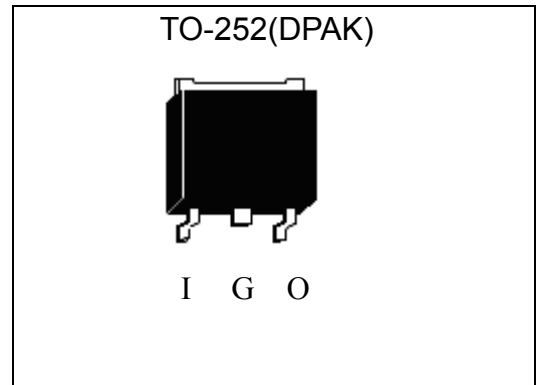


## Three Terminal Positive Voltage Regulators

# LM78XXJ3



### Description

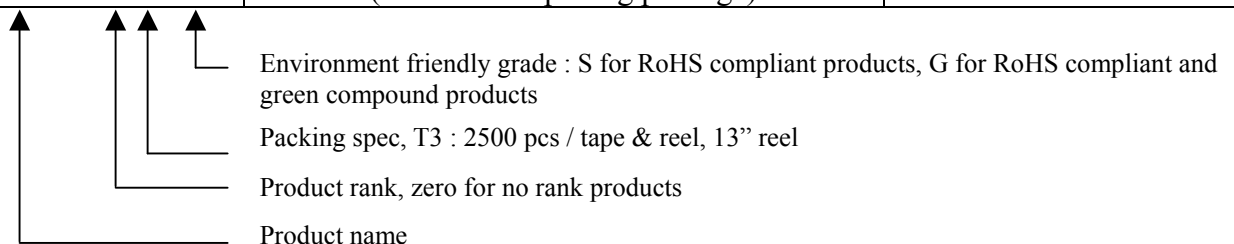
The LM78XXJ3 series of fixed voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single point regulation. Each of these regulators can deliver 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
- Pb-free lead plating package

### Ordering Information

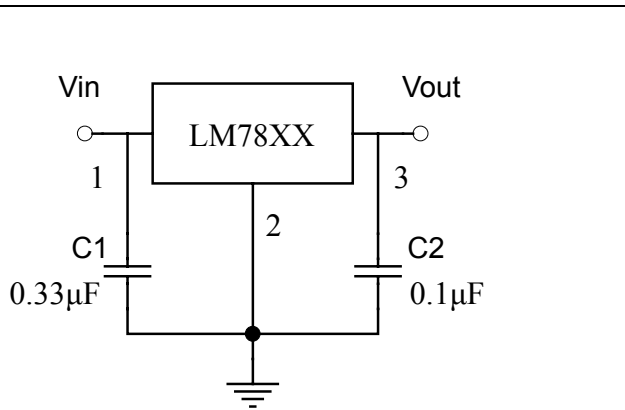
Device	Package	Shipping
LM78XXJ3-X-T3-X	TO-252 (Pb-free lead plating package)	2500 pcs / Tape & Reel



**Absolute Maximum Ratings (Ta=25°C)**

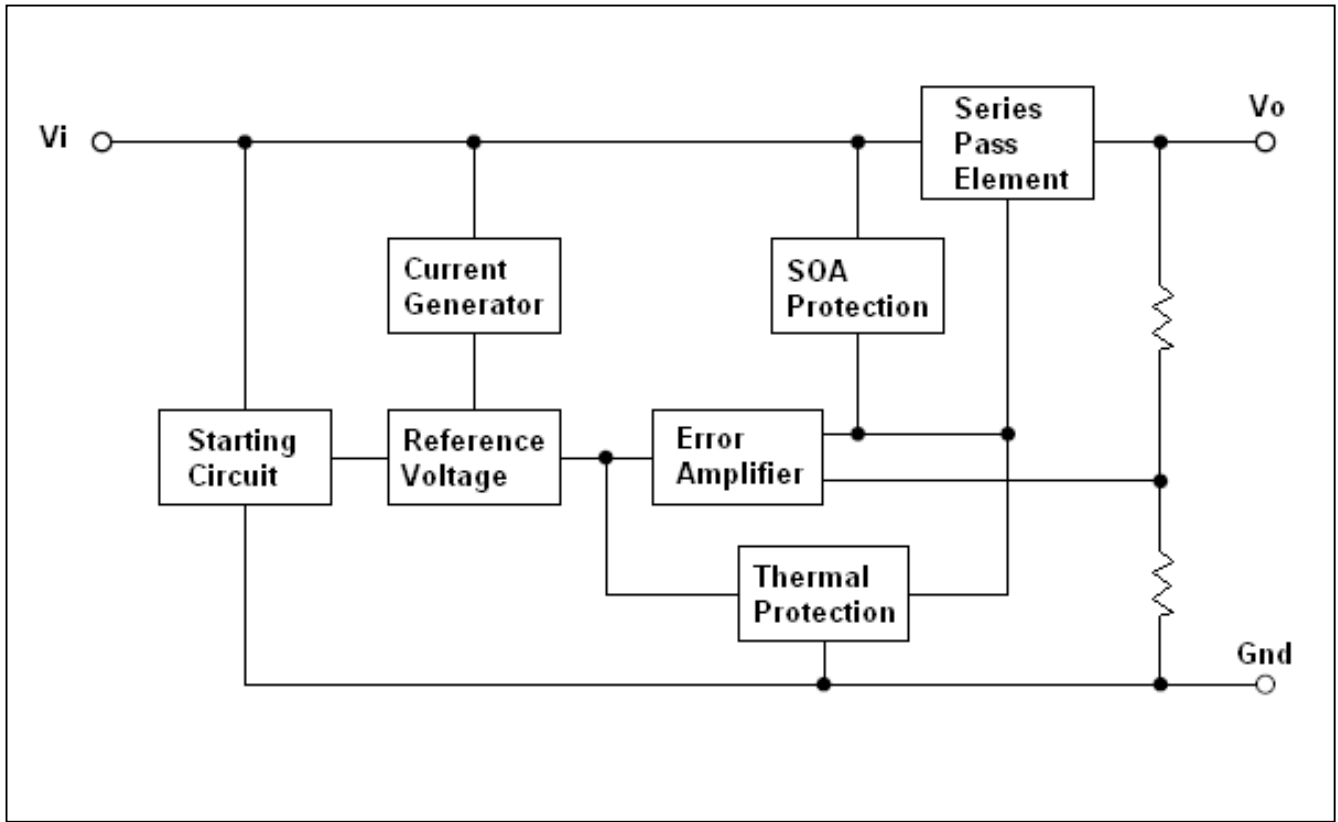
Parameter		Ratings	Unit
Input Voltage	LM7805~LM7818	35	V
	LM7824	40	
Output Current		1	A
Operating Junction Temperature Range		-40 ~ +125	°C
Storage Temperature Range		-55 ~ +125	°C
Thermal Resistance, Junction to Ambient (RθJA)		125	°C/W
Thermal Resistance, Junction to Case (RθJC)		12.5	°C/W

**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** ( $T_j=0\sim 125^{\circ}\text{C}$ ,  $V_{in}=10\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units
$V_o$	Output Voltage	4.85	5.0	5.15	$V_{in}=10\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$ $7.5\text{V}\leq V_{in}\leq 20\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $\text{PD}\leq 15\text{W}$	V
		4.75	-	5.25		
$\Delta V_o$	Line Regulation	-	3	50	$7\text{V}\leq V_{in}\leq 25\text{V}$ , $T_j=25^{\circ}\text{C}$	mV
		-	1	25	$8\text{V}\leq V_{in}\leq 12\text{V}$ , $T_j=25^{\circ}\text{C}$	
$\Delta V_o$	Load Regulation	-	-	100	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^{\circ}\text{C}$	mV
		-	-	50	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^{\circ}\text{C}$	
$I_Q$	Quiescent Current	-	-	8	$V_{in}=10\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$	mA
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA
		-	-	1.3	$7\text{V}\leq V_{in}\leq 25\text{V}$	
$V_n$	Output Noise Voltage	-	40	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^{\circ}\text{C}$	$\mu\text{V}$
RR	Ripple Rejection	-	80	-	$8\text{V}\leq V_{in}\leq 18\text{V}$ , $f=120\text{Hz}$ , $T_j=25^{\circ}\text{C}$	dB
VD	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^{\circ}\text{C}$	V
ISC	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^{\circ}\text{C}$	mA
IPK	Peak Output Current	-	1.8	-	$T_j=25^{\circ}\text{C}$	A
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-0.6	-	$I_o=5\text{mA}$ , $0^{\circ}\text{C}\leq T_j\leq 125^{\circ}\text{C}$	$\text{mV}/^{\circ}\text{C}$



**LM7806** ( $T_j=0\sim 125^\circ\text{C}$ ,  $V_{in}=11\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	5.82	6.0	6.18	$V_{in}=11\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$ $8\text{V}\leq V_{in}\leq 21\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		5.70	-	6.30		
$\Delta V_o$	Line Regulation	-	3	60	$8\text{V}\leq V_{in}\leq 25\text{V}$ , $T_j=25^\circ\text{C}$	mV	
		-	1	25	$9\text{V}\leq V_{in}\leq 13\text{V}$ , $T_j=25^\circ\text{C}$		
$\Delta V_o$	Load Regulation	-	-	100	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^\circ\text{C}$	mV	
		-	-	50	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^\circ\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=11\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.3	$8\text{V}\leq V_{in}\leq 25\text{V}$		
$V_n$	Output Noise Voltage	-	45	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^\circ\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	75	-	$9\text{V}\leq V_{in}\leq 19\text{V}$ , $f=120\text{Hz}$ , $T_j=25^\circ\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^\circ\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^\circ\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^\circ\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-0.7	-	$I_o=5\text{mA}$ , $0^\circ\text{C}\leq T_j\leq 125^\circ\text{C}$	$\text{mV}/^\circ\text{C}$	

**LM7808** ( $T_j=0\sim 125^\circ\text{C}$ ,  $V_{in}=14\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	7.76	8.0	8.24	$V_{in}=14\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$ $10.5\text{V}\leq V_{in}\leq 23\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		7.60	-	8.40		
$\Delta V_o$	Line Regulation	-	3	80	$10.5\text{V}\leq V_{in}\leq 25\text{V}$ , $T_j=25^\circ\text{C}$	mV	
		-	1	40	$11\text{V}\leq V_{in}\leq 17\text{V}$ , $T_j=25^\circ\text{C}$		
$\Delta V_o$	Load Regulation	-	-	100	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^\circ\text{C}$	mV	
		-	-	50	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^\circ\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=14\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.3	$10.5\text{V}\leq V_{in}\leq 25\text{V}$		
$V_n$	Output Noise Voltage	-	58	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^\circ\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	72	-	$11.5\text{V}\leq V_{in}\leq 21.5\text{V}$ , $f=120\text{Hz}$ , $T_j=25^\circ\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^\circ\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^\circ\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^\circ\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-0.9	-	$I_o=5\text{mA}$ , $0^\circ\text{C}\leq T_j\leq 125^\circ\text{C}$	$\text{mV}/^\circ\text{C}$	



**LM7809** ( $T_j=0\sim 125^{\circ}\text{C}$ ,  $V_{in}=15\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	8.73	9.0	9.27	$V_{in}=15\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$ $11.5\text{V}\leq V_{in}\leq 24\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		8.55	-	9.45		
$\Delta V_o$	Line Regulation	-	5	90	$11.5\text{V}\leq V_{in}\leq 25\text{V}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	3	45	$13\text{V}\leq V_{in}\leq 19\text{V}$ , $T_j=25^{\circ}\text{C}$		
$\Delta V_o$	Load Regulation	-	-	100	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	-	50	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^{\circ}\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=15\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.3	$11.5\text{V}\leq V_{in}\leq 26\text{V}$		
$V_n$	Output Noise Voltage	-	58	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^{\circ}\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	72	-	$12.5\text{V}\leq V_{in}\leq 22.5\text{V}$ , $f=120\text{Hz}$ , $T_j=25^{\circ}\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^{\circ}\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^{\circ}\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^{\circ}\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-1.1	-	$I_o=5\text{mA}$ , $0^{\circ}\text{C}\leq T_j\leq 125^{\circ}\text{C}$	$\text{mV}/^{\circ}\text{C}$	

**LM7810** ( $T_j=0\sim 125^{\circ}\text{C}$ ,  $V_{in}=16\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	9.70	10.0	10.30	$V_{in}=16\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$ $12.5\text{V}\leq V_{in}\leq 25\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		9.50	-	10.50		
$\Delta V_o$	Line Regulation	-	-	100	$13\text{V}\leq V_{in}\leq 25\text{V}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	-	50	$14\text{V}\leq V_{in}\leq 20\text{V}$ , $T_j=25^{\circ}\text{C}$		
$\Delta V_o$	Load Regulation	-	-	100	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	-	50	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^{\circ}\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=16\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.0	$12.5\text{V}\leq V_{in}\leq 25\text{V}$		
$V_n$	Output Noise Voltage	-	58	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^{\circ}\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	72	-	$13\text{V}\leq V_{in}\leq 23\text{V}$ , $f=120\text{Hz}$ , $T_j=25^{\circ}\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^{\circ}\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^{\circ}\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^{\circ}\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-1.1	-	$I_o=5\text{mA}$ , $0^{\circ}\text{C}\leq T_j\leq 125^{\circ}\text{C}$	$\text{mV}/^{\circ}\text{C}$	



**LM7812** ( $T_j=0\sim 125^{\circ}\text{C}$ ,  $V_{in}=19\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	11.64	12.0	12.36	$V_{in}=19\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$ $14.5\text{V}\leq V_{in}\leq 27\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		11.40	-	12.60		
$\Delta V_o$	Line Regulation	-	10	120	$14.5\text{V}\leq V_{in}\leq 30\text{V}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	3	60	$16\text{V}\leq V_{in}\leq 22\text{V}$ , $T_j=25^{\circ}\text{C}$		
$\Delta V_o$	Load Regulation	-	-	100	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	-	60	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^{\circ}\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=19\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.3	$14.5\text{V}\leq V_{in}\leq 30\text{V}$		
$V_n$	Output Noise Voltage	-	75	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^{\circ}\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	72	-	$15\text{V}\leq V_{in}\leq 25\text{V}$ , $f=120\text{Hz}$ , $T_j=25^{\circ}\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^{\circ}\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^{\circ}\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^{\circ}\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-1.5	-	$I_o=5\text{mA}$ , $0^{\circ}\text{C}\leq T_j\leq 125^{\circ}\text{C}$	$\text{mV}/^{\circ}\text{C}$	

**LM7815** ( $T_j=0\sim 125^{\circ}\text{C}$ ,  $V_{in}=23\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	14.55	15.0	15.45	$V_{in}=23\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$ $17.5\text{V}\leq V_{in}\leq 30\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		14.25	-	15.75		
$\Delta V_o$	Line Regulation	-	-	150	$17.5\text{V}\leq V_{in}\leq 30\text{V}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	-	75	$18.5\text{V}\leq V_{in}\leq 30\text{V}$ , $T_j=25^{\circ}\text{C}$		
$\Delta V_o$	Load Regulation	-	-	150	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^{\circ}\text{C}$	mV	
		-	-	75	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^{\circ}\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=23\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^{\circ}\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.3	$17.5\text{V}\leq V_{in}\leq 30\text{V}$		
$V_n$	Output Noise Voltage	-	90	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^{\circ}\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	70	-	$18.5\text{V}\leq V_{in}\leq 28.5\text{V}$ , $f=120\text{Hz}$ , $T_j=25^{\circ}\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^{\circ}\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^{\circ}\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^{\circ}\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-1.8	-	$I_o=5\text{mA}$ , $0^{\circ}\text{C}\leq T_j\leq 125^{\circ}\text{C}$	$\text{mV}/^{\circ}\text{C}$	



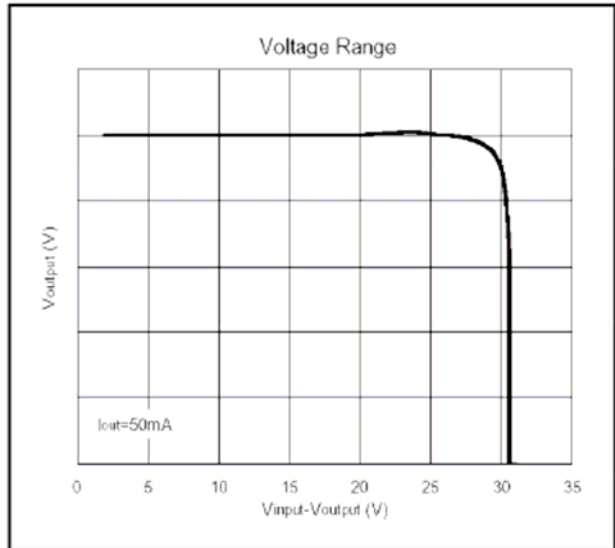
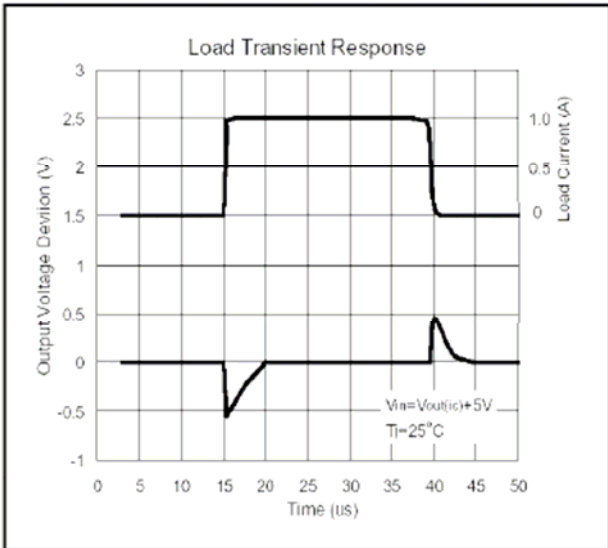
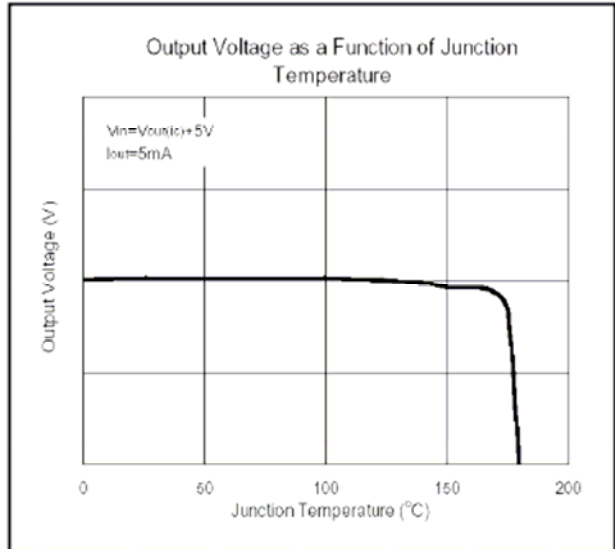
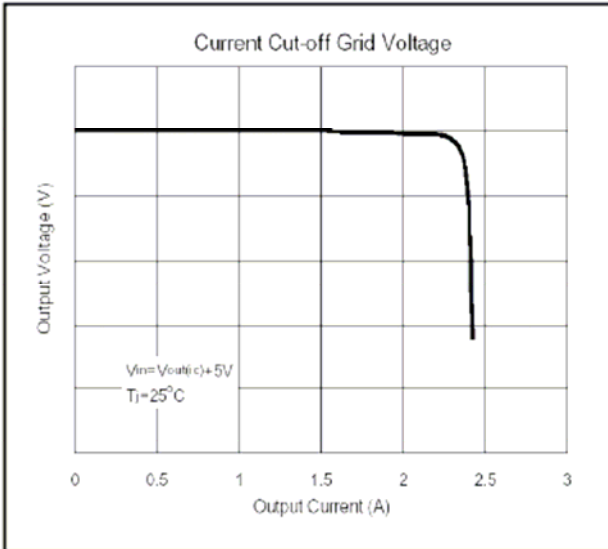
**LM7818** ( $T_j=0\sim 125^\circ\text{C}$ ,  $V_{in}=27\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	17.46	18.0	18.54	$V_{in}=27\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$ $21\text{V}\leq V_{in}\leq 33\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		17.10	-	18.90		
$\Delta V_o$	Line Regulation	-	-	180	$21\text{V}\leq V_{in}\leq 33\text{V}$ , $T_j=25^\circ\text{C}$	mV	
		-	-	90	$24\text{V}\leq V_{in}\leq 30\text{V}$ , $T_j=25^\circ\text{C}$		
$\Delta V_o$	Load Regulation	-	-	180	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^\circ\text{C}$	mV	
		-	-	90	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^\circ\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=27\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.0	$21\text{V}\leq V_{in}\leq 33\text{V}$		
$V_n$	Output Noise Voltage	-	110	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^\circ\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	69	-	$22\text{V}\leq V_{in}\leq 32\text{V}$ , $f=120\text{Hz}$ , $T_j=25^\circ\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^\circ\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^\circ\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^\circ\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-2.2	-	$I_o=5\text{mA}$ , $0^\circ\text{C}\leq T_j\leq 125^\circ\text{C}$	$\text{mV}/^\circ\text{C}$	

**LM7824** ( $T_j=0\sim 125^\circ\text{C}$ ,  $V_{in}=33\text{V}$ ,  $I_o=500\text{mA}$ ,  $C_{in}=0.33\mu\text{F}$ ,  $C_{out}=0.1\mu\text{F}$ , unless otherwise noted)

Symbol	Parameter	Min	Typ	Max	Conditions	Units	
$V_o$	A-rank(3%)	Output Voltage	23.28	24.0	24.72	$V_{in}=33\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$ $27\text{V}\leq V_{in}\leq 38\text{V}$ , $5\text{mA}\leq I_o\leq 1\text{A}$ , $PD\leq 15\text{W}$	V
	B-rank(5%)		22.80	-	25.20		
$\Delta V_o$	Line Regulation	-	-	240	$27\text{V}\leq V_{in}\leq 38\text{V}$ , $T_j=25^\circ\text{C}$	mV	
		-	-	120	$30\text{V}\leq V_{in}\leq 36\text{V}$ , $T_j=25^\circ\text{C}$		
$\Delta V_o$	Load Regulation	-	-	240	$5\text{mA}\leq I_o\leq 1\text{A}$ , $T_j=25^\circ\text{C}$	mV	
		-	-	120	$250\text{mA}\leq I_o\leq 750\text{mA}$ , $T_j=25^\circ\text{C}$		
$I_Q$	Quiescent Current	-	-	8	$V_{in}=33\text{V}$ , $I_o=500\text{mA}$ , $T_j=25^\circ\text{C}$	mA	
$\Delta I_Q$	Quiescent Current Change	-	-	0.5	$5\text{mA}\leq I_o\leq 1\text{A}$	mA	
		-	-	1.0	$28\text{V}\leq V_{in}\leq 38\text{V}$		
$V_n$	Output Noise Voltage	-	170	-	$10\text{Hz}\leq f\leq 100\text{KHz}$ , $T_j=25^\circ\text{C}$	$\mu\text{V}$	
$RR$	Ripple Rejection	-	66	-	$28\text{V}\leq V_{in}\leq 38\text{V}$ , $f=120\text{Hz}$ , $T_j=25^\circ\text{C}$	dB	
$VD$	Dropout Voltage	-	2	-	$I_o=1\text{A}$ , $T_j=25^\circ\text{C}$	V	
$ISC$	Output Short Circuit Current	-	250	-	$V_{in}=35\text{V}$ , $T_j=25^\circ\text{C}$	mA	
$IPK$	Peak Output Current	-	1.8	-	$T_j=25^\circ\text{C}$	A	
$\Delta V_o/\Delta T_j$	Temperature Stability	-	-2.8	-	$I_o=5\text{mA}$ , $0^\circ\text{C}\leq T_j\leq 125^\circ\text{C}$	$\text{mV}/^\circ\text{C}$	

**Characteristic Curves**



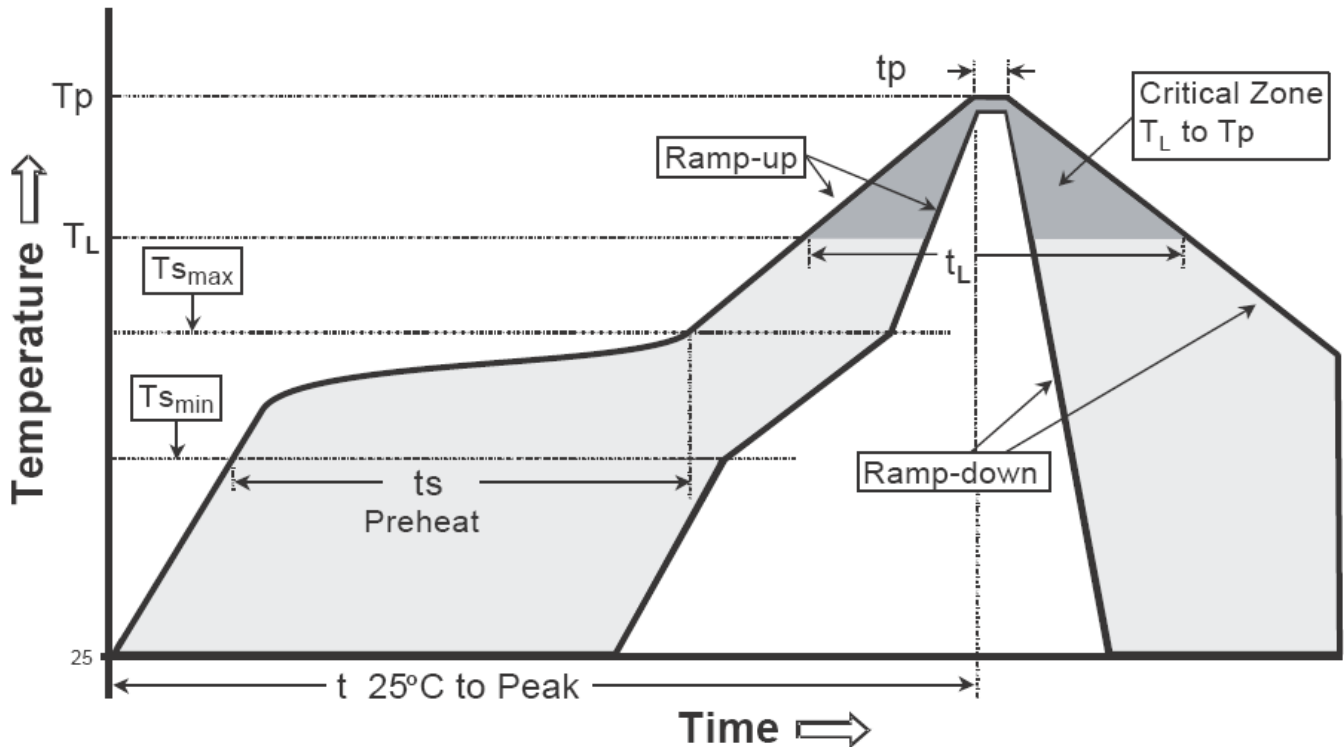




**Recommended wave soldering condition**

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 (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak Temperature(T <sub>P</sub> )	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-252(DPAK) Dimension**

The diagram shows three views of the TO-252(DPAK) package: a top view with dimensions D, D1, B, E, L, b1, L3, e, e1, b; a side view with dimensions C1, A, A1, L2, C; and a front view with dimensions H, K, V, L1. A marking diagram shows a 4-pin package with pins 1, 2, 3, and 4. Pin 1 is labeled 'Device Name' with a '78' followed by two empty boxes. Pin 2 is labeled 'Date Code' with three empty boxes. Pin 3 is labeled 'Vout' with a list of voltage options: 5V: 05, 6V: 06, 8V: 08, 9V: 09, 10V: 10, 12V: 12, 15V: 15, 18V: 18, 24V: 24. Pin 4 is labeled 'Ground'.

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

Date Code :  
 1<sup>st</sup> code : year code, 1→ 2011, 2→2012, ...,etc  
 2<sup>nd</sup> code : month code, referring to the following table  
 3<sup>rd</sup> and 4<sup>th</sup> codes : production lot serial number : 01, 02, 03,...,etc.

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

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	A	B	C	D	E	F	G	H	J	K	L	M

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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