2512	4000/reel
	N	Inverse	1206					
			1225					
			2010					
			2512					

Note 1: For values which require all 6 characters, e.g. R00075, the hyphen is omitted.