K78_MT-1000R4 Series

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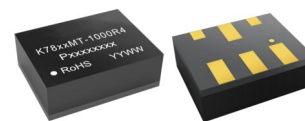
- Ultra-small, ultra-thin DFN package (9 x 7 x 3.1mm)
- Operating ambient temperature range: -40ºC to +105ºC
- High efficiency up to 94%
- Output short-circuit protection
- Meets AEC-Q100 (under testing)
- 3 Year Warranty

The K78_MT-1000R4 series of low cost surface mount DC/DC converters offer ultra small DFN surface mount regulated current of up to 1000mA in a range of voltages from +/-3.3V to +/-15V. The units operate from –40 to +105ºC with a 10% trim and short circuit protection. Units are single output, but offer 2 possible voltages in one unit.

Dimensions:

9.00 × 7.00 × 3.10mm

Models & Ratings

Model Number	Input Voltage[1]	Output Voltage	Output Current	Efficiency (Typical) Vin min/ nom / max	Maximum Capacitive Load
K7803MT-1000R4	24V (4.5 - 36V)	3.3V	1000mA	89/84/81%	680uF
	12V (8 - 27V)	-3.3V	-500mA	85/85/81%	330uF
K7805MT-1000R4	24V (6.5 - 36V)	5V	1000mA	92/87/84%	680uF
	12V (8 - 27V)	-5V	-500mA	85/85/83%	330uF
K78X6MT-1000R4	24V (8 - 36V)	6.5V	1000mA	92/88/86%	680uF
	12V (8 - 24V)	-6.5V	-500mA	83/85/84%	330uF
K7809MT-1000R4	24V (12 - 36V)	9V	1000mA	92/90/87%	680uF
	12V (8 - 24V)	-9V	-500mA	81/85/84%	330uF
K7812MT-1000R4	24V (15 - 36V)	12V	1000mA	94/91/89%	680uF
	12V (8 - 20V)	-12V	-300mA	83/85/84%	330uF
K7815MT-1000R4	24V (18 - 36V)	15	1000mA	94/93/90%	680uF
	12V (8 - 18V)	-15V	-300mA	82/84/84%	330uF

Notes

1. For Vin above >30VDC use 22uF/50V
2. Max capacitive load tested at nominal Vin and max load

3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load.

Input

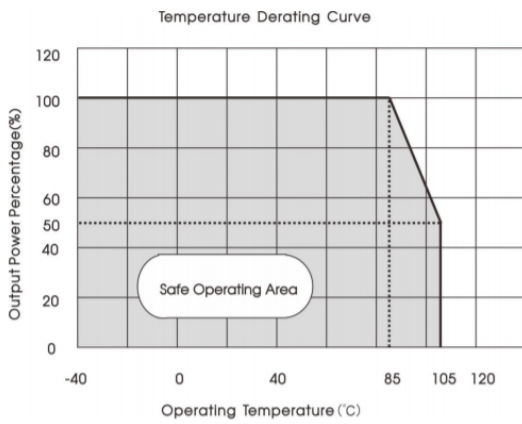| Parameter	Condition	Minimum	Typical	Maximum	Unit
No load input current	Nominal input voltage	-	0.1	-	mA
Input filter		Capacitor			
Control[1]	Module on	Ctrl pin open[2] or pulled high (TTL 1.6~5VDC)			
	Module off	Ctrl pin pulled low to GND(-Vo)(0~0.6VDC)			
	Input current when off	-	240	-	uA

Notes

1. The positive output ctrl pin voltage is referenced to input GND; Negative output ctrl pin voltage is referenced to -Vo;

2. The Ctrl pin needs to be connected to +Vin pin if the electromagnetic environment with a large interference.

General

| Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Switching frequency		1		MHz	
MTBF	8552			kHrs	As per MIL-HDBK-217F, 25ºC GB
Weight	0.58g typical				
Case material	Back epoxy resin: flame-retardant and heat resistant (UL94 V-0)				
Pollution Degree		PD3			
Reflow Soldering Temperature	Peak temperature <245ºC, duration <60s max over 217ºC.also refer IPC/JEDEC J-STD-020D.1.				

3.3V/5V/6.5V output

Temperature Derating Curve

9/12/15V output

Temperature Derating Curve
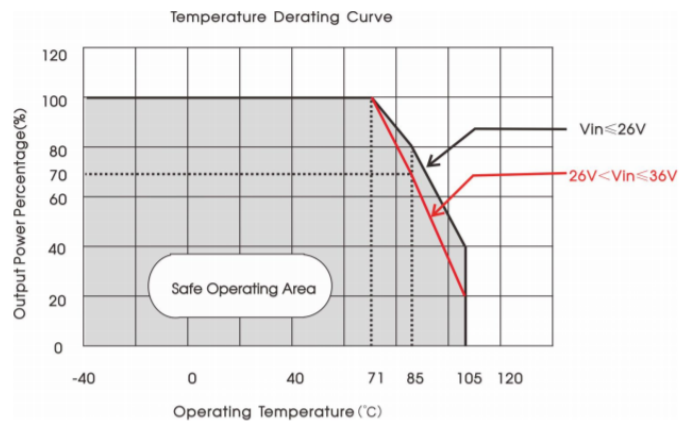
Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-40		105	°C	See derating curve
Storage temperature	-55		125	°C	
Cooling					Convection cooled 30-65LFM
Humidity	5		95	% RH	Non-condensing
Moisture sensitivity level (MSL)	IPC/JEDEC J-STD-020D.1 LEVEL 1				

Output

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Set point accuracy: 3.3V	-	±2	±4	%	Full load
Others	-	±2	±3		Full load
Line regulation	-	±0.2	-		Full load min to max Vin
Load regulation	-	±1	-		From 10% to 100% load change. Nominal Vin
Temperature coefficient	-	±0.02	-	%/°C	Operating temp –40°C to 105°C
Ripple and nose	-	75	150	mVp-p	20MHz BW
	-	20	75	mVp-p	20MHz BW with 22uF capacitor
Transient response deviation	-	50	120	mV	3.3V/5V/6.5V/9V Outputs
	-	100	300	mV	12/15V Outputs
Transient recovery time	-	0.1	0.8	ms	Nominal input voltage, 25% step change.
Short circuit protection	Continuous, self-recovery				
Vtrim	-	±10	-	%Vout	Input voltage range

EMC

	Standard	Criteria	Notes & Conditions
Conducted	CISPR32 / EN55032 level B	-	See application note
Radiated	CISPR32 / EN55032 Level B	-	See application note
ESD	IEC 61000-4-2	B	6kV contact discharge. 2kV on Ctrl. If higher level required on Ctrl contact sales
RS	IEC 61000-4-3	A	80~1000 MHz, 10V/m, 80% AM (1kHz)
CS	IEC 61000-4-6	A	3Vrms
EFT	IEC 61000-4-4	B	1kV. See application note
Surge	IEC 61000-4-5	B	1kV. See application note

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Mechanical Details

THIRD ANGLE PROJECTION
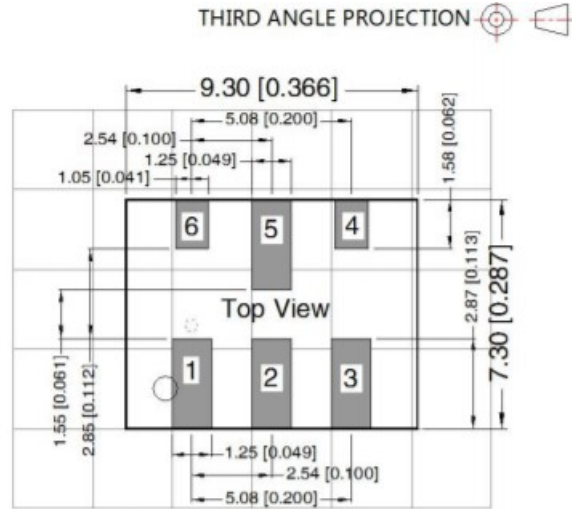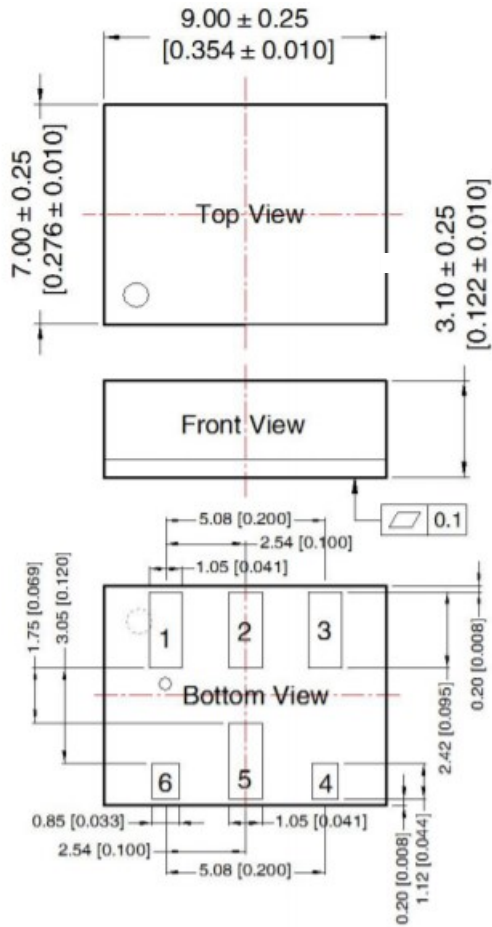
Note: Grid 2.54*2.54mm

Pin Connections		
Pin	Positive	Negative
1	+Vin	+Vin
2	GND	-Vout
3	+Vout	GND
4	Trim	Trim
5	GND	-Vout
6	Ctrl	Ctrl
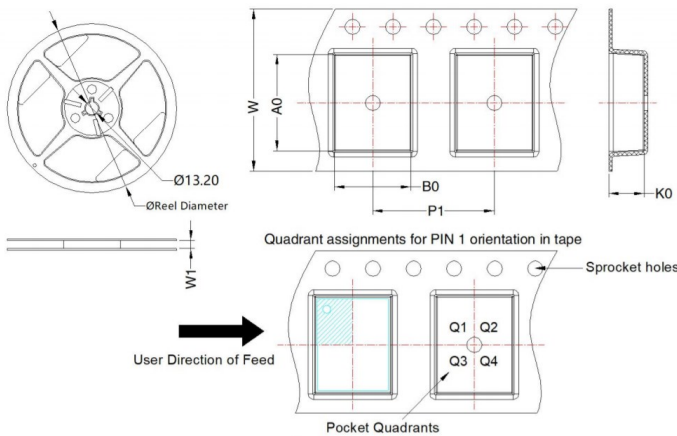
Pad Layout
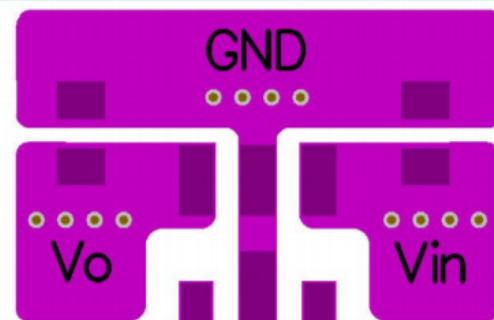
| Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
K78xxMT-1000R4	DFN 7x9	7	400	180.0	16.4	9.56	7.56	3.5	12.0	16.0	Q1

Notes

1. All dimensions shown in millimetres [inches]

2. Pin tolerance ±0.10 [±0.004]

3. Please contact us for soldering process details

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Typical application

Additional components are recommended for best performance. They should be placed as close to the module as possible . Note that capacitor values may be increased to enhance performance or used in addition with tantalum or low ESR electrolytics.
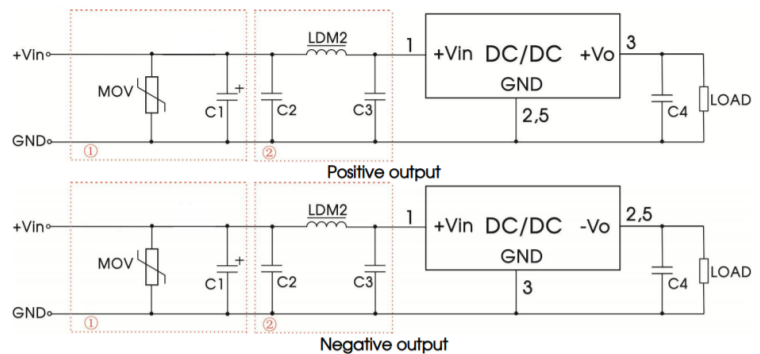

Positive output

Negative output
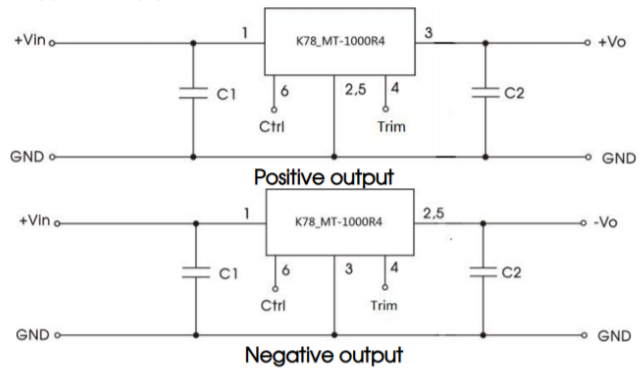
Model Number	C1	C2	Ra1/Ra2
K7803MT-1000R4		22uF/10V	
K7805MT-1000R4		22uF/10V	
K78X6MT-1000R4	10pF/50V	22uF/16V	Refer to trim table
K7809MT-1000R4		22uF/16V	
K7812MT-1000R4		22uF/25V	
K7815MT-1000R4		22uF/25V	

EMI Filter

Additional components should be used to enhance EMI performance. Components should be placed as close to the unit as possible.

Section 1 of the filter is used to mitigate surge and transients. Section 2 of the filter is for mitigating emissions


Positive output

Negative output

Model Number	MOV	C1	C2	LDM2	C3	C4
K7803/05/X6MT-1000R4 (Positive output)	S20K30	680uF/50V	10uF/50V	68uH	-	22uF/25V
All others					10uF/50V	

Application note

Trim

The output voltage can be trimmed by adding the appropriate resistor to the pins shown below

Positive output trim up   Positive output trim down   Negative output trim up   Negative output trim down
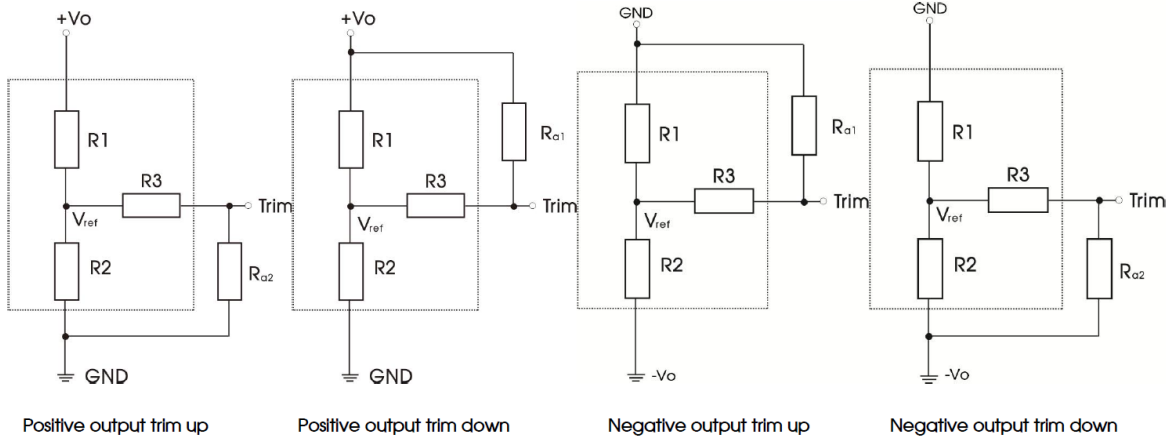
Trim up : $R_{a2} = \dfrac{aR_2}{R_2 - a} - R_3, \quad a = R_2 // (R_3 + R_{a2}) = \dfrac{V_{ref}}{V_o' - V_{ref}} R_1$

Trim down : $R_{a1} = \dfrac{aR_1}{R_1 - a} - R_3, \quad a = R_1 // (R_3 + R_{a1}) = \dfrac{V_o' - V_{ref}}{V_{ref}} R_2$

Vout	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref
3.3	150	33	180	0.6
5	100	13.66	82	0.6
6.5	32.4	3.3	20	0.6
9	100	7.14	47	0.6
12	100	5.28	43	0.6
15	180	7.5	51	0.6

Vout nom	±3.3VDC		±5VDC		±6.5VDC		±9VDC		±12VDC		±15VDC	
Vout adj	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2
2.97	815k											
3.63		117.3k										
4.5			710k									
5.5				36.2k								
5.85					245.4k							
7.15						9.5k						
8.1							783.2k					
9.9								19.9k				
10.8									833.5k			
13.2										5.5k		
13.5											1497k	
16.5												21k