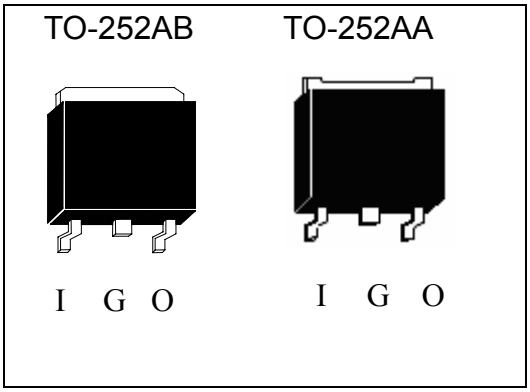
Three Terminal Positive Voltage Regulators

LM78XXJ3



Description

The LM78XXJ3 series of fixed voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single point regulation. Each of these regulators can deliver up to 1A of output current. The internal current limiting and thermal shutdown features of these regulators make them essentially immune to overload.

Features:

- 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 24V output voltage available
- Internal Short-Circuit Current Limiting
- High Power Dissipation Capability
- Internal Thermal Overload Protection
- No External Components Required
- Output Transistor Safe Area Compensation
- RoHS compliant package

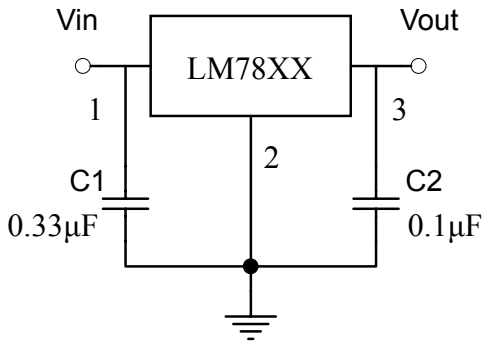
Absolute Maximum Ratings (Ta=25°C)

Parameter		Ratings	Unit
Input Voltage	LM7805~LM7818	35	V
	LM7824	40	
Output Current		1	A
Operating Junction Temperature Range		-40 ~ +125	℃
Storage Temperature Range		-55 ~ +125	℃
Thermal Resistance, Junction to Ambient ($R_{\theta JA}$)		125	℃/W
Thermal Resistance, Junction to Case ($R_{\theta JC}$)		12.5	℃/W

Ordering Information

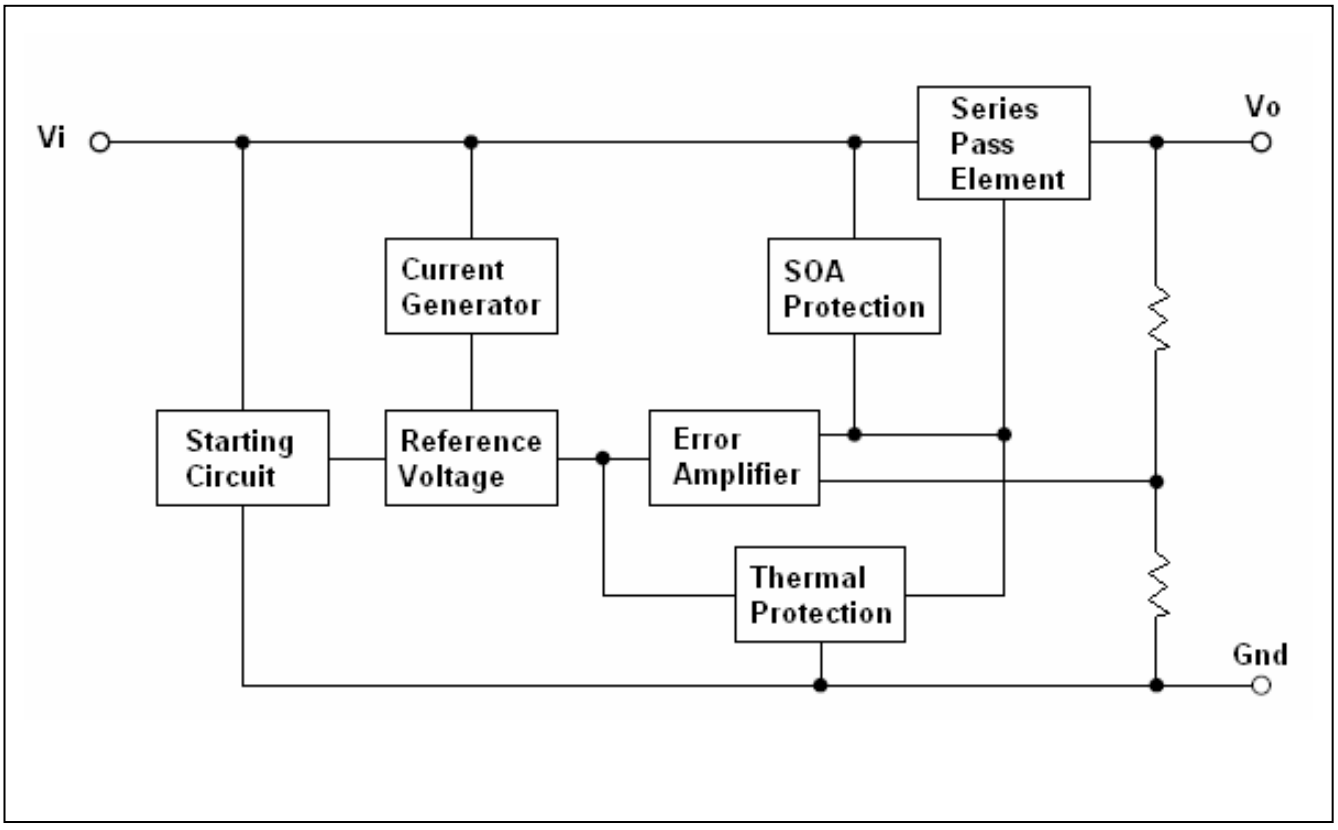
Device	Output Voltage Tolerance	Package	Shipping	Marking
LM7805J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7805
LM7805J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7805
LM7806J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7806
LM7806J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7806
LM7808J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7808
LM7808J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7808
LM7809J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7809
LM7809J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7809
LM7810J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7810
LM7810J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7810
LM7812J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7812
LM7812J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7812
LM7815J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7815
LM7815J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7815
LM7818J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7818
LM7818J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7818
LM7824J3 A-rank	±3%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7824
LM7824J3 B-rank	±5%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	7824

Typical Application Circuit



Note:
C1 and C2 are required if regulator is located far from power supply filter and load, or oscillation may induced on the loop.

Block Diagram



Electrical Characteristics

LM7805 (Tj=0~125°C, Vin=10V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	4.85	5.0	5.15	Vin=10V, Io=500mA,Tj=25°C 7.5V≤Vin≤20V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		4.75	-	5.25		
ΔVo		Line Regulation	-	3	50	7V≤Vin≤25V, Tj=25°C	mV
			-	1	25	8V≤Vin≤12V, Tj=25°C	
ΔVo		Load Regulation	-	-	100	5mA≤Io≤1A, Tj=25°C	mV
			-	-	50	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=10V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.3	7V≤Vin≤25V	
Vn		Output Noise Voltage	-	40	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	80	-	8V≤Vin≤18V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-0.6	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

LM7806 (Tj=0~125°C, Vin=11V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	5.82	6.0	6.18	Vin=11V, Io=500mA,Tj=25°C 8V≤Vin≤21V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		5.70	-	6.30		
ΔVo		Line Regulation	-	3	60	8V≤Vin≤25V, Tj=25°C	mV
			-	1	25	9V≤Vin≤13V, Tj=25°C	
ΔVo		Load Regulation	-	-	100	5mA≤Io≤1A, Tj=25°C	mV
			-	-	50	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=11V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.3	8V≤Vin≤25V	
Vn		Output Noise Voltage	-	45	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	75	-	9V≤Vin≤19V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-0.7	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

LM7808 (Tj=0~125°C, Vin=14V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	7.76	8.0	8.24	Vin=14V, Io=500mA,Tj=25°C 10.5V≤Vin≤23V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		7.60	-	8.40		
ΔVo		Line Regulation	-	3	80	10.5V≤Vin≤25V, Tj=25°C	mV
			-	1	40	11V≤Vin≤17V, Tj=25°C	
ΔVo		Load Regulation	-	-	100	5mA≤Io≤1A, Tj=25°C	mV
			-	-	50	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=14V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.3	10.5V≤Vin≤25V	
Vn		Output Noise Voltage	-	58	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	72	-	11.5V≤Vin≤21.5V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-0.9	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

LM7809 (Tj=0~125°C, Vin=15V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	8.73	9.0	9.27	Vin=15V, Io=500mA,Tj=25°C 11.5V≤Vin≤24V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		8.55	-	9.45		
ΔVo		Line Regulation	-	5	90	11.5V≤Vin≤25V, Tj=25°C	mV
			-	3	45	13V≤Vin≤19V, Tj=25°C	
ΔVo		Load Regulation	-	-	100	5mA≤Io≤1A, Tj=25°C	mV
			-	-	50	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=15V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.3	11.5V≤Vin≤26V	
Vn		Output Noise Voltage	-	58	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	72	-	12.5V≤Vin≤22.5V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-1.1	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

LM7810 (Tj=0~125°C, Vin=16V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	9.70	10.0	10.30	Vin=16V, Io=500mA,Tj=25°C 12.5V≤Vin≤25V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		9.50	-	10.50		
ΔVo		Line Regulation	-	-	100	13V≤Vin≤25V, Tj=25°C	mV
			-	-	50	14V≤Vin≤20V, Tj=25°C	
ΔVo		Load Regulation	-	-	100	5mA≤Io≤1A, Tj=25°C	mV
			-	-	50	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=16V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.0	12.5V≤Vin≤25V	
Vn		Output Noise Voltage	-	58	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	72	-	13V≤Vin≤23V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-1.1	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

LM7812 (Tj=0~125°C, Vin=19V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	11.64	12.0	12.36	Vin=19V, Io=500mA,Tj=25°C 14.5V≤Vin≤27V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		11.40	-	12.60		
ΔVo		Line Regulation	-	10	120	14.5V≤Vin≤30V, Tj=25°C	mV
			-	3	60	16V≤Vin≤22V, Tj=25°C	
ΔVo		Load Regulation	-	-	100	5mA≤Io≤1A, Tj=25°C	mV
			-	-	60	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=19V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.3	14.5V≤Vin≤30V	
Vn		Output Noise Voltage	-	75	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	72	-	15V≤Vin≤25V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-1.5	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

LM7815 (Tj=0~125°C, Vin=23V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	14.55	15.0	15.45	Vin=23V, Io=500mA,Tj=25°C 17.5V≤Vin≤30V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		14.25	-	15.75		
ΔVo		Line Regulation	-	-	150	17.5V≤Vin≤30V, Tj=25°C	mV
			-	-	75	18.5V≤Vin≤30V, Tj=25°C	
ΔVo		Load Regulation	-	-	150	5mA≤Io≤1A, Tj=25°C	mV
			-	-	75	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=23V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.3	17.5V≤Vin≤30V	
Vn		Output Noise Voltage	-	90	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	70	-	18.5V≤Vin≤28.5V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-1.8	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

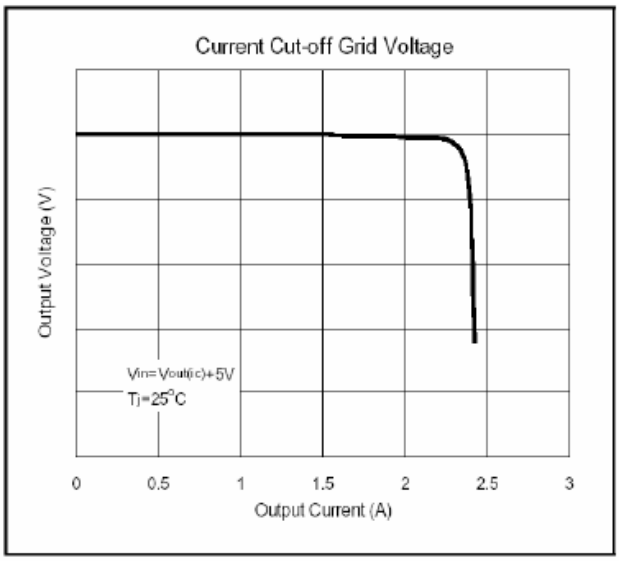
LM7818 (Tj=0~125°C, Vin=27V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

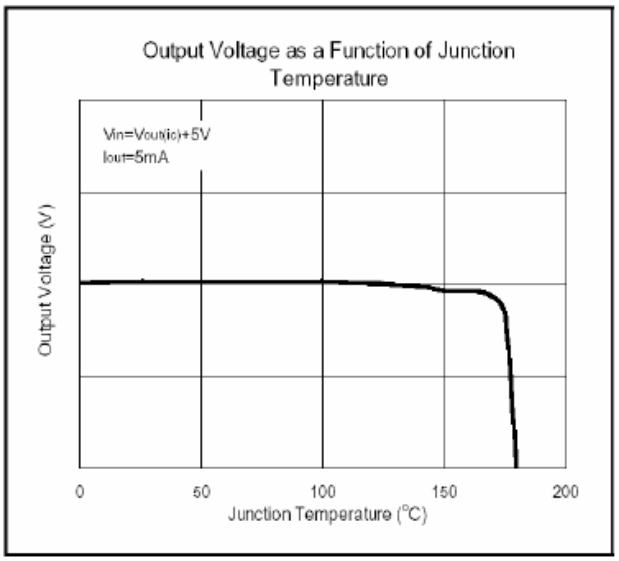
Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	17.46	18.0	18.54	Vin=27V, Io=500mA,Tj=25°C 21V≤Vin≤33V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		17.10	-	18.90		
ΔVo		Line Regulation	-	-	180	21V≤Vin≤33V, Tj=25°C	mV
			-	-	90	24V≤Vin≤30V, Tj=25°C	
ΔVo		Load Regulation	-	-	180	5mA≤Io≤1A, Tj=25°C	mV
			-	-	90	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=27V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.0	21V≤Vin≤33V	
Vn		Output Noise Voltage	-	110	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	69	-	22V≤Vin≤32V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-2.2	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

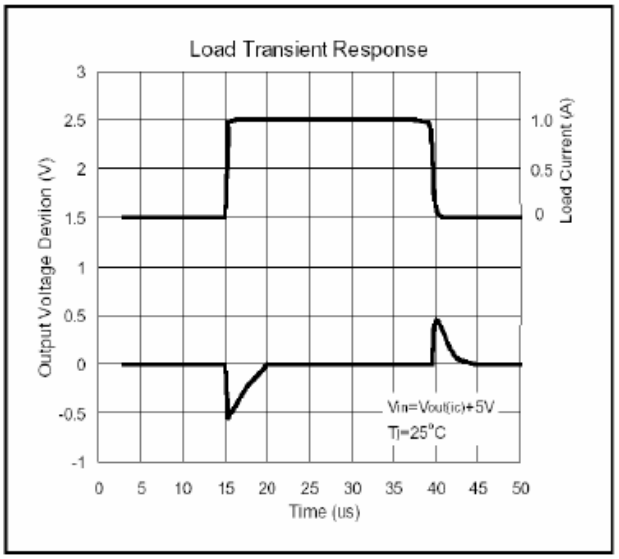
LM7824 (Tj=0~125°C, Vin=33V, Io=500mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

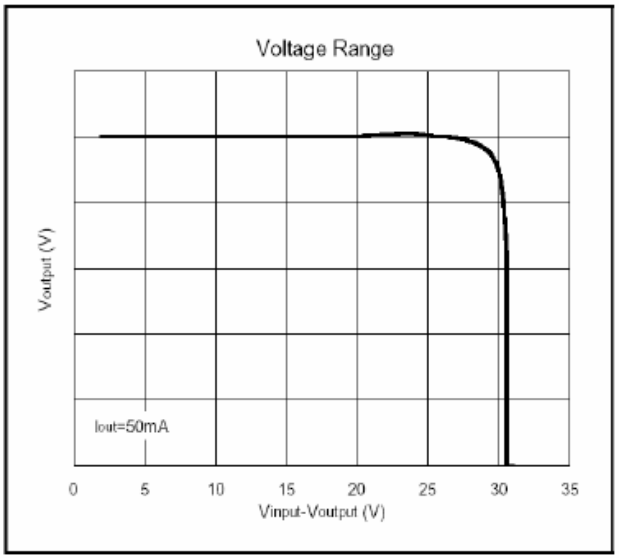
Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	23.28	24.0	24.72	Vin=33V, Io=500mA,Tj=25°C 27V≤Vin≤38V, 5mA≤Io≤1A, PD≤15W	V
	B-rank(5%)		22.80	-	25.20		
ΔVo		Line Regulation	-	-	240	27V≤Vin≤38V, Tj=25°C	mV
			-	-	120	30V≤Vin≤36V, Tj=25°C	
ΔVo		Load Regulation	-	-	240	5mA≤Io≤1A, Tj=25°C	mV
			-	-	120	250mA≤Io≤750mA, Tj=25°C	
IQ		Quiescent Current	-	-	8	Vin=33V, Io=500mA, Tj=25°C	mA
ΔIQ		Quiescent Current Change	-	-	0.5	5mA≤Io≤1A	mA
			-	-	1.0	28V≤Vin≤38V	
Vn		Output Noise Voltage	-	170	-	10Hz≤f≤100KHz, Tj=25°C	μV
RR		Ripple Rejection	-	66	-	28V≤Vin≤38V, f=120Hz, Tj=25°C	dB
VD		Dropout Voltage	-	2	-	Io=1A, Tj=25°C	V
ISC		Output Short Circuit Current	-	250	-	Vin=35V, Tj=25°C	mA
IPK		Peak Output Current	-	1.8	-	Tj=25°C	A
ΔVo/ΔTj		Temperature Stability	-	-2.8	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃

Characteristic Curves

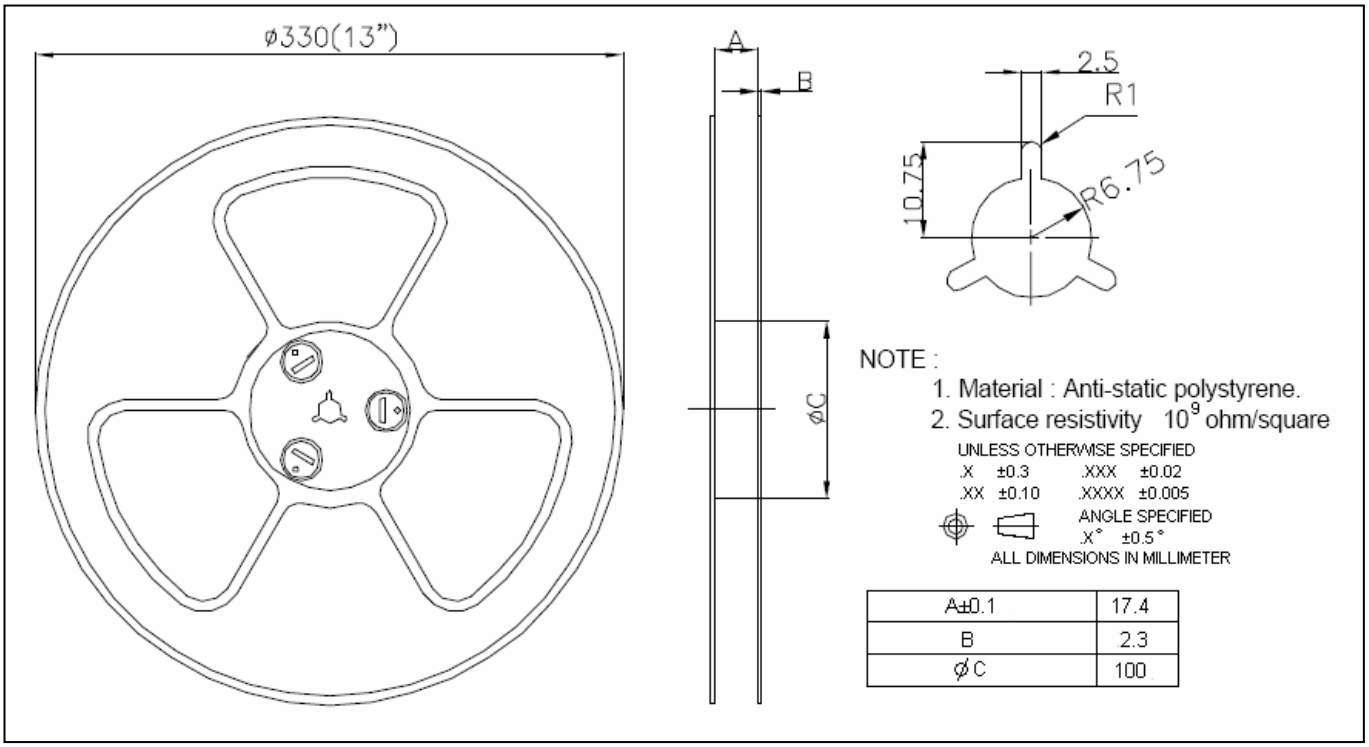






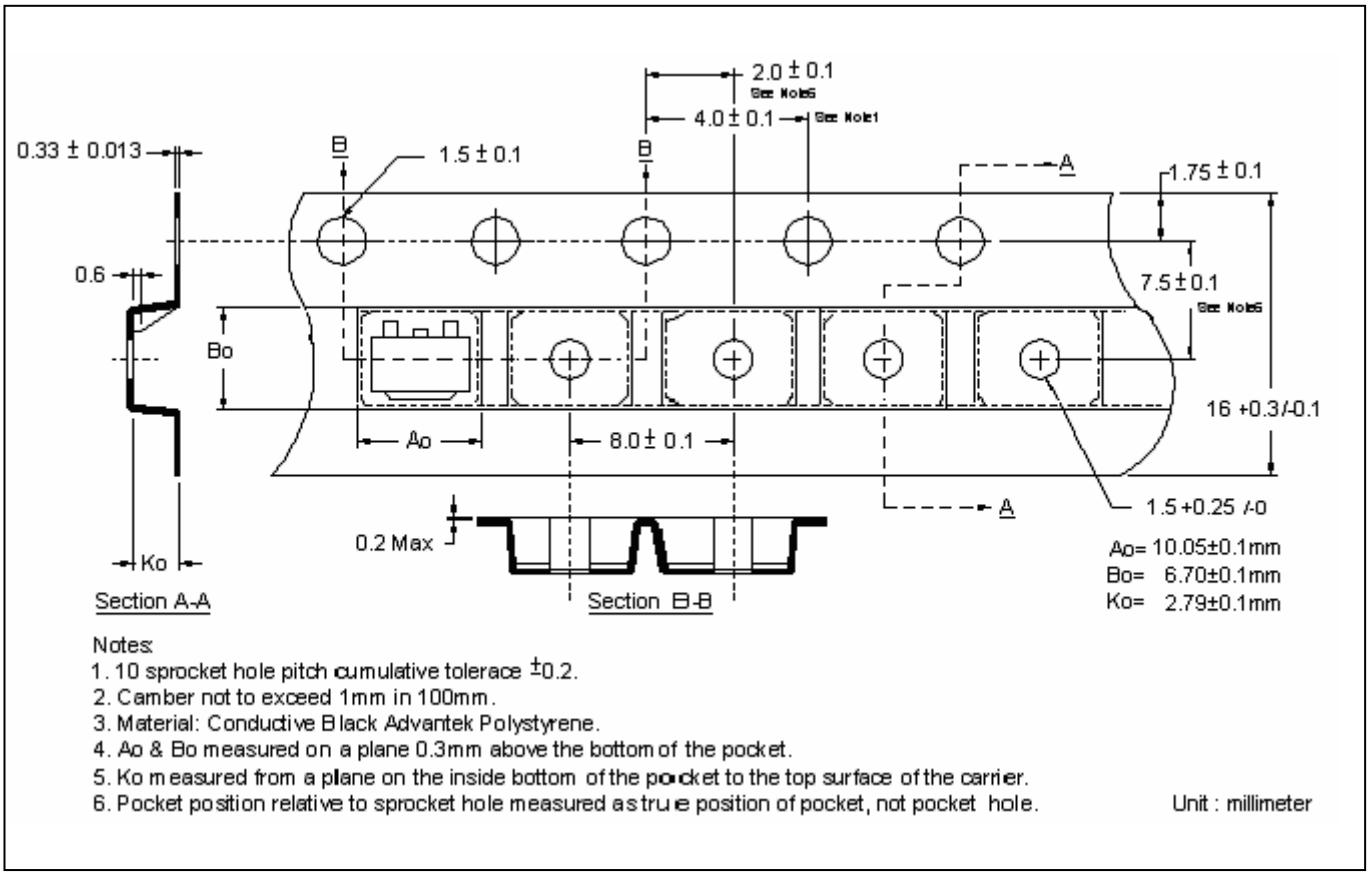


Reel Dimension



A±0.1	17.4
B	2.3
øC	100

Carrier Tape Dimension



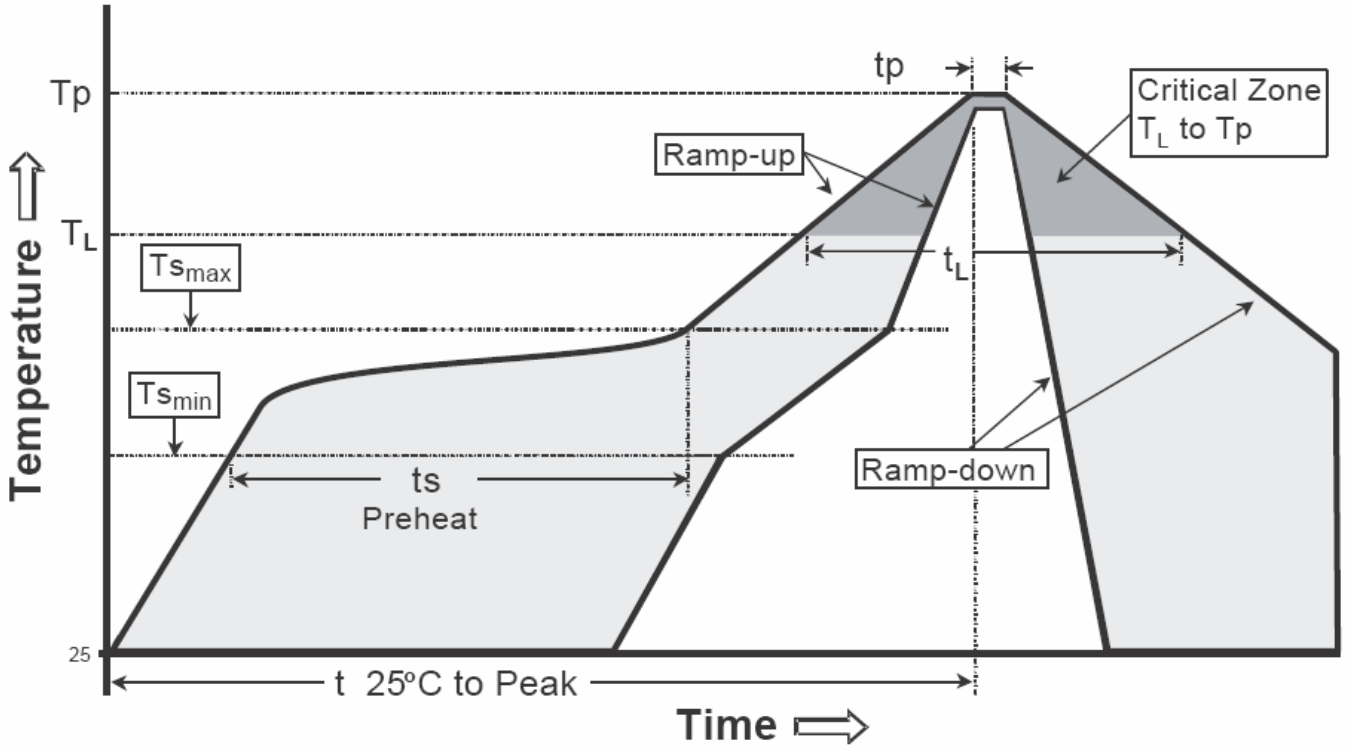
Notes:
1. 10 sprocket hole pitch cumulative tolerace ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: Conductive Black Advantek Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

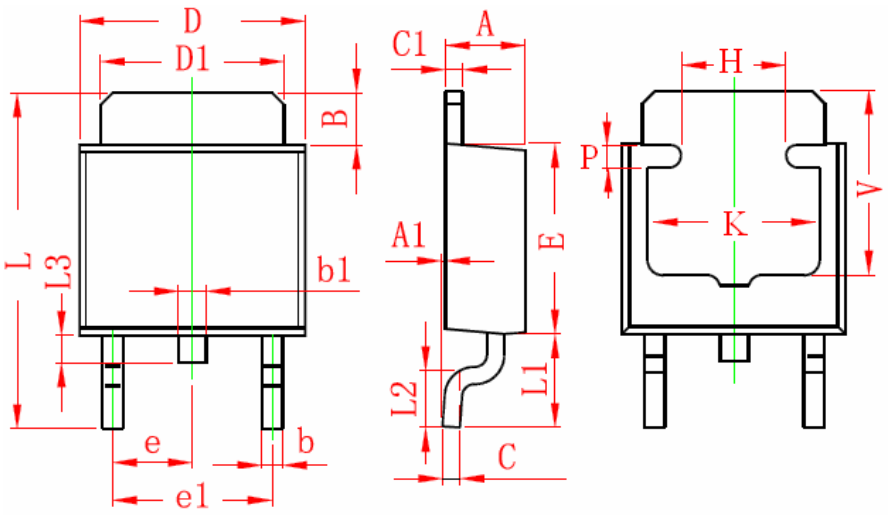
Recommended temperature profile for IR reflow

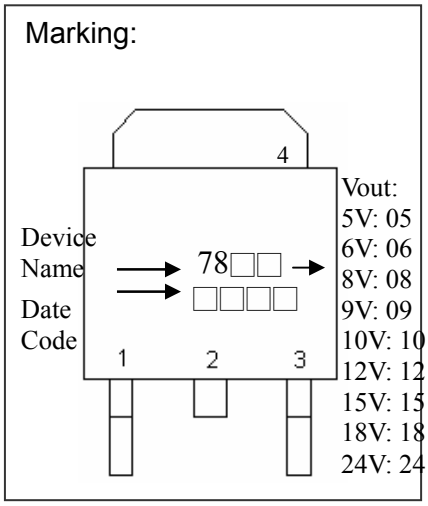


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

TO-252AB Dimension





3-Lead TO-252AB Plastic Surface Mount Package
CYStek Package Code: J3

Style: Pin 1.Vin 2.Ground 3.Vout
4.Ground

*: Typical

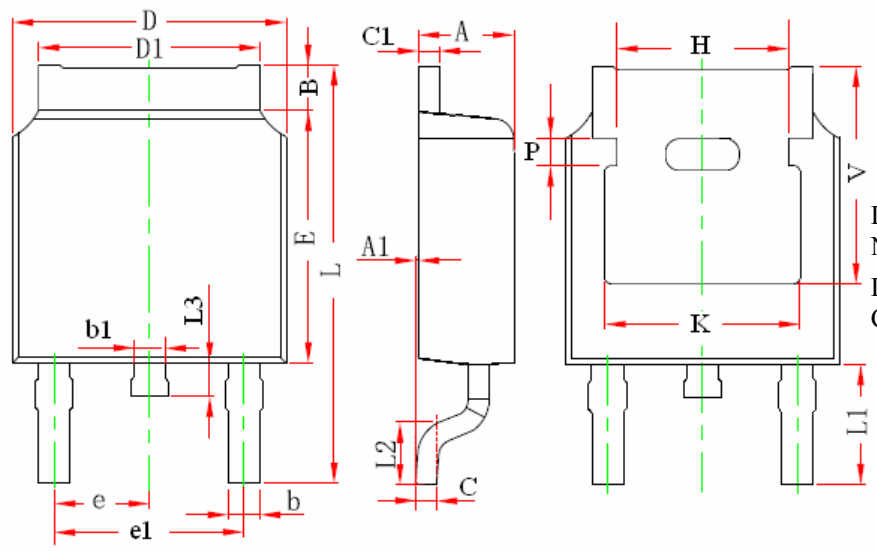
DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	e	*0.091		*2.300	
A1	0.000	0.005	0.000	0.127	e1	0.177	0.185	4.500	4.700
B	0.053	0.065	1.350	1.650	H	0.118 REF		3.000 REF	
b	0.020	0.028	0.500	0.700	K	0.197 REF		5.000 REF	
b1	0.028	0.035	0.700	0.900	L	0.374	0.390	9.500	9.900
C	0.017	0.023	0.430	0.580	L1	0.100	0.114	2.550	2.900
C1	0.017	0.023	0.430	0.580	L2	0.055	0.070	1.400	1.780
D	0.250	0.262	6.350	6.650	L3	0.024	0.035	0.600	0.900
D1	0.205	0.213	5.200	5.400	P	0.028 REF		0.700 REF	
E	0.213	0.224	5.400	5.700	V	0.209 REF		5.300 REF	

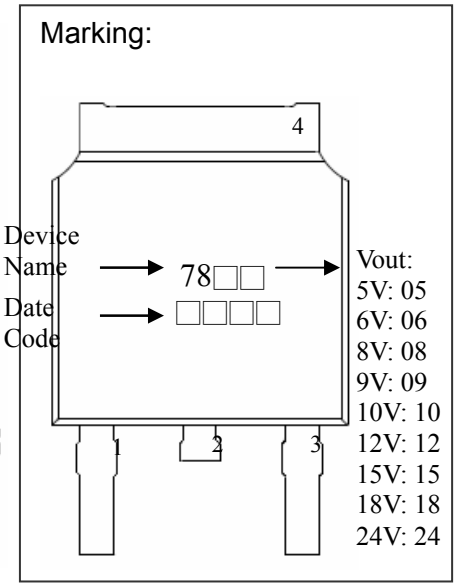
Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead : Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

TO-252AA Dimension





3-Lead TO-252AA Plastic Surface Mount Package
CYStek Package Code: J3

Style: Pin 1.Vin 2.Ground 3.Vout
4.Ground

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	e	0.086	0.094	2.186	2.386
A1	0.000	0.005	0.000	0.127	e1	0.172	0.188	4.372	4.772
B	0.039	0.048	0.990	1.210	H	0.163	REF	4.140	REF
b	0.026	0.034	0.660	0.860	K	0.190	REF	4.830	REF
b1	0.026	0.034	0.660	0.860	L	0.386	0.409	9.800	10.400
C	0.018	0.023	0.460	0.580	L1	0.114	REF	2.900	REF
C1	0.018	0.023	0.460	0.580	L2	0.055	0.067	1.400	1.700
D	0.256	0.264	6.500	6.700	L3	0.024	0.039	0.600	1.000
D1	0.201	0.215	5.100	5.460	P	0.026	REF	0.650	REF
E	0.236	0.244	6.000	6.200	V	0.211	REF	5.350	REF

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead : Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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