

# IL78XXC SERIES

## THREE-TERMINAL POSITIVE VOLTAGE REGULATORS

These voltage regulators are monolithic integrated circuits designed fixed-voltage regulators for a wide variety of applications including local, on card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation. With adequate heatsinking they can deliver output currents in excess of 1.0 ampere.

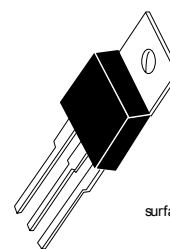
Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

- Output Current in Excess of 1.0 Ampere
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short - Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage Offered in 2% and 4% Tolerance

Device type/nominal output voltage			
IL7806	5 V	IL7812	12 V
IL7806	6 V	IL7815	15 V
IL7808	8 V	IL7818	18 V
IL7809	9 V	IL7824	24 V

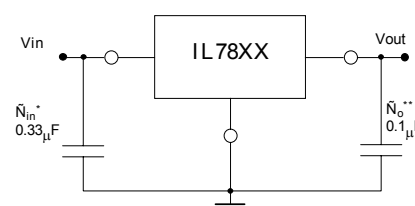
TO-220 AB

Pin 1. Input  
2. Ground  
3. Output



(Heatsink surface connected to Pin 2.)

### Standard application



A common ground is required between the input and the output voltage. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

XX = these two digits of the type number indicate voltage.

\* = C<sub>in</sub> is required if regulator is located an appreciable distance from power supply filter.

\*\* = C<sub>o</sub> is not needed for stability ; however, it does improve transient response

XX indicates nominal voltage

### Maximum ratings (T<sub>A</sub> = +25 °C unless otherwise noted)

Rating	Symbol	Value	Unit
Input Voltage (5.0 V - 18 V) (24 V)	V <sub>in</sub>	35 40	V <sub>dc</sub>
Power Dissipation and Thermal Characteristics Plastic Package T <sub>A</sub> = +25 °C Derate above T <sub>A</sub> = 25 °C Thermal Resistance, Junction to Air	P <sub>D</sub> 1/R <sub>θJA</sub> R <sub>θJC</sub>	Internally Limited 15.4 65	Watts mW/°C °C/W
T <sub>A</sub> = +25 °C Derate above T <sub>C</sub> = +75 °C (See Figure 1) Thermal Resistance, Junction to Case	P <sub>D</sub> 1/R <sub>θJC</sub> R <sub>θJC</sub>	Internally Limited 200 5.0	Watts mW/°C °C/W
Storage Junction Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Operating Junction Temperature Range IL78XXC	T <sub>J</sub>	0 to +125	°C

# IL78XXC SERIES

## IL7805

### Electrical characteristics

( $V_{in} = 10V$ ,  $I_o = 500mA$ ,  $T_J = \text{Tlow to Thigh}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	4.8	5.0	5.2	V <sub>dc</sub>
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $7.0V_{dc} \leq V_{in} \leq 20V_{dc}$	$V_o$	4.75	5.0	5.25	V <sub>dc</sub>
Line Regulation( $T_J = +25^\circ C$ , Note2) $7.0V_{dc} \leq V_{in} \leq 25V_{dc}$ $8.0V_{dc} \leq V_{in} \leq 13V_{dc}$	Reg <sub>line</sub>	- -	9.0 3.0	100 50	mV
Load Regulation( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Reg <sub>load</sub>	- -	43 16	100 50	mV
Quiescent Current ( $T_J = +25^\circ C$ )	IB	-	4.3	8.0	mA
Quiescent Current Change $7.0V_{dc} \leq V_{in} \leq 25V_{dc}$ $5.0mA \leq I_o \leq 1.0A$	$\Delta IB$	- -	- -	1.3 0.5	mA
Ripple Rejection $8.0V_{dc} \leq V_{in} \leq 18V_{dc}$ , $f = 120 Hz$	RR	-	68	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	V <sub>dc</sub>
Output Noise Voltage( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	17	-	$m\Omega$
Short -Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 V_{dc}$	I <sub>sc</sub>	-	0.2	-	A
Peak Output Current( $T_J = +25^\circ C$ )	I <sub>max</sub>	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	TCV <sub>o</sub>	-	-0.8	-	$mV/^\circ C$

## IL7806

### Electrical characteristics

( $V_{in} = 11V$ ,  $I_o = 500mA$ ,  $T_J = \text{Tlow to Thigh}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	5.75	6.0	6.25	V <sub>dc</sub>
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $8.0V_{dc} \leq V_{in} \leq 21V_{dc}$ $9.0V_{dc} \leq V_{in} \leq 21V_{dc}$	$V_o$	5.7 -	6.0 -	6.3 -	V <sub>dc</sub>
Line Regulation( $T_J = +25^\circ C$ , Note2) $8.0V_{dc} \leq V_{in} \leq 25V_{dc}$ $9.0V_{dc} \leq V_{in} \leq 13V_{dc}$	Reg <sub>line</sub>	- -	9.0 3.0	120 60	mV
Load Regulation( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Reg <sub>load</sub>	- -	43 16	120 60	mV
Quiescent Current ( $T_J = +25^\circ C$ )	IB	-	4.3	8.0	mA
Quiescent Current Change $8.0V_{dc} \leq V_{in} \leq 25V_{dc}$ $5.0mA \leq I_o \leq 1.0A$	$\Delta IB$	- -	- -	1.3 0.5	mA
Ripple Rejection $9.0V_{dc} \leq V_{in} \leq 19V_{dc}$ , $f = 120 Hz$	RR	-	65	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	V <sub>dc</sub>
Output Noise Voltage( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	17	-	$m\Omega$
Short -Circuit Current Limit( $T_A = +25^\circ C$ ) $V_{in} = 35 V_{dc}$	I <sub>sc</sub>	-	0.2	-	A
Peak Output Current( $T_J = +25^\circ C$ )	I <sub>max</sub>	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	TCV <sub>o</sub>	-	-0.8	-	$mV/^\circ C$

Note:

1. Tlow =  $0^\circ C$ , Thigh =  $+125^\circ C$

2. 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 cycle is used.

## IL78XXC SERIES

### IL7808

#### Electrical characteristics

( $V_{in} = 11V$ ,  $I_o = 500mA$ ,  $T_J = \text{Tlow to Thigh}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	7.7	8.0	8.0	Vdc
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $10.5V_{dc} \leq V_{in} \leq 23V_{dc}$	$V_o$	7.6	8.0	8.4	Vdc
Line Regulation ( $T_J = +25^\circ C$ , Note2) $10.5V_{dc} \leq V_{in} \leq 25V_{dc}$ $11V_{dc} \leq V_{in} \leq 17V_{dc}$	Reg <sub>line</sub>	- -	12 5.0	160 80	mV
Load Regulation ( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Reg <sub>load</sub>	- -	45 16	160 80	mV
Quiescent Current ( $T_J = +25^\circ C$ )	$I_B$	-	4.3	8.0	mA
Quiescent Current Change $10.5V_{dc} \leq V_{in} \leq 25V_{dc}$ $5.0mA \leq I_o \leq 1.0A$	$\Delta I_B$	- -	- -	1.0 0.5	mA
Ripple Rejection $11.5V_{dc} \leq V_{in} \leq 21.5V_{dc}$ , $f = 120 Hz$	RR	-	62	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	Vdc
Output Noise Voltage ( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	18	-	$m\Omega$
Short -Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 V_{dc}$	$I_{sc}$	-	0.2	-	A
Peak Output Current ( $T_J = +25^\circ C$ )	$I_{max}$	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	$TCV_o$	-	-0.8	-	$mV/^\circ C$

### IL7809

#### Electrical characteristics

( $V_{in} = 15V$ ,  $I_o = 500mA$ ,  $T_J = 0^\circ C$  to  $+125^\circ C$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	8.65	9.0	9.35	V <sub>dc</sub>
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $11.5V_{dc} \leq V_{in} \leq 24V_{dc}$	$V_o$	8.55	9.0	9.45	V <sub>dc</sub>
Line Regulation ( $T_J = +25^\circ C$ , Note2) $11.5V_{dc} \leq V_{in} \leq 26V_{dc}$ $11.5V_{dc} \leq V_{in} \leq 17V_{dc}$	Reg <sub>line</sub>	- -	12 5.0	180 90	mV
Load Regulation ( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Reg <sub>load</sub>	- -	35 12	180 90	mV
Quiescent Current ( $T_J = +25^\circ C$ )	$I_B$	-	4.3	8.0	mA
Quiescent Current Change $11.5V_{dc} \leq V_{in} \leq 26V_{dc}$ $5.0mA \leq I_o \leq 1.0A$	$\Delta I_B$	- -	- -	1.0 0.5	mA
Ripple Rejection $11.5V_{dc} \leq V_{in} \leq 21.5V_{dc}$ , $f = 120 Hz$	RR	-	61	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	V <sub>dc</sub>
Output Noise Voltage ( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	18	-	$m\Omega$
Short -Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 V_{dc}$	$I_{sc}$	-	0.2	-	A
Peak Output Current ( $T_J = +25^\circ C$ )	$I_{max}$	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	$TCV_o$	-	-1.0	-	$mV/^\circ C$

Note:

1. Tlow =  $0^\circ C$ , Thigh =  $+125^\circ C$
2. 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 cycle is used.

## IL78XXC SERIES

### IL7812

#### Electrical characteristics

( $V_{in} = 19V$ ,  $I_o = 500mA$ ,  $T_J = T_{low}$  to  $T_{low}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	11.5	12	12.5	Vdc
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $14.5Vdc \leq V_{in} \leq 27Vdc$	$V_o$	11.4	12	12.6	Vdc
Line Regulation ( $T_J = +25^\circ C$ , Note2) $14.5Vdc \leq V_{in} \leq 30Vdc$ $16Vdc \leq V_{in} \leq 22Vdc$	Regline	-	13 6.0	240 120	mV
Load Regulation ( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Regload	-	46 17	240 120	mV
Quiescent Current ( $T_J = +25^\circ C$ )	$I_B$	-	4.4	8.0	mA
Quiescent Current Change $14.5Vdc \leq V_{in} \leq 30Vdc$ $5.0mA \leq I_o \leq 1.0A$	$\Delta I_B$	-	-	1.0 0.5	mA
Ripple Rejection $15Vdc \leq V_{in} \leq 25Vdc$ , $f = 120 Hz$	RR	-	60	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	Vdc
Output Noise Voltage ( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	18	-	$m\Omega$
Short - Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 Vdc$	$I_{sc}$	-	0.2	-	A
Peak Output Current ( $T_J = +25^\circ C$ )	$I_{max}$	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	$TCV_o$	-	-1.0	-	$mV/^\circ C$

### IL7815

#### Electrical characteristics

( $V_{in} = 11V$ ,  $I_o = 500mA$ ,  $T_J = T_{low}$  to  $T_{high}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	14.4	15	15.6	Vdc
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $17.5Vdc \leq V_{in} \leq 30Vdc$	$V_o$	14.25	15	15.75	Vdc
Line Regulation ( $T_J = +25^\circ C$ , Note2) $17.5Vdc \leq V_{in} \leq 30Vdc$ $20Vdc \leq V_{in} \leq 26Vdc$	Regline	-	13 6.0	300 150	mV
Load Regulation ( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Regload	-	52 20	300 150	mV
Quiescent Current ( $T_J = +25^\circ C$ )	$I_B$	-	4.4	8.0	mA
Quiescent Current Change $17.5Vdc \leq V_{in} \leq 30Vdc$ $5.0mA \leq I_o \leq 1.0A$	$\Delta I_B$	-	-	1.0 0.5	mA
Ripple Rejection $18.5Vdc \leq V_{in} \leq 28.5Vdc$ , $f = 120 Hz$	RR	-	58	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	Vdc
Output Noise Voltage ( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	19	-	$m\Omega$
Short - Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 Vdc$	$I_{sc}$	-	0.2	-	A
Peak Output Current ( $T_J = +25^\circ C$ )	$I_{max}$	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	$TCV_o$	-	-1.0	-	$mV/^\circ C$

Note:

1.  $T_{low} = 0^\circ C$ ,  $T_{high} = +125^\circ C$
2. 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 cycle is used.

## IL78XXC SERIES

### IL7818

#### Electrical characteristics

( $V_{in} = 27V$ ,  $I_o = 500mA$ ,  $T_J = \text{Tlow to Thigh}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	17.3	18	18.7	Vdc
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $21Vdc \leq V_{in} \leq 33Vdc$	$V_o$	17.1	18	18.9	Vdc
Line Regulation( $T_J = +25^\circ C$ , Note2) $21Vdc \leq V_{in} \leq 33Vdc$ $24Vdc \leq V_{in} \leq 30Vdc$	Regline	- -	25 10	360 180	mV
Load Regulation( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Regload	- -	55 22	360 180	mV
Quiescent Current ( $T_J = +25^\circ C$ )	$I_B$	-	4.5	8.0	mA
Quiescent Current Change $21Vdc \leq V_{in} \leq 33Vdc$ $5.0mA \leq I_o \leq 1.0A$	$\Delta I_B$	- -	- -	1.0 0.5	mA
Ripple Rejection $22Vdc \leq V_{in} \leq 33Vdc$ , $f = 120 Hz$	RR	-	57	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	Vdc
Output Noise Voltage( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	19	-	$m\Omega$
Short - Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 Vdc$	$I_{sc}$	-	0.2	-	A
Peak Output Current( $T_J = +25^\circ C$ )	$I_{max}$	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	$TCV_o$	-	-1.0	-	$mV/^\circ C$

### IL7824

#### Electrical characteristics

( $V_{in} = 33V$ ,  $I_o = 500mA$ ,  $T_J = \text{Tlow to Thigh}$  (Note 1) unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ C$ )	$V_o$	23	24	25	Vdc
Output Voltage ( $5.0 mA \leq I_o \leq 1.0A$ , $P_o \leq 15 W$ ) $27Vdc \leq V_{in} \leq 38Vdc$	$V_o$	22.8	24	25.2	Vdc
Line Regulation( $T_J = +25^\circ C$ , Note2) $27Vdc \leq V_{in} \leq 38Vdc$ $30Vdc \leq V_{in} \leq 38Vdc$	Regline	- -	31 14	480 240	mV
Load Regulation( $T_J = +25^\circ C$ , Note2) $5.0mA \leq I_o \leq 1.5A$ $250mA \leq I_o \leq 750 mA$	Regload	- -	60 25	480 240	mV
Quiescent Current ( $T_J = +25^\circ C$ )	$I_B$	-	4.6	8.0	mA
Quiescent Current Change $27Vdc \leq V_{in} \leq 38Vdc$ $5.0mA \leq I_o \leq 1.0A$	$\Delta I_B$	- -	- -	1.0 0.5	mA
Ripple Rejection $28Vdc \leq V_{in} \leq 38Vdc$ , $f = 120 Hz$	RR	-	54	-	dB
Dropout Voltage ( $I_o = 1.0A$ , $T = +25^\circ C$ )	$V_{in} - V_o$	-	2.0	-	Vdc
Output Noise Voltage( $T_A = +25^\circ C$ ) $10 Hz \leq f \leq 13100 kHz$	$V_n$	-	10	-	$\mu V/V_o$
Output Resistance $f = 1.0 kHz$	$r_o$	-	20	-	$m\Omega$
Short - Circuit Current Limit ( $T_A = +25^\circ C$ ) $V_{in} = 35 Vdc$	$I_{sc}$	-	0.2	-	A
Peak Output Current( $T_J = +25^\circ C$ )	$I_{max}$	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	$TCV_o$	-	-1.5	-	$mV/^\circ C$

Note: 1. Tlow =  $0^\circ C$ , Thigh =  $+125^\circ C$   
2. 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 cycle is used.