

Three Terminal Fixed Voltage Positive Regulators

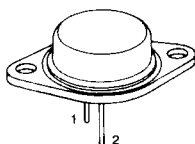
FEATURES

- Complete Specifications at 1A Load
- No External Components
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe Area Compensation
- Available in TO-3, TO-220, TO-257, and isolated TO-257
- Output Voltages of 5V, 12V and 15V
(For Other Voltages, Please Contact the Factory)

DESCRIPTION

These three terminal monolithic positive voltage regulators employ internal current limiting, thermal shutdown and safe area compensation, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A of output current. They are intended as fixed voltage regulators in a wide range of applications including local (on card) regulation for elimination of distribution problems associated with single point regulation. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents. The 7800 and 7800C series have output tolerances of $\pm 4\%$. The 7800A and 7800AC series offer $\pm 1\%$ tolerances on initial output voltage and, in addition, are specified to provide better regulator performance.

K(TO-3)



Pin 1. Adjust
2. Input
Case: Output

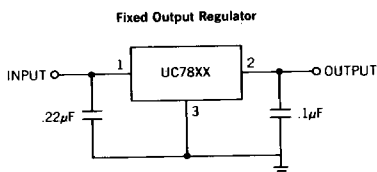
G, 1G (TO-257)



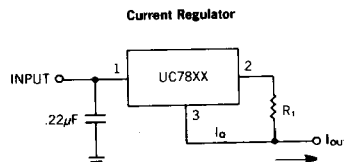
Non-isolated
Pin 1. Adjust
2. Input
3. Output
4. Output

Isolated
Pin 1. Adjust
2. Input
3. Output
4. No Connection

TYPICAL APPLICATIONS



- Notes:**
1. To specify an output voltage, substitute voltage value for "XX".
 2. Although no output capacitor is needed for stability, it does improve transient responses.
 3. Input capacitor required if regulator is located an appreciable distance from power supply filter.



$$I_{OUT} = \frac{V_{OUT}}{R_1} + I_O$$

Note: When ordering, add "K" (for TO-3 package), "T" (for TO-220 package), "G" (for non-isolated TO-257) and "1G" (for isolated TO-257) to the part number

ABSOLUTE MAXIMUM RATINGS

Input Voltage	35V
Power Dissipation	Internally limited
Operating Junction Temperature Range	
UC7800 SERIES	-55°C to +150°C
UC7800C SERIES	0°C to +125°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 seconds)	
K (TO-3), G, IG (TO-257 Packages)	300°C
T (TO-220) package	230°C
Power/Thermal Characteristics	

K (TO-3) Package T (TO-220) Package G (TO-257) Package IG (ISOLATED TO-257)

Rated Power @ 25°C

T_C	20W	15W	15W	15W
T_A	4.3W	2W	3W	3W

Thermal Resistance

θ_{JC}	3°C/W	5°C/W	3.5°C/W	4.2°C/W
θ_{JA}	35°C/W	60°C/W	42°C/W	42°C/W

ELECTRICAL CHARACTERISTICS $T_A = T_J$

PARAMETER	TEST CONDITIONS	UC7805			UC7805C			UNITS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Output Voltage	$T_i = 25^\circ\text{C}, V_{IN} = 10\text{V}, I_o = 1\text{A}$	4.8		5.2	4.8		5.2	V
	$T_i = 25^\circ\text{C}, 7.5\text{V} \leq V_{IN} \leq 20\text{V}$ $5\text{mA} \leq I_{OUT} \leq 1\text{A}, P_D \leq 15\text{W}$	4.8		5.2	4.77		5.23	V
	Over Temperature, $T_{MIN} \leq T_j \leq T_{MAX}$	4.75		5.25	4.75		5.25	V
Line Regulation	$T_i = 25^\circ\text{C}, 7.5\text{V} \leq V_{IN} \leq 20\text{V}, I_o = 500\text{mA}$			25			35	mV
	Over Temperature, $T_{MIN} \leq T_j \leq T_{MAX}$		10	50		10	50	mV
Load Regulation	$T_i = 25^\circ\text{C}, V_{IN} = 10\text{V}, 5\text{mA} \leq I_o \leq 1.5\text{A}$ (Note 1)		20	26		20	40	mV
	$V_{IN} = 10\text{V}, 5\text{mA} \leq I_o \leq 1\text{A}$ (Note 1) Over Temperature, $T_{MIN} \leq T_j \leq T_{MAX}$			50			50	mV
Quiescent Current	$T_i = 25^\circ\text{C}, V_{IN} = 10\text{V}, I_o = 1\text{A}$		4.5	6		4.5	6	mA
	Over Temperature, $T_{MIN} \leq T_j \leq T_{MAX}$			6.5			6.5	mA
Quiescent Current Change	$T_i = 25^\circ\text{C}, V_{IN} = 10\text{V}, 5\text{mA} \leq I_o \leq 1\text{A}$			.4			.4	mA
	Over Temperature, $T_{MIN} \leq T_j \leq T_{MAX}$			.5			.5	mA
	$T_i = 25^\circ\text{C}, 7.5\text{V} \leq V_{IN} \leq 20\text{V}, I_o = 500\text{mA}$			.8			.8	mA
	Over Temperature, $T_{MIN} \leq T_j \leq T_{MAX}$			1.0			1.0	mA
Ripple Rejection	$T_i = 25^\circ\text{C}, 8\text{V} \leq V_{IN} \leq 18\text{V}, I_o = 500\text{mA}$	63			63			dB
Output Noise Voltage	$T_i = 25^\circ\text{C}, V_{IN} = 10\text{V}, I_o = 1\text{A}$		40			40		μV
Dropout Voltage	$T_i = 25^\circ\text{C}, I_o = 1\text{A}$		2			2		V
Short Circuit Current	$T_i = 25^\circ\text{C}, V_{IN} = 10\text{V}$		2.1			2.1		A
Peak Output Current	$I_j = 25^\circ\text{C}$		2.4			2.4		A
Avg. Temp. Variation of V_{OUT}	$0^\circ\text{C} \leq T_j \leq T_{MAX}, V_{IN} = 10\text{V}, I_o = 5\text{mA}$		-4			-4		mV/°C
Long Term Stability	1000 Hrs. @ $T_j = 125^\circ\text{C}, V_{IN} = 10\text{V}, I_o = 5\text{mA}$		20			20		mV
Thermal Shutdown	$V_{IN} = 10\text{V}, I_o = 5\text{mA}$		175			175		°C
	T_{MAX}		125			125		°C
	T_{MIN}		-55			0		°C

Note: All characteristics except noise voltage and ripple rejection are measured using pulse techniques ($t_w \leq 10\text{ms}$, duty-cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

1) Measurement taken at 0.180 inches from case for G and IG Packages.

ELECTRICAL CHARACTERISTICS $T_A = T_J$

PARAMETER	TEST CONDITIONS	UC7812			UC7812C			UNITS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Output Voltage	$T_J = 25^\circ\text{C}, V_{IN} = 19\text{V}, I_O = 1\text{A}$	11.52		12.48	11.52		12.48	V
	$T_J = 25^\circ\text{C}, 14.5\text{V} \leq V_{IN} \leq 27\text{V}$ $5\text{mA} \leq I_{OUT} \leq 1\text{A}, P_D \leq 15\text{W}$	11.52		12.48	11.46		12.54	V
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$	11.40		12.60	11.40		12.60	V
Line Regulation	$T_J = 25^\circ\text{C}, 14.5\text{V} \leq V_{IN} \leq 27\text{V}, I_O = 500\text{mA}$			60			84	mV
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$		20	120		20	120	mV
Load Regulation	$T_J = 25^\circ\text{C}, V_{IN} = 19\text{V}, 5\text{mA} \leq I_O \leq 1.5\text{A}$ (Note 1)		50	64		50	100	mV
	$V_{IN} = 19\text{V}, 5\text{mA} \leq I_O \leq 1\text{A}$ Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$ (Note 1)			120			120	mV
Quiescent Current	$T_J = 25^\circ\text{C}, V_{IN} = 19\text{V}, I_O = 1\text{A}$		4.5	7		4.5	7	mA
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$			6.5			6.5	mA
Quiescent Current Change	$T_J = 25^\circ\text{C}, V_{IN} = 19\text{V}, 5\text{mA} \leq I_O \leq 1\text{A}$			.4			.4	mA
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$			.5			.5	mA
	$T_J = 25^\circ\text{C}, 14.5\text{V} \leq V_{IN} \leq 27\text{V}, I_O = 500\text{mA}$			.8			.8	mA
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$			1.0			1.0	mA
Ripple Rejection	$T_J = 25^\circ\text{C}, 15\text{V} \leq V_{IN} \leq 25\text{V}, I_O = 500\text{mA}$	56			56			dB
Output Noise Voltage	$T_J = 25^\circ\text{C}, V_{IN} = 19\text{V}, I_O = 5\text{mA}$		75			75		μV
Dropout Voltage	$T_J = 25^\circ\text{C}, I_O = 1\text{A}$		2			2		V
Short Circuit Current	$T_J = 25^\circ\text{C}, V_{IN} = 19\text{V}$		1.5			1.5		A
Peak Output Current	$T_J = 25^\circ\text{C}$		2.4			2.4		A
Avg. Temp. Variation of V_{OUT}	$0^\circ\text{C} \leq T_J \leq T_{MAX}, V_{IN} = 19\text{V}, I_O = 5\text{mA}$		-8			-8		mV/ $^\circ\text{C}$
Long Term Stability	1000 Hrs. @ $T_J = 125^\circ\text{C}, V_{IN} = 19\text{V}, I_O = 5\text{mA}$		50			50		mV
Thermal Shutdown	$V_{IN} = 19\text{V}, I_O = 5\text{mA}$		175			175		$^\circ\text{C}$
	T_{MAX}		125			125		$^\circ\text{C}$
	T_{MIN}		-55			0		$^\circ\text{C}$

Note: All characteristics except noise voltage and ripple rejection are measured using pulse techniques ($t_w \leq 10\text{ms}$, duty-cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

1) Measurement taken at 0.180 inches from case for G and IG Packages.

ELECTRICAL CHARACTERISTICS $T_A = T_J$

PARAMETER	TEST CONDITIONS	UC7815			UC7815C			UNITS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Output Voltage	$T_J = 25^\circ\text{C}$, $V_{IN} = 23\text{V}$, $I_O = 1\text{A}$	14.4		15.6	14.4		15.6	V
	$T_J = 25^\circ\text{C}$, $17.5\text{V} \leq V_{IN} \leq 30\text{V}$ $5\text{mA} \leq I_{OUT} \leq 1\text{A}$, $P_D \leq 15\text{W}$	14.4		15.6	14.3		15.7	V
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$	14.25		15.75	14.25		15.75	V
Line Regulation	$T_J = 25^\circ\text{C}$, $17.5\text{V} \leq V_{IN} \leq 30\text{V}$, $I_O = 500\text{mA}$			75			100	mV
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$		22	150		22	150	mV
Load Regulation	$T_J = 25^\circ\text{C}$, $V_{IN} = 23\text{V}$, $5\text{mA} \leq I_O \leq 1.5\text{A}$ (Note 1)		50	80		50	120	mV
	$V_{IN} = 23\text{V}$, $5\text{mA} \leq I_O \leq 1\text{A}$ Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$ (Note 1)			150			150	mV
Quiescent Current	$T_J = 25^\circ\text{C}$, $V_{IN} = 23\text{V}$, $I_O = 1\text{A}$		4.5	7		4.5	7	mA
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$			6.5			6.5	mA
Quiescent Current Change	$T_J = 25^\circ\text{C}$, $V_{IN} = 23\text{V}$, $5\text{mA} \leq I_O \leq 1\text{A}$			.4			.4	mA
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$			.5			.5	mA
	$T_J = 25^\circ\text{C}$, $17.5\text{V} \leq V_{IN} \leq 30\text{V}$, $I_O = 500\text{mA}$			.8			.8	mA
	Over Temperature, $T_{MIN} \leq T_J \leq T_{MAX}$			1.0			1.0	mA
Ripple Rejection	$T_J = 25^\circ\text{C}$, $18.5\text{V} \leq V_{IN} \leq 28.5\text{V}$, $I_O = 500\text{mA}$	54			54			dB
Output Noise Voltage	$T_J = 25^\circ\text{C}$, $V_{IN} = 23\text{V}$, $I_O = 5\text{mA}$		90			90		μV
Dropout Voltage	$T_J = 25^\circ\text{C}$, $I_O = 1\text{A}$		2			2		V
Short Circuit Current	$T_J = 25^\circ\text{C}$, $V_{IN} = 23\text{V}$		1.2			1.2		A
Peak Output Current	$T_J = 25^\circ\text{C}$		2.4			2.4		A
Avg. Temp. Variation of V_{OUT}	$0^\circ\text{C} \leq T_J \leq T_{MAX}$, $V_{IN} = 23\text{V}$, $I_O = 5\text{mA}$		-1.0			-1.0		mV/ $^\circ\text{C}$
Long Term Stability	1000 Hrs. @ $T_J = 125^\circ\text{C}$, $V_{IN} = 23\text{V}$, $I_O = 5\text{mA}$		60			60		mV
Thermal Shutdown	$V_{IN} = 23\text{V}$, $I_O = 5\text{mA}$		175			175		$^\circ\text{C}$
	T_{MAX}		125			125		$^\circ\text{C}$
	T_{MIN}		-55			0		$^\circ\text{C}$

Note: All characteristics except noise voltage and ripple rejection are measured using pulse techniques ($t_w \leq 10\text{ms}$, duty-cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

1) Measurement taken at 0.180 inches from case for G and IG Packages.

ORDERING INFORMATION

OUTPUT VOLTAGE	PACKAGE SUFFIX		
	K (TO-3)	G (TO-257)	IG (ISOLATED TO-257)
5V	UC7805K UC7805CK	UC7805G UC7805CG	UC7805IG UC7805CIG
12V	UC7812K UC7812CK	UC7812G UC7812CG	UC7812IG UC7812CIG
15V	UC7815K UC7815CK	UC7815G UC7815CG	UC7815IG UC7815CIG