

# POSITIVE VOLTAGE REGULATOR

**IL78xx**

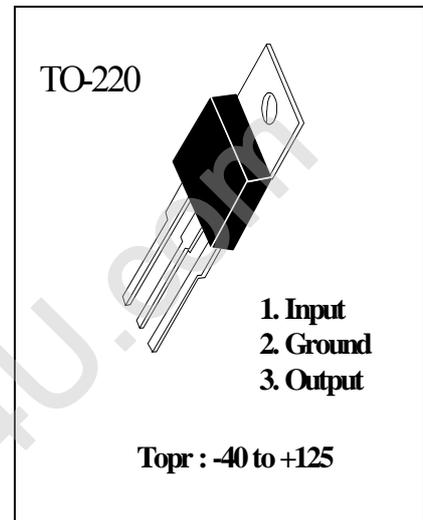
## 3- TERMINAL 1A POSITIVE VOLTAGE REGULATORS

The IL78xx series of three-terminal positive regulators are available in the TO-220 package and with several fixed output voltage, marking them useful in a wide range of applications.

These applications include on-card regulation for elimination of noise and distribution problems associated with single point regulation with single point regulation. In addition, they can be used with power pass elements to make high current voltage regulators.

If adequate heat sinking is provided, each of these regulator can deliver over 1A of output current.

Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.



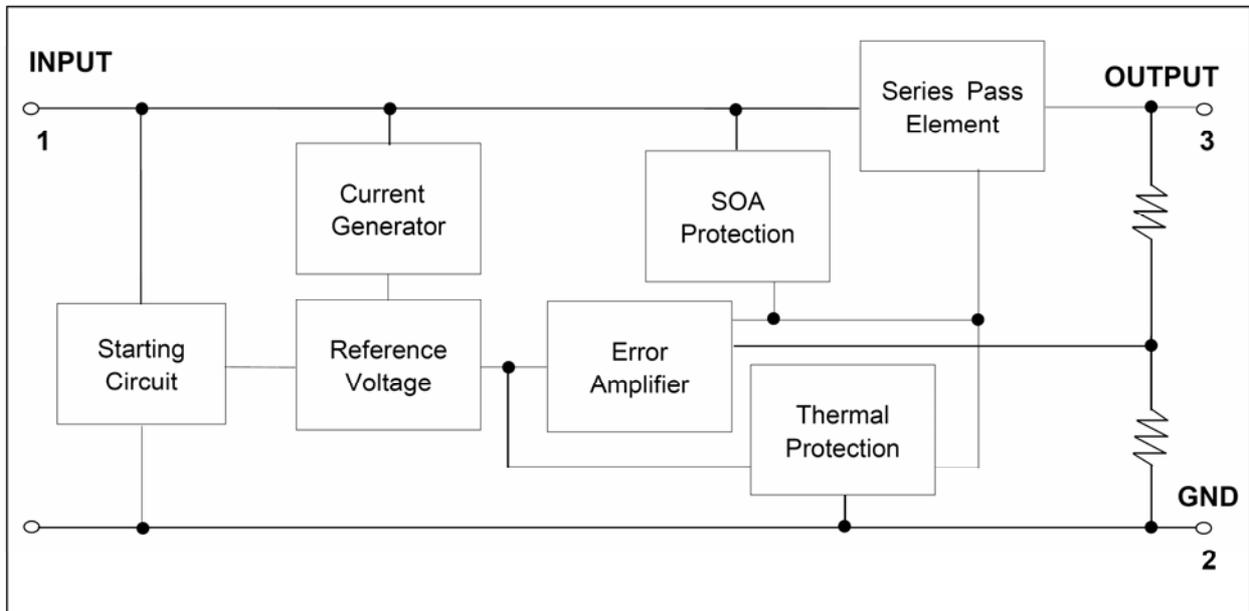
### FEATURES

- ◇ Output current up to 1A
- ◇ No external components required
- ◇ Internal short circuit current limiting
- ◇ Internal thermal overload protection
- ◇ Output transistor safe-area compensation
- ◇ Output voltage offered in 4% tolerance

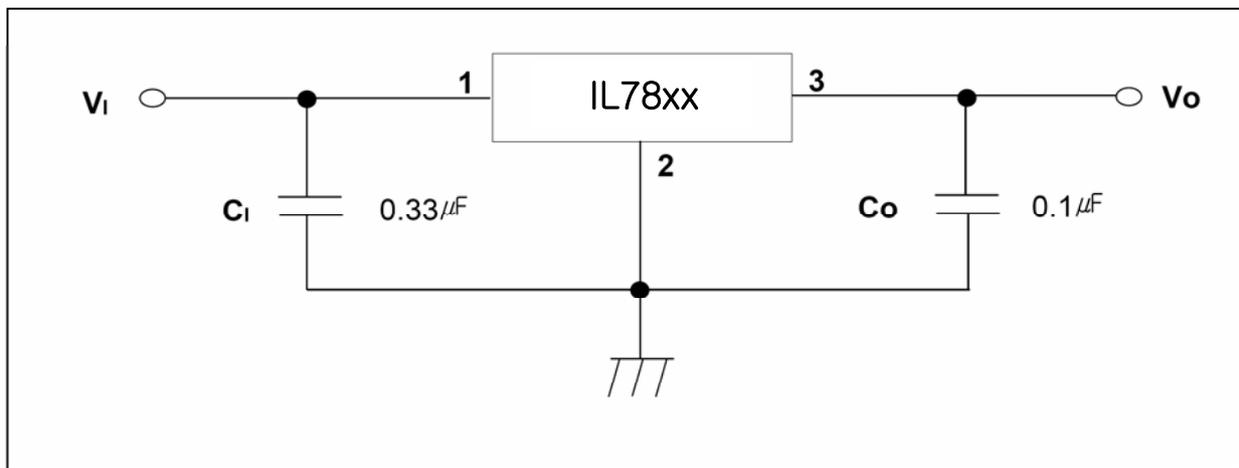
### ABSOLUTE MAXIMUM RATINGS

Characteristics		Symbol	Value	Unit
Input Voltage	IL7805 ~ IL7818	VI	35	v
	IL7824	VI	40	
Operating junction temperature		Topr	-40 ~ +125	° C
Power Dissipation (Tc=25° C)		PD	20	W
Power Dissipation (Without Heatsink)		PD	1.2	W
Operating temperature		Topr	-40 ~ +125	° C
Storage temperature		Tstg	-60 ~ +150	° C

1. BLOCK DIAGRAM



2. TYPICAL APPLICATIONS



Notes :

- (1) To specify an output voltage, substitute voltage value for "XX"
- (2)  $C_i$  is required if regulator is located in appreciable distance from power supply filter.
- (3)  $C_o$  improves stability and transient response.

**IL7805 ELECTRICAL CHARACTERISTICS**

 (Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 10V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	4.8	5.0	5.2	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 7V$ to $20V$ $V_i = 8V$ to $20V$	4.75	5.0	5.25		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 7V$ to $25V$		4.0	100	mV
			$V_i = 8V$ to $12V$		1.6	50	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		9	100	
			$I_o = 250mA$ to $750mA$		4	50	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$		0.03	0.5	mA
			$V_i = 7V$ to $25V$		0.3	1.3	
			$V_i = 8V$ to $25V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-0.8		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		42		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 8V$ to $18V$	62	73		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		15		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		230		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**IL7806 ELECTRICAL CHARACTERISTICS**

 (Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 11V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	5.75	6.0	6.25	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 8V$ to $21V$ $V_i = 9V$ to $21V$	5.7	6.0	6.3		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 8V$ to $25V$		5	120	mV
			$V_i = 9V$ to $13V$		1.5	60	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		9	120	
			$I_o = 250mA$ to $750mA$		3	60	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$			0.5	mA
			$V_i = 8V$ to $25V$			1.3	
			$V_i = 9V$ to $25V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-0.8		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		45		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 9V$ to $19V$	59	75		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		19		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		250		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**IL7808 ELECTRICAL CHARACTERISTICS**

 (Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 14V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
Output Voltage	$V_o$	$T_j = 25^\circ C$	7.7	8.0	8.3	V
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 10.5V$ to $23V$ $V_i = 11.5V$ to $23V$	7.6	8.0	8.4	
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 10.5V$ to $25V$	5.0	160	mV
			$V_i = 11.5V$ to $17V$	2.0	80	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$	10	160	
			$I_o = 250mA$ to $750mA$	5	80	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5	8	mA
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$	0.05	0.5	mA
			$V_i = 10.5V$ to $25V$	0.5	1.0	
			$V_i = 11.5V$ to $25V$			
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-0.8		mV/ $^\circ C$
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		52		$\mu V$
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 11.5V$ to $21.5V$	56	73		dB
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A
Output Resistance	$R_o$	$f = 1KHz$		17		$M\Omega$
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		230		mA

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**IL7809 ELECTRICAL CHARACTERISTICS**

 (Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 15V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	8.65	9.0	9.35	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 11.5V$ to $24V$ $V_i = 12.5V$ to $24V$	8.6	9.0	9.4		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 11.5V$ to $25V$		6.0	180	mV
			$V_i = 12V$ to $25V$		2	90	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		12	180	
			$I_o = 250mA$ to $750mA$		4	90	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5.0	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$			0.5	mA
			$V_i = 11.5V$ to $26V$			1.3	
			$V_i = 12.5V$ to $26V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-1		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		58		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 13V$ to $23V$	56	71		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		17		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		250		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**IL7810 ELECTRICAL CHARACTERISTICS**

(Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_I = 16V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	9.6	10.0	10.4	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_I = 12.5V$ to $25V$ $V_I = 13.5V$ to $25V$	9.5	10.0	10.5		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_I = 12.5V$ to $25V$		10	200	mV
			$V_I = 13V$ to $25V$		3	100	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		12	200	
			$I_o = 250mA$ to $750mA$		4	400	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5.1	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$			0.5	mA
			$V_I = 12.5V$ to $29V$			1	
			$V_I = 13.5V$ to $29V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-1		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		58		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_I = 13V$ to $23V$	56	71		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		17		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		250		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

## IL7812 ELECTRICAL CHARACTERISTICS

(Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 19V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	11.5	12	12.5	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 14.5V$ to $27V$ $V_i = 15.5V$ to $27V$	11.4	12	12.6		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 14.5V$ to $30V$		10	240	mV
			$V_i = 16V$ to $22V$		3	120	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		11	240	
			$I_o = 250mA$ to $750mA$		5	120	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5.1	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$		0.1	0.5	mA
			$V_i = 14.5V$ to $30V$		0.5	1.0	
			$V_i = 15V$ to $30V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-1		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		76		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 15V$ to $25V$	55	71		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		17		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		230		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**IL7815 ELECTRICAL CHARACTERISTICS**

 (Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_I = 23V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	14.4	15	15.6	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_I = 17.5V$ to $30V$ $V_I = 18.5V$ to $30V$	14.25	15	15.75		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_I = 17.5V$ to $30V$		11	300	mV
			$V_I = 20V$ to $26V$		3	150	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		12	300	
			$I_o = 250mA$ to $750mA$		4	150	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5.2	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$			0.5	mA
			$V_I = 17.5V$ to $30V$			1.0	
			$V_I = 18.5V$ to $30V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-1		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		90		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_I = 18.5V$ to $28.5V$	54	70		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		19		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		250		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

## IL7818 ELECTRICAL CHARACTERISTICS

(Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 27V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	17.3	18	18.7	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 21V$ to $33V$ $V_i = 22V$ to $33V$	17.1	18	18.9		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 21V$ to $33V$		15	360	mV
			$V_i = 24V$ to $30V$		5	180	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		15	360	
			$I_o = 250mA$ to $750mA$		5	180	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5.2	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$			0.5	mA
			$V_i = 21V$ to $33V$			1.0	
			$V_i = 22V$ to $33V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-1		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		110		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 22V$ to $32V$	53	69		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		22		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		250		mA	

\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

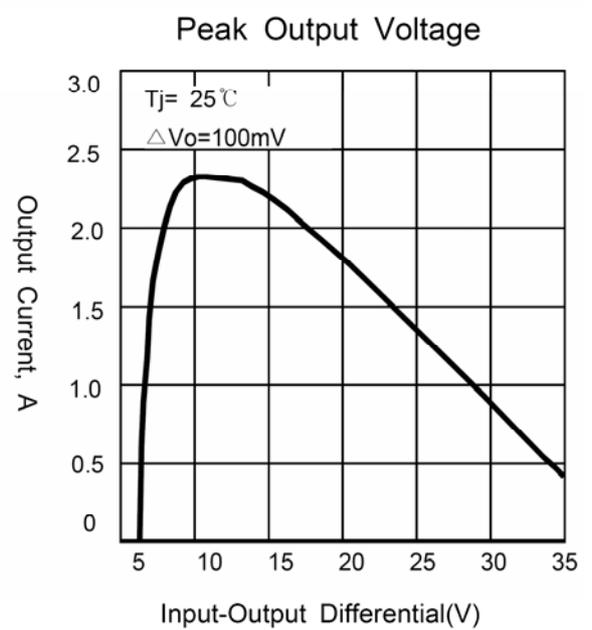
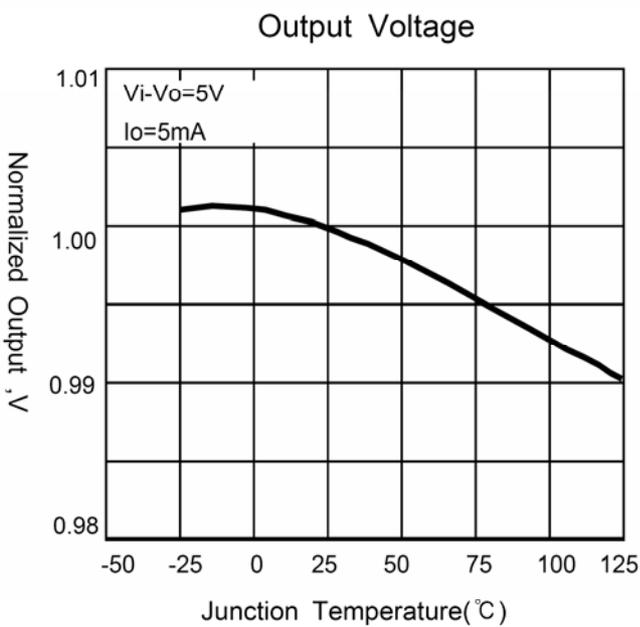
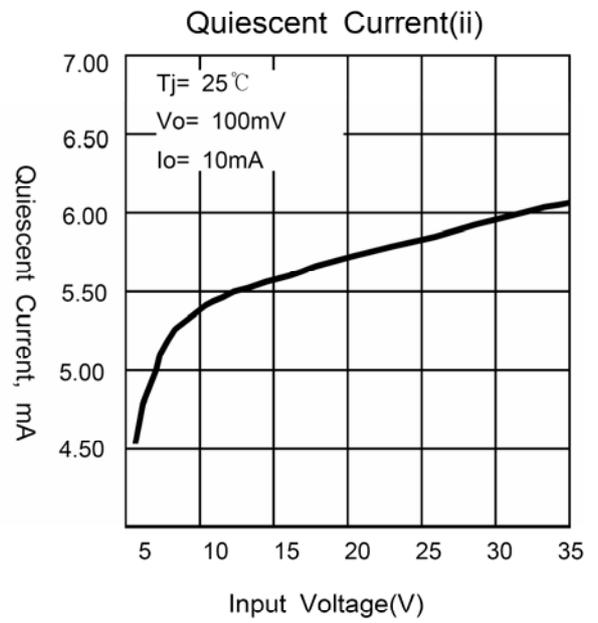
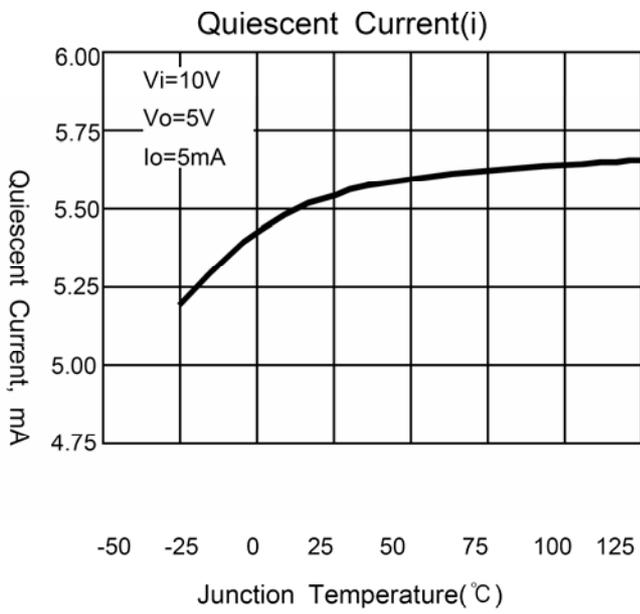
**IL7824 ELECTRICAL CHARACTERISTICS**

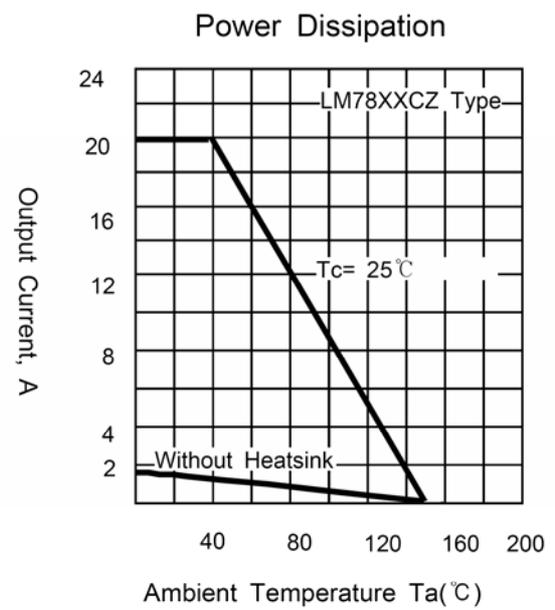
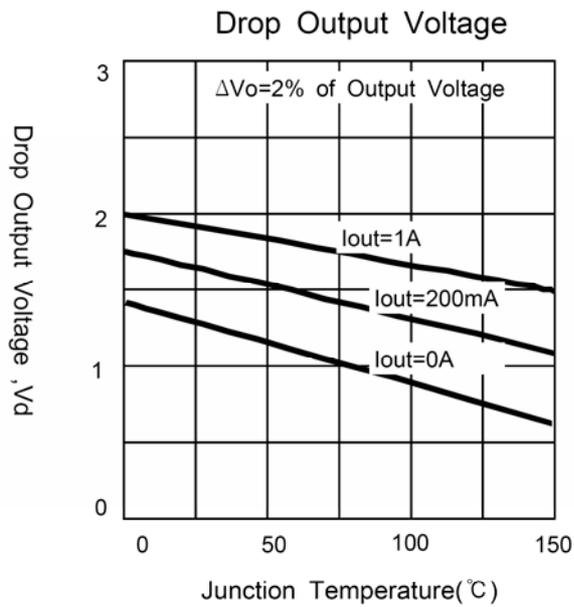
 (Refer to test circuit,  $T_{min} < T_j < T_{max}$ ,  $I_o = 500mA$ ,  $V_i = 33V$ ,  $C_i = 0.33 \mu F$ ,  $C_o = 0.1 \mu F$ , unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit	
Output Voltage	$V_o$	$T_j = 25^\circ C$	23	24	25	V	
		$5.0mA \leq I_o \leq 1.0A$ , $PD \leq 15W$ $V_i = 27V$ to $38V$ $V_i = 28V$ to $38V$	22.8	24	25.25		
Line Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$V_i = 27V$ to $38V$		17	480	mV
			$V_i = 30V$ to $36V$		6	240	
Load Regulation	$\Delta V_o$	$T_j = 25^\circ C$	$I_o = 5.0mA$ to $1.5A$		15	480	
			$I_o = 250mA$ to $750mA$		5	240	
Quiescent current	$I_q$	$T_j = 25^\circ C$		5.2	8	mA	
Quiescent current Change	$\Delta I_q$		$I_o = 5mA$ to $1A$		0.1	0.5	mA
			$V_i = 27V$ to $38V$		0.5	1.0	
			$V_i = 28V$ to $38V$				
Output voltage Drift	$\Delta V_o / \Delta T$	$I_o = 5mA$		-1.5		mV/ $^\circ C$	
Output noise voltage	$V_n$	$f = 10Hz$ to $100KHz$ , $T_a = 25^\circ C$		60		$\mu V$	
Ripple Rejection	RR	$f = 120Hz$ , $V_i = 28V$ to $38V$	50	67		dB	
Dropout voltage	$V_d$	$I_o = 1A$ , $T_j = 25^\circ C$		2		V	
Peak current	$I_{pk}$	$T_j = 25^\circ C$		2.2		A	
Output Resistance	$R_o$	$f = 1KHz$		28		$M\Omega$	
Short circuit current	$I_{sc}$	$V_i = 35V$ , $T_a = 25^\circ C$		230		mA	

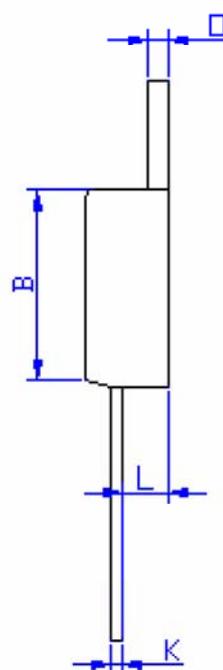
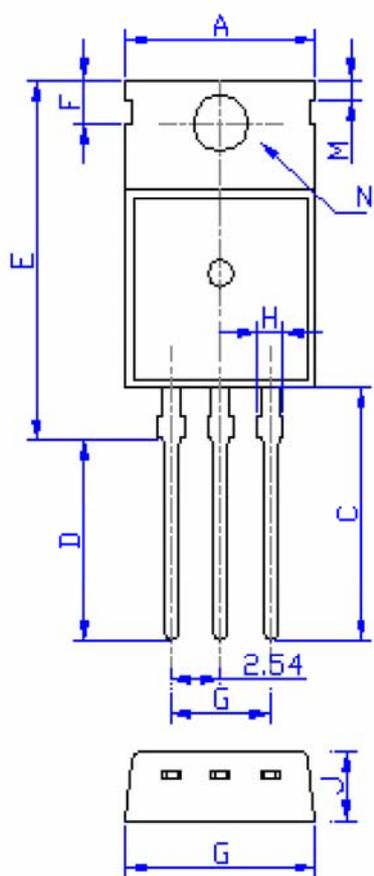
\* Load and line regulation are specified at constant junction temperature. Changes in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

TYPICAL PERFORMANCE CHARACTERISTICS





PACKAGE OUTLINE DIMENSIONS



Package Dimension (unit:mm)			
Symbol	Min	Typ	Max
A	-	[9.90]	-
B	9.00	9.20	9.40
C	12.88	13.08	13.28
D	9.78	10.08	10.38
E	-	-	18.95
F	2.70	2.80	2.90
G	4.88	5.08	5.28
H	1.42	1.52	1.62
I	9.80	10.00	10.20
J	4.03	4.50	4.70
K	0.45	0.50	0.60
L	2.30	2.40	2.50
M	1.20	1.30	1.40
N	-	[ $\phi$ 3.60]	-
O	1.25	1.30	1.40