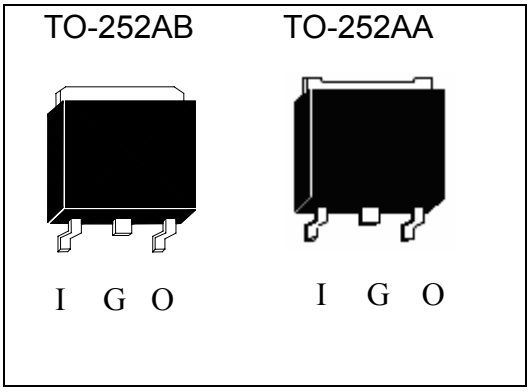
Three Terminal Medium Current Positive Voltage Regulators

LM78MXXJ3



Description

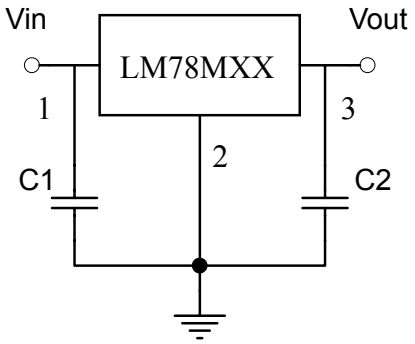
The LM78MXXJ3 series of three-terminal positive regulators are available in the TO-252 package and with 5V, 6V, 8V, 9V, 12V, 15V, 18V and 24V fixed output voltages, making them useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current-limiting ,thermal shut-down and safe operating area protection, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 500mA output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Absolute Maximum Ratings (Ta=25°C)

Parameter	Ratings	Unit
Input Voltage	35	V
Operating Temperature Range	-40 ~ +125	℃
Output Current	500	mA
Storage Temperature Range	-65 ~ +150	℃
Total Power Dissipation	1.0 (Note)	W

Note : Reduced by 8mW for each increase in Ta of 1℃ over 25℃(without heat sink)

Typical Application

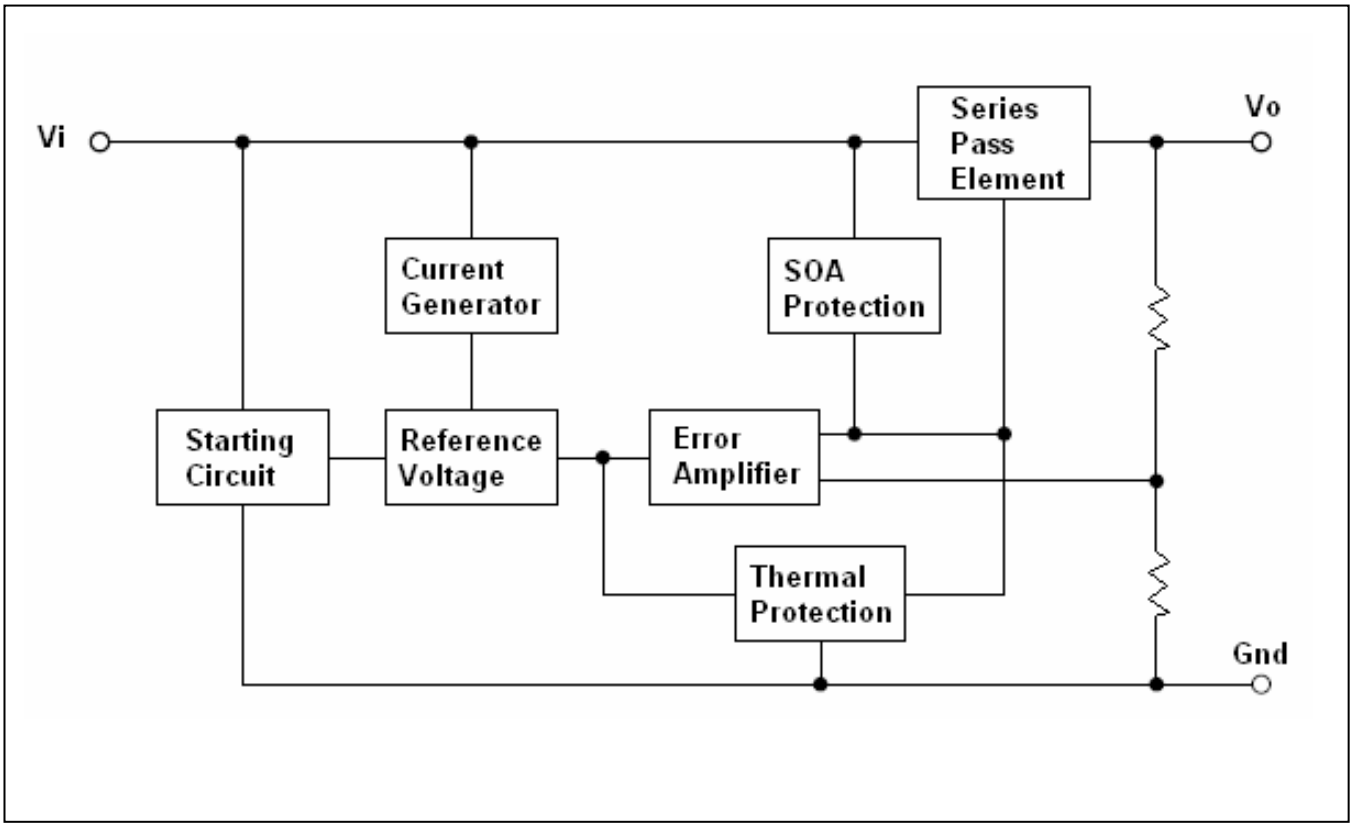


Note:
C1 and C2 are required if regulator is located far from power supply filter and load, or oscillation may induced on the loop.

Ordering Information

Device	Output Voltage Tolerance	Package	Shipping	Marking
LM78M05J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M05
LM78M06J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M06
LM78M08J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M08
LM78M09J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M09
LM78M12J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M12
LM78M15J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M15
LM78M18J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M18
LM78M24J3	±4%	TO-252 (Pb-free)	2500 pcs / Tape & Reel	78M24

Block Diagram



Electrical Characteristics

LM78M05 (Ta=25°C, Vin=10V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol	Parameter	Conditions	LM78M05			Units
			Min	Typ	Max	
Vo	Output Voltage		4.80	5.0	5.20	V
		5mA≤Io≤350mA 7.5V≤Vin≤20V	4.75	-	5.25	
ΔVo	Line Regulation	Io=200mA, 7V≤Vin≤25V	-	3	100	mV
		Io=200mA, 8V≤Vin≤12V	-	1	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	100	mV
		5mA≤Io≤200mA	-	12	50	
IQ	Quiescent Current	Io=0mA	-	3	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		8V≤Vin≤25V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	40	-	μV
RR	Ripple Rejection	8V≤Vin≤18V, Io=100mA, f=120Hz, e_{IN}=1Vrms	62	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=25V		400		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-1		mV/℃

LM78M06 (Ta=25°C, Vin=11V, Io=350mA, Cin=0.33uF, Cout=0.1uF,unless otherwise noted)

Symbol	Parameter	Conditions	LM78M06			Units
			Min	Typ	Max	
Vo	Output Voltage		5.76	6.0	6.24	V
		5mA≤Io≤350mA 8.5V≤Vin≤21V	5.70	-	6.30	
ΔVo	Line Regulation	Io=200mA, 8V≤Vin≤25V	-	3	100	mV
		Io=200mA, 9V≤Vin≤25V	-	1	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	120	mV
		5mA≤Io≤200mA	-	15	60	
IQ	Quiescent Current	Io=0mA	-	3	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		9V≤Vin≤25V,Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	60	-	μV
RR	Ripple Rejection	9V≤Vin≤19V, Io=100mA, f=120Hz, e_{IN}=1Vrms	60	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=25V		400		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.5		mV/℃

LM78M08 (Ta=25°C, Vin=14V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol	Parameter	Conditions	LM78M08			Units
			Min	Typ	Max	
Vo	Output Voltage		7.68	8.0	8.32	V
		5mA≤Io≤350mA 10.5V≤Vin≤23V	7.60	-	8.40	
ΔVo	Line Regulation	Io=200mA, 10.5V≤Vin≤25V	-	4	100	mV
		Io=200mA, 11V≤Vin≤25V	-	1	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	160	mV
		5mA≤Io≤200mA	-	15	80	
IQ	Quiescent Current	Io=0mA	-	3	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		10.5V≤Vin≤25V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	80	-	μV
RR	Ripple Rejection	11.5V≤Vin≤21.5V, Io=100mA, f=120Hz, e_{IN}=1Vrms	56	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=25V		400		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.5		mV/℃

LM78M09 (Ta=25°C, Vin=15V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol	Parameter	Conditions	LM78M09			Units
			Min	Typ	Max	
Vo	Output Voltage		8.64	9.0	9.36	V
		5mA≤Io≤350mA 11.5V≤Vin≤24V	8.55	-	9.45	
ΔVo	Line Regulation	Io=200mA, 11.5V≤Vin≤26V	-	4	100	mV
		Io=200mA, 12V≤Vin≤25V	-	2	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	180	mV
		5mA≤Io≤200mA	-	15	90	
IQ	Quiescent Current	Io=0mA	-	3.5	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		12V≤Vin≤25V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	90	-	μV
RR	Ripple Rejection	13V≤Vin≤23V, Io=100mA, f=120Hz, e_{IN}=1Vrms	56	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=30V		170		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.5		mV/℃

LM78M12 (Ta=25°C, Vin=19V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol	Parameter	Conditions	LM78M12			Units
			Min	Typ	Max	
Vo	Output Voltage		11.52	12.0	12.48	V
		5mA≤Io≤350mA 15V≤Vin≤27V	11.40	-	12.60	
ΔVo	Line Regulation	Io=200mA, 14.5V≤Vin≤30V	-	5	100	mV
		Io=200mA, 16V≤Vin≤30V	-	3	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	240	mV
		5mA≤Io≤200mA	-	15	120	
IQ	Quiescent Current	Io=0mA	-	3.5	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		14.5V≤Vin≤30V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	110	-	μV
RR	Ripple Rejection	15V≤Vin≤25V, Io=100mA, f=120Hz, e_{IN}=1Vrms	55	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=30V		170		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.5		mV/℃

LM78M15 (Ta=25°C, Vin=23V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

Symbol	Parameter	Conditions	LM78M15			Units
			Min	Typ	Max	
Vo	Output Voltage		14.40	15.0	15.60	V
		5mA≤Io≤350mA 17.5V≤Vin≤30V	14.25	-	15.75	
ΔVo	Line Regulation	Io=200mA, 17.5V≤Vin≤30V	-	6	100	mV
		Io=200mA, 20V≤Vin≤30V	-	3	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	300	mV
		5mA≤Io≤200mA	-	15	150	
IQ	Quiescent Current	Io=0mA	-	4.5	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		17.5V≤Vin≤30V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	130	-	μV
RR	Ripple Rejection	18.5V≤Vin≤28.5V, Io=100mA, f=120Hz, e_{IN}=1Vrms	54	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=30V		170		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.6		mV/℃

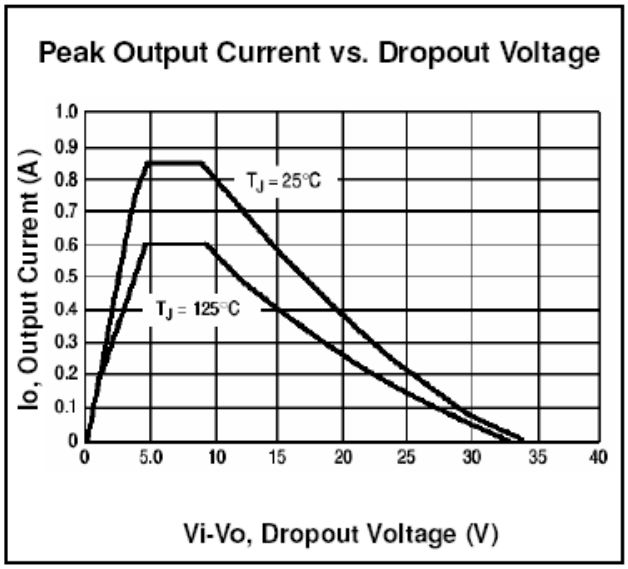
LM78M18 (Ta=25°C, Vin=27V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

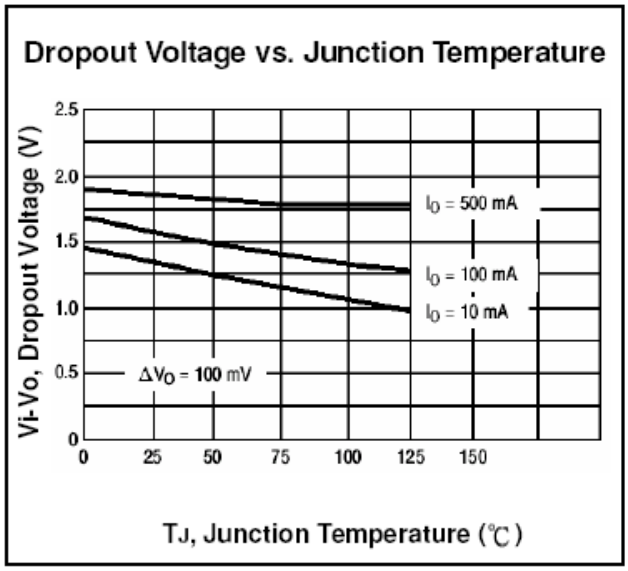
Symbol	Parameter	Conditions	LM78M18			Units
			Min	Typ	Max	
Vo	Output Voltage		17.28	18.0	18.72	V
		5mA≤Io≤350mA 21V≤Vin≤33V	17.10	-	18.90	
ΔVo	Line Regulation	Io=200mA, 21V≤Vin≤33V	-	7	100	mV
		Io=200mA, 24V≤Vin≤33V	-	3	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	360	mV
		5mA≤Io≤200mA	-	15	180	
IQ	Quiescent Current	Io=0mA	-	4.5	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		21V≤Vin≤33V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	140	-	μV
RR	Ripple Rejection	22V≤Vin≤32V, Io=100mA, f=120Hz, e_{IN}=1Vrms	53	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=30V		170		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.6		mV/℃

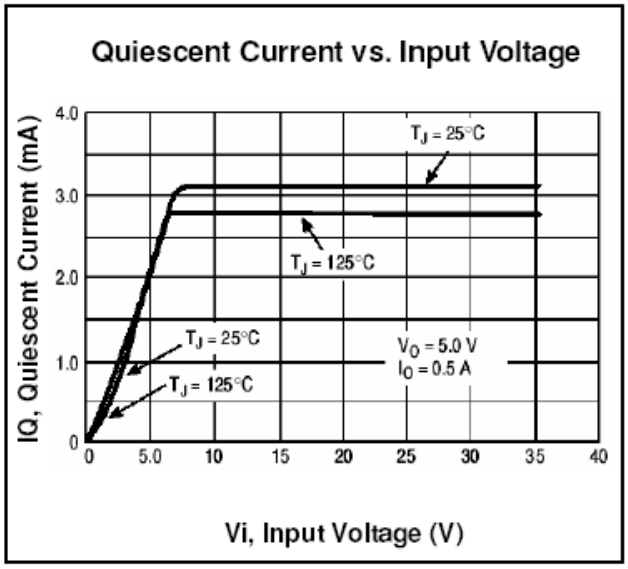
LM78M24 (Ta=25°C, Vin=33V, Io=350mA, Cin=0.33uF, Cout=0.1uF, unless otherwise noted)

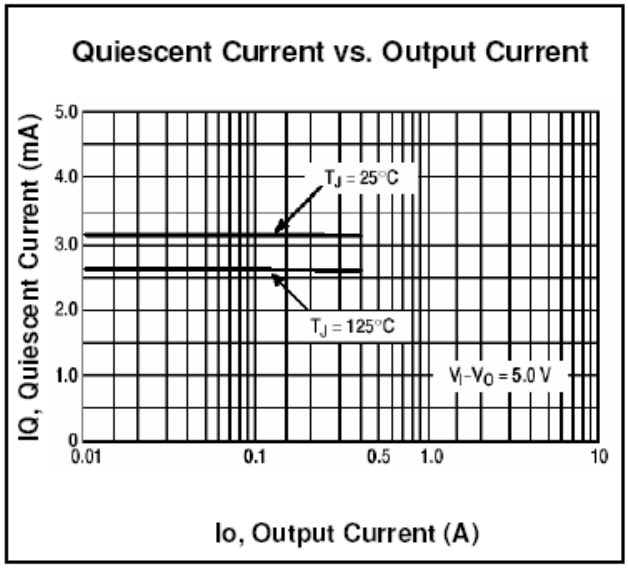
Symbol	Parameter	Conditions	LM78M24			Units
			Min	Typ	Max	
Vo	Output Voltage		23.04	24.0	24.96	V
		5mA≤Io≤350mA 27V≤Vin≤33V	22.80	-	25.20	
ΔVo	Line Regulation	Io=200mA, 27V≤Vin≤33V	-	10	100	mV
		Io=200mA, 28V≤Vin≤33V	-	5	50	
ΔVo	Load Regulation	5mA≤Io≤500mA	-	30	480	mV
		5mA≤Io≤200mA	-	15	240	
IQ	Quiescent Current	Io=0mA	-	4.8	6	mA
ΔIQ	Quiescent Current Change	5mA≤Io≤350mA	-	-	0.5	mA
		27V≤Vin≤33V, Io=200mA	-	-	0.8	
Vn	Output Noise Voltage	10Hz≤f≤100KHz	-	170	-	μV
RR	Ripple Rejection	28V≤Vin≤38V, Io=100mA, f=120Hz, e_{IN}=1Vrms	50	-	-	dB
VD	Dropout Voltage	Io=500mA	-	2	-	V
ISC	Output Short Circuit Current	Vin=30V		170		mA
IPK	Peak Output Current	Tj=25℃		700		mA
TCVo	Temperature Coefficient of Output Voltage	Io=5mA, 0≤Tj≤125℃		-0.7		mV/℃

Characteristic Curves

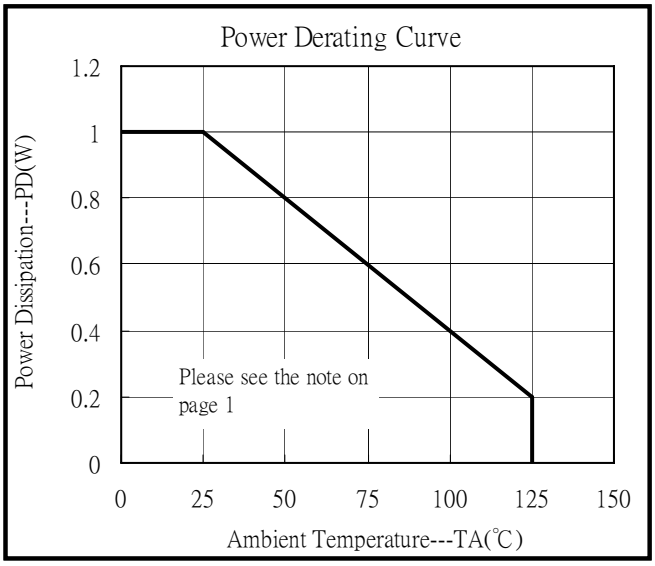








Characteristic Curves(Cont.)



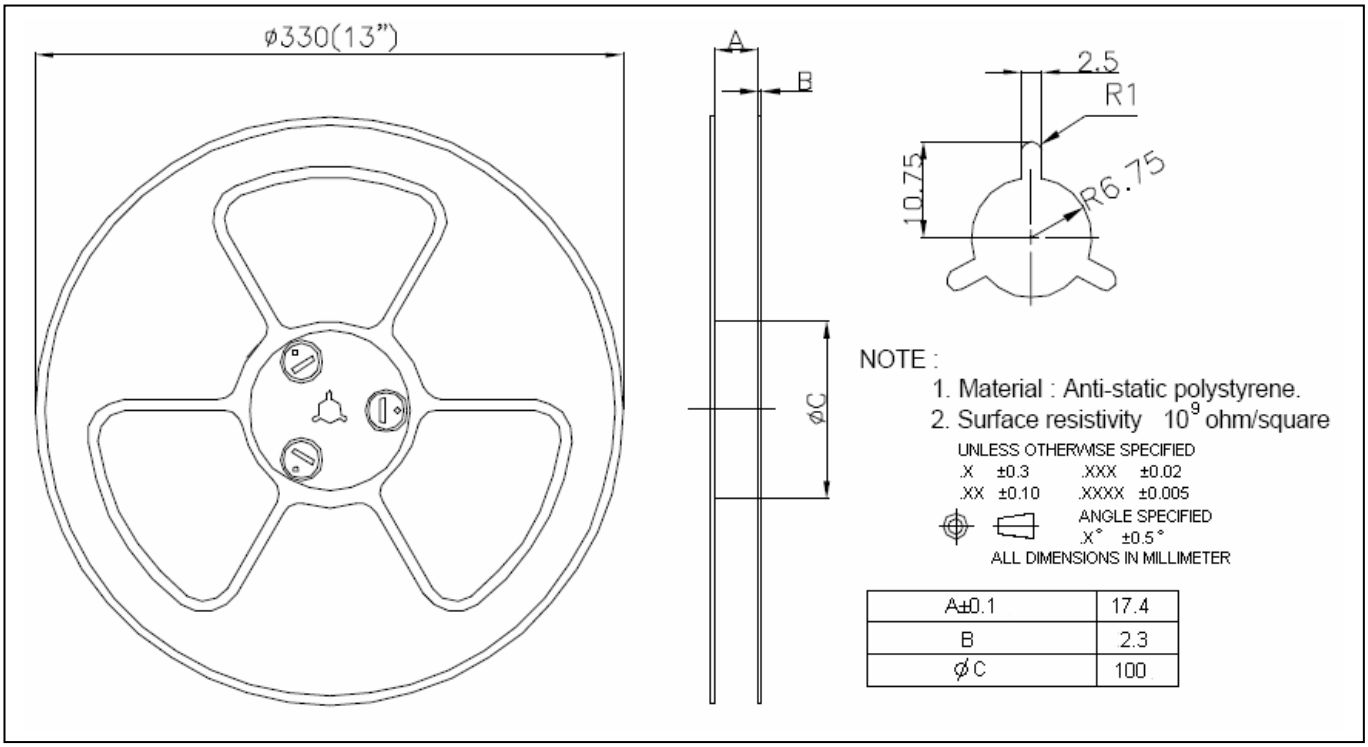
Moisture Sensitivity Level : conform to JEDEC level 3

Recommended Storage Condition:

Temperature : ≤ 30 °C

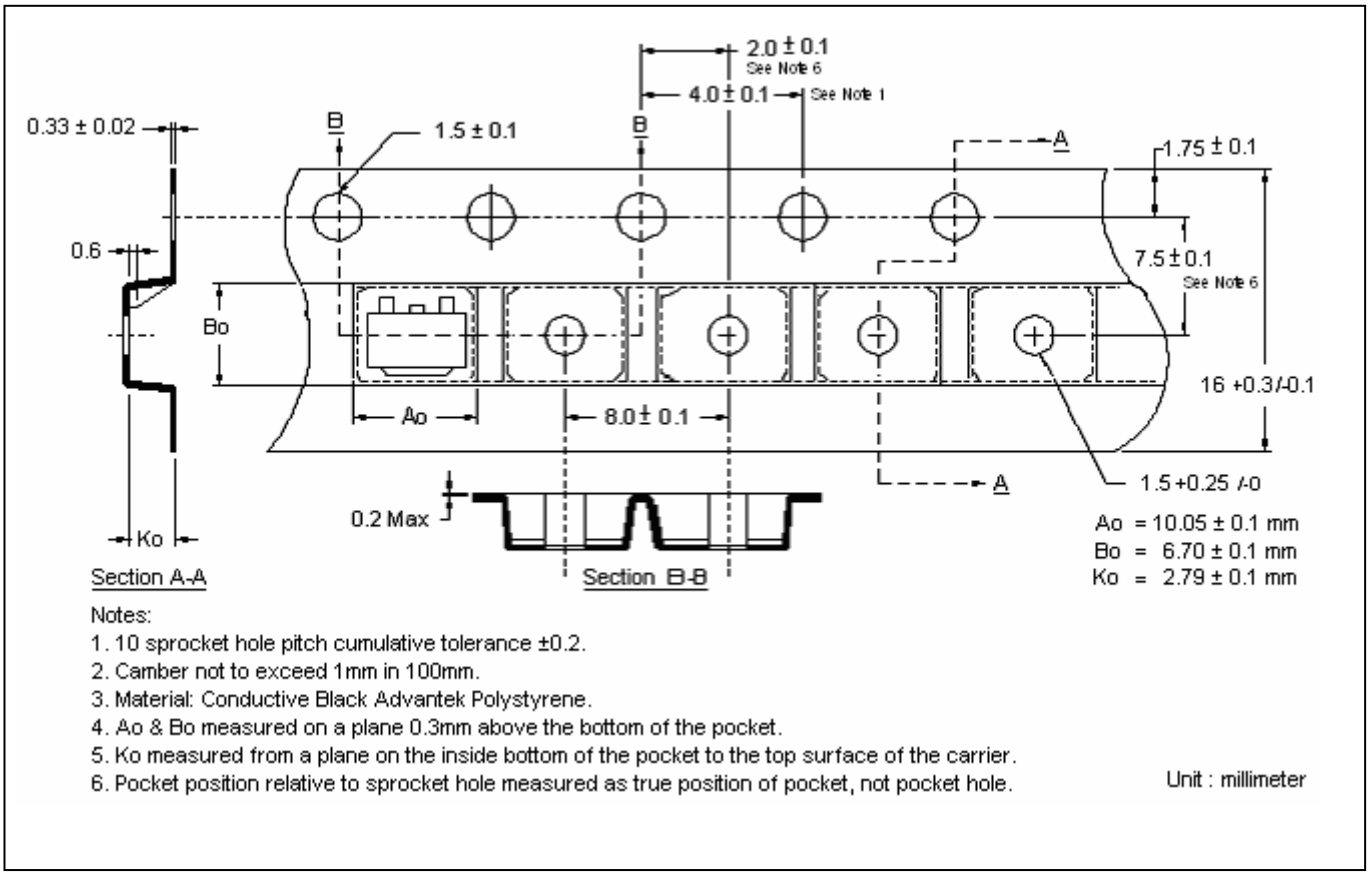
Humidity : ≤ 60% RH

Reel Dimension



A±0.1	17.4
B	2.3
øC	100

Carrier Tape Dimension



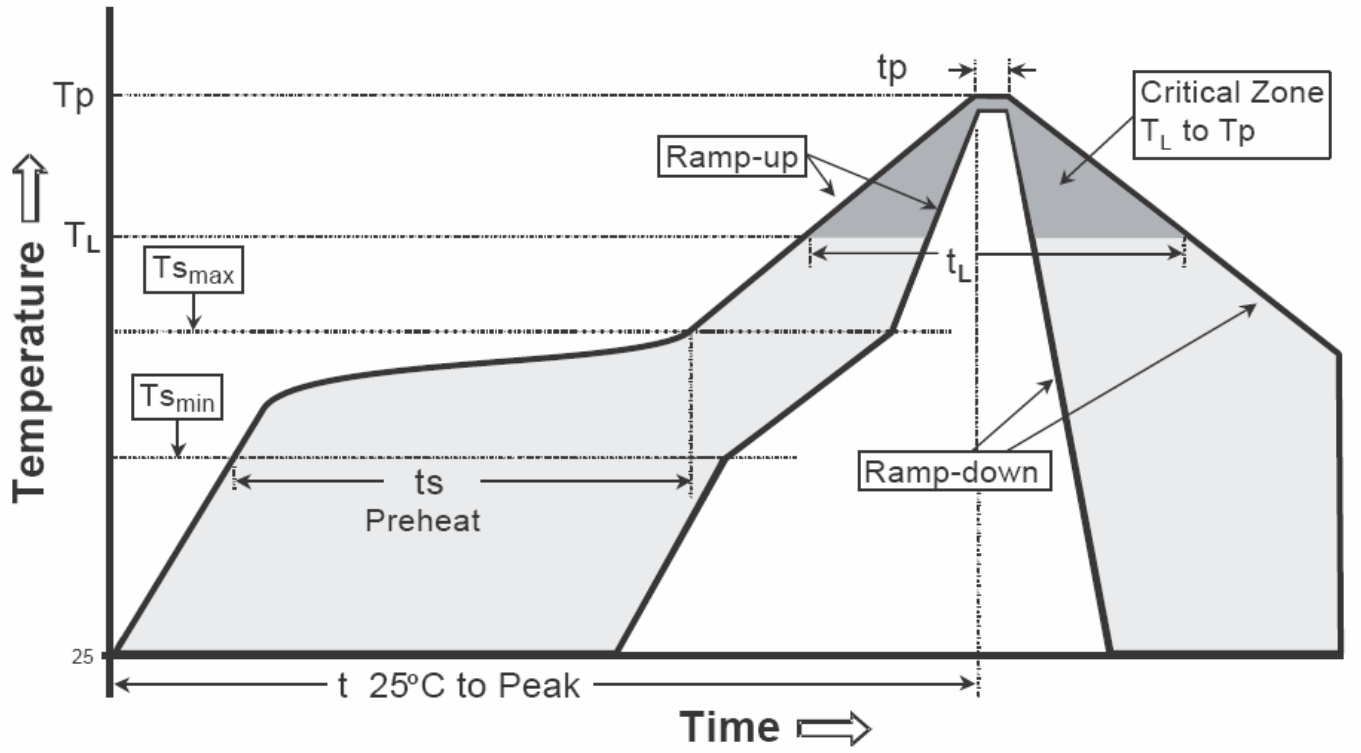
Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: Conductive Black Advantek Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface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

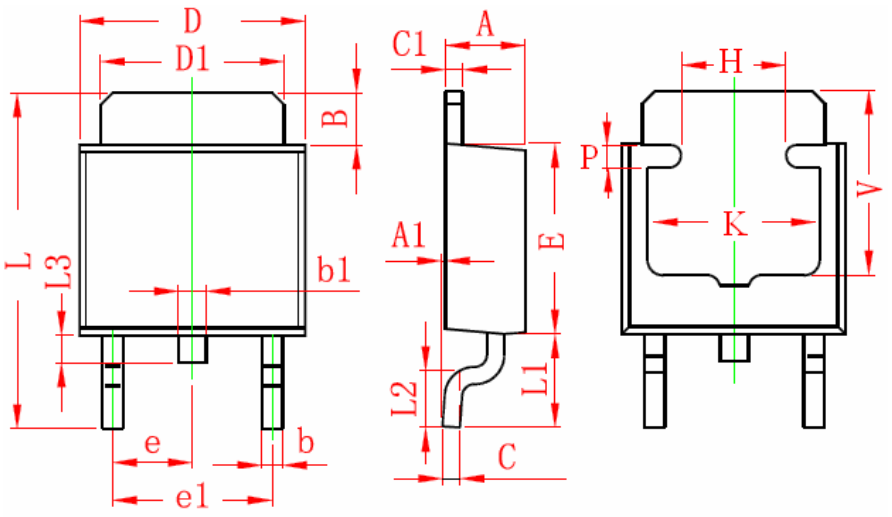
Recommended temperature profile for IR reflow

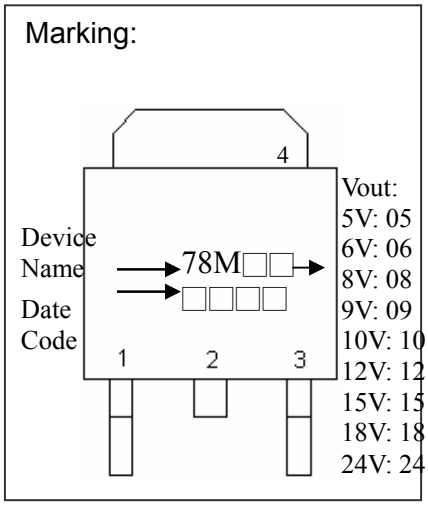


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (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

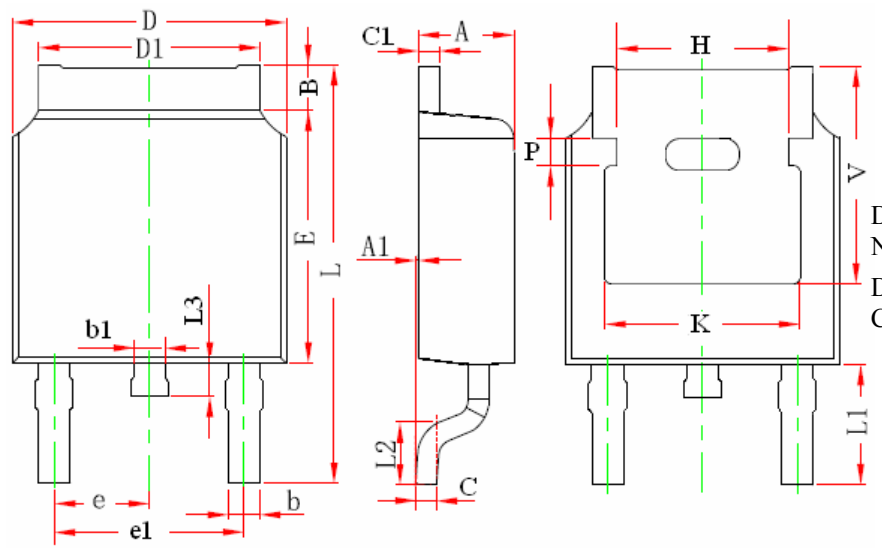
DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	e	*0.091		*2.300	
A1	0.000	0.005	0.000	0.127	e1	0.177	0.185	4.500	4.700
B	0.053	0.065	1.350	1.650	H	0.118 REF		3.000 REF	
b	0.020	0.028	0.500	0.700	K	0.197 REF		5.000 REF	
b1	0.028	0.035	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	

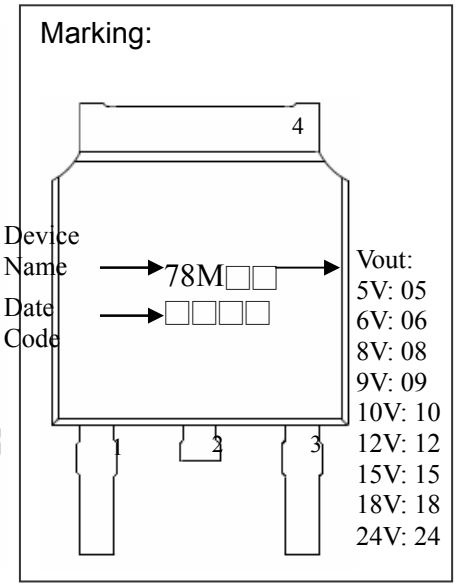
Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

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.Vin

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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