

LM78TXX

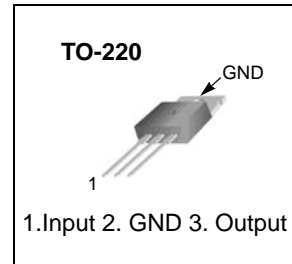
3-Terminal 3A Positive Voltage Regulator

Features

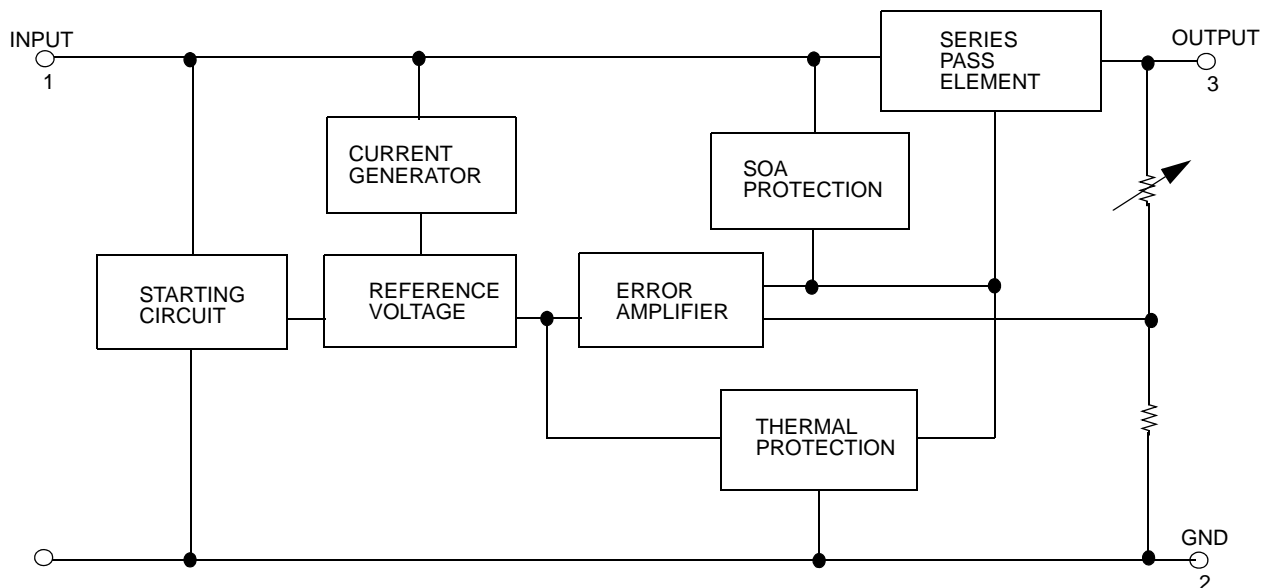
- Output Current in Excess of 3.0A
- Output Transistor Safe Operating Area Compensation
- Power Dissipation :25W
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- Output Voltage Offered in 4% Tolerance
- No External Components Required
- Output Voltage of 5,12 and 15V

Description

This family of fixed voltage regulators are monolithic integrated circuit capable of driving loads in excess of 3.0 A.



Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V$ to $12V$) (for $V_O = 15V$)	V_I	35 40	V V
Power Dissipation	PD	Internally limited	
Thermal Resistance, Junction to Air (Note1, 2) $T_a = +25^\circ\text{C}$	$R_{\theta JA}$	65	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note1) $T_c = +25^\circ\text{C}$	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Operating Junction Temperature Range	T_J	0 ~ +125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^\circ\text{C}$

Note:

- Thermal resistance test board
Size: 76.2mm * 114.3mm * 1.6mm(1S0P)
JEDEC standard: JESD51-3, JESD51-7
- Assume no ambient airflow.

Electrical Characteristics(LM78T05)

($V_I = 10V$, $I_O = 3.0\text{ A}$, $0^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$, $P_o \leq P_{MAX}$ (Note3), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	$5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$ $7.3\text{V} \leq V_I \leq 20\text{V}$, $5\text{mA} \leq I_O \leq 2.0\text{A}$	4.8 4.75	5.0 5.0	5.2 5.25	V
Line Regulation (Note4)	ΔV_O	$7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 5\text{mA}$, $T_J = +25^\circ\text{C}$ $7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 1.0\text{A}$, $T_J = +25^\circ\text{C}$ $7.5\text{V} \leq V_I \leq 20\text{V}$, $I_O = 2.0\text{A}$, $T_J = +25^\circ\text{C}$ $8.0\text{V} \leq V_I \leq 12\text{V}$, $I_O = 3.0\text{A}$, $T_J = +25^\circ\text{C}$	-	3.0	25	mV
Load Regulation (Note4)	ΔV_O	$5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$ $5\text{mA} \leq I_O \leq 3.0\text{A}$	-	10 15	30 80	mV mV
Thermal Regulation	REG_T	Pulse = 10ms, $P = 20\text{W}$ $T_A = +25^\circ\text{C}$	-	0.002	0.03	% V_O/W
Quiescent Current	I_Q	$5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$ $5\text{mA} \leq I_O \leq 3.0\text{A}$	-	3.5 4.0	5.0 6.0	mA mA
Quiescent Current Change	ΔI_Q	$7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 5\text{mA}$ $T_J = +25^\circ\text{C}$; $7.5\text{V} \leq V_I \leq 20\text{V}$, $I_O = 2.0\text{A}$; $5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25^\circ\text{C}$	-	0.1	0.8	mA
Ripple Rejection	RR	$f = 120\text{Hz}$, $8\text{V} \leq V_I \leq 18\text{V}$, $I_O = 2.0\text{A}$ $T_J = +25^\circ\text{C}$	-	75	-	dB
Dropout Voltage	V_D	$I_O = 3\text{A}$, $T_J = +25^\circ\text{C}$	-	2.2	2.5	V
Output Noise Voltage	V_N	$T_A = +25^\circ\text{C}$, $10\text{Hz} \leq f \leq 100\text{kHz}$	-	10	-	$\mu\text{V}/V_O$
Peak Output Current	I_{PK}	$T_A = +25^\circ\text{C}$	-	5.0	-	A
Output Resistance	R_O	$f = 1.0\text{kHz}$	-	2.0	-	$\text{m}\Omega$
Short Circuit Current Limit	I_{SC}	$V_I = 35\text{V}$, $T_J = +25^\circ\text{C}$	-	1.5	2.5	A
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$I_O = 5.0\text{mA}$	-	0.2	-	$\text{mV}/^\circ\text{C}$

Note:

- Although power dissipation is internally limited, specifications apply only for $P_O \leq P_{max}$, $P_{max} = 25\text{W}$
- Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics(LM78T12) (Continued)(V_I = 19V, I_O = 3.0 A, 0°C ≤ T_J ≤ +125°C, P_o ≤ P_{MAX} (Note1), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _O	5mA ≤ I _o ≤ 3.0A , T _J = +25°C 14.5V ≤ V _I ≤ 27V, 5mA ≤ I _o ≤ 2.0A	11.5 11.4	12 12	12.5 12.8	V
Line Regulation (Note2)	ΔV _O	14.5V ≤ V _I ≤ 35V, I _o = 5mA, T _J = +25°C 14.5V ≤ V _I ≤ 35V, I _o = 1.0A, T _J = +25°C 14.9V ≤ V _I ≤ 28V, I _o = 2.0A, T _J = +25°C 16V ≤ V _I ≤ 22V, I _o = 3.0A, T _J = +25°C	-	6.0	45	mV
Load Regulation (Note2)	ΔV _O	5mA ≤ I _o ≤ 3.0A, T _J = +25°C 5mA ≤ I _o ≤ 3.0A	-	10 15	30 80	mV mV
Thermal Regulation	REG _T	Pulse = 10ms, P = 20W T _A = +25°C	-	0.002	0.03	%V _O /W
Quiescent Current	I _Q	5mA ≤ I _o ≤ 3.0A, T _J = +25°C 5mA ≤ I _o ≤ 3.0A	-	3.5 4.0	5.0 6.0	mA mA
Quiescent Current Change	ΔI _Q	14.5V ≤ V _I ≤ 35V, I _o = 5mA T _J = +25°C ; 14.9V ≤ V _I ≤ 27V, I _o = 2.0A ; 5mA ≤ I _o ≤ 3.0A, T _J = +25°C	-	0.1	0.8	mA
Ripple Rejection	RR	f = 120Hz, 15V ≤ V _I ≤ 25V, I _o = 2.0A T _J = +25°C	-	67	-	dB
Dropout Voltage	V _D	I _o = 3A, T _J = +25°C	-	2.2	2.5	V
Output Noise Voltage	V _N	T _A = +25°C, 10Hz ≤ f ≤ 100kHz	-	10	-	μV/V _O
Peak Output Current	I _{PK}	T _A = +25°C	-	5.0	-	A
Output Resistance	R _o	f = 1.0kHz	-	2.0	-	mΩ
Short Circuit Current Limit	I _{sc}	V _I = 35V, T _J = +25°C	-	1.5	2.5	A
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	I _o = 5.0mA	-	0.5	-	mV/°C

Note:

1. Although power dissipation is internally limited, specifications apply only for P_O ≤ P_{max}, P_{max} = 25W
2. Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used. (P_{MAX} = 25W)

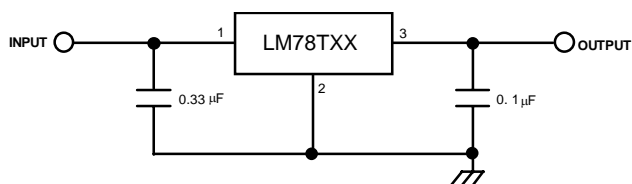
Electrical Characteristics(LM78T15) (Continued)(V_I = 23V, I_O = 3.0 A, 0°C ≤ T_J ≤ +125°C, P_O ≤ P_{MAX} (Note1), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _O	5mA ≤ I _O ≤ 3.0A, T _J = +25°C 17.5V ≤ V _I ≤ 30V, 5mA ≤ I _O ≤ 2.0A	14.4 14.25	15 15	15.6 15.75	V
Line Regulation (Note2)	ΔV _O	17.6V ≤ V _I ≤ 40V, I _O = 5mA, T _J = +25°C 17.6V ≤ V _I ≤ 40V, I _O = 1.0A, T _J = +25°C 18V ≤ V _I ≤ 30V, I _O = 2.0A, T _J = +25°C 20V ≤ V _I ≤ 26V, I _O = 3.0A, T _J = +25°C	-	7.5	55	mV
Load Regulation (Note2)	ΔV _O	5mA ≤ I _O ≤ 3.0A, T _J = +25°C 5mA ≤ I _O ≤ 3.0A	-	10 15	30 80	mV mV
Thermal Regulation	REG _T	Pulse = 10ms, P = 20W T _A = +25°C	-	0.002	0.03	%V _O /W
Quiescent Current	I _Q	5mA ≤ I _O ≤ 3.0A, T _J = +25°C 5mA ≤ I _O ≤ 3.0A	-	3.5 4.0	5.0 6.0	mA mA
Quiescent Current Change	ΔI _Q	17.6V ≤ V _I ≤ 40V, I _O = 5mA T _J = +25°C ; 18V ≤ V _I ≤ 30V, I _O = 2.0A ; 5mA ≤ I _O ≤ 3.0A, T _J = +25°C	-	0.1	0.8	mA
Ripple Rejection	RR	f = 120Hz, 18.5V ≤ V _I ≤ 28.5V, I _O = 2.0A T _J = +25°C	-	65	-	dB
Dropout Voltage	V _D	I _O = 3A, T _J = +25°C	-	2.2	2.5	V
Output Noise Voltage	V _N	T _A = +25°C, 10Hz ≤ f ≤ 100kHz	-	10	-	μV/V _O
Peak Output Current	I _{PK}	T _A = +25°C	-	5.0	-	A
Output Resistance	R _O	f = 1.0kHz	-	2.0	-	mΩ
Short Circuit Current Limit	I _{sc}	V _I = 40V, T _J = +25°C	-	1.0	2.0	A
Average Temperature Coefficient of Output Voltage	ΔV _O /ΔT	I _O = 5.0mA	-	0.5	-	mV/°C

Note:

1. Although power dissipation is internally limited, specifications apply only for P_O ≤ P_{max}, P_{max} = 25W
2. Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used. (P_{MAX} = 25W)

Typical Application

**Note:**

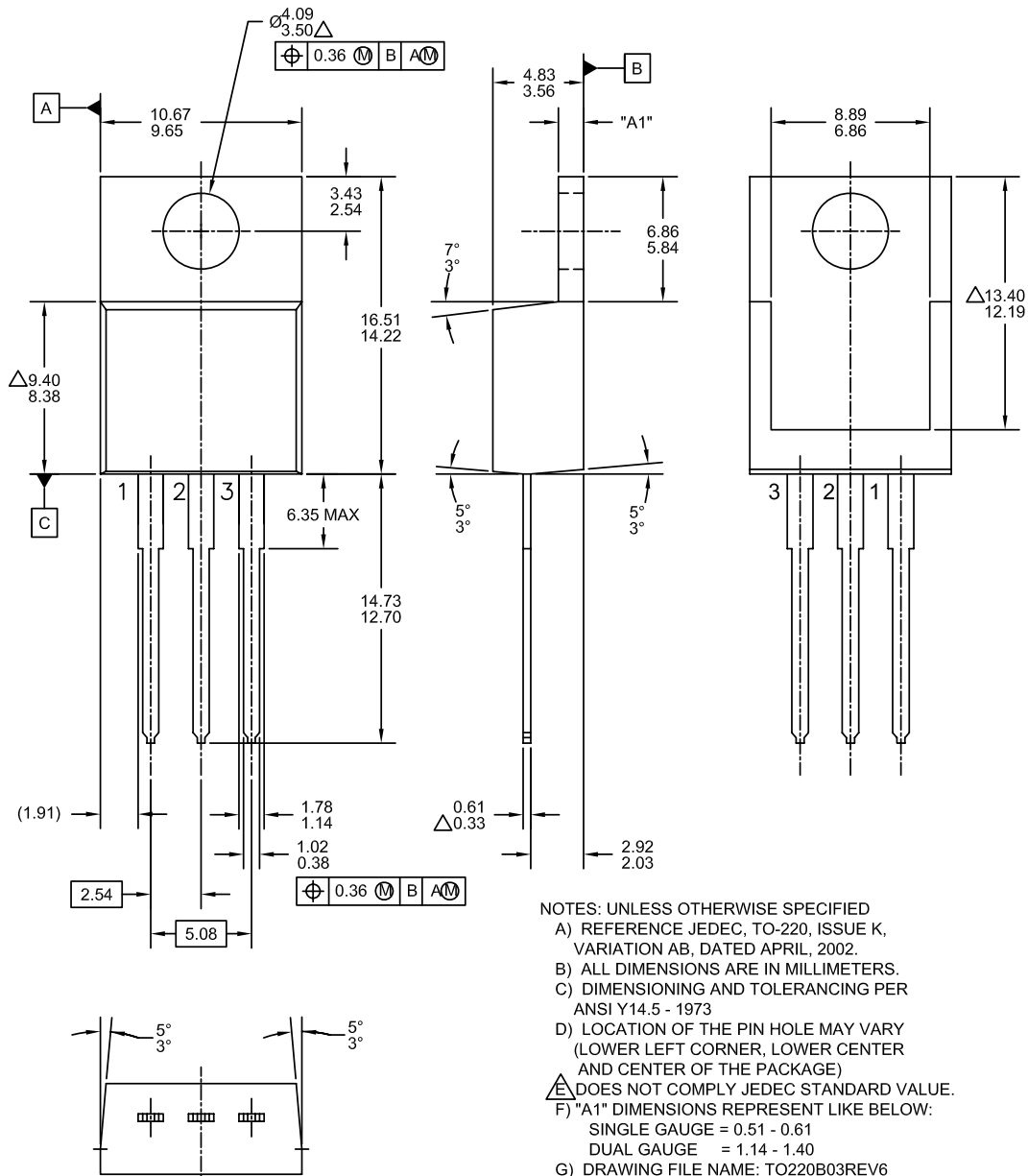
1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator

Mechanical Dimensions

Package

Dimensions in millimeters

TO-220 [SINGLE GAUGE]



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1973
 - D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
 - Δ DOES NOT COMPLY JEDEC STANDARD VALUE.
 - F) "A1" DIMENSIONS REPRESENT LIKE BELOW:
 SINGLE GAUGE = 0.51 - 0.61
 DUAL GAUGE = 1.14 - 1.40
 - G) DRAWING FILE NAME: TO220B03REV6

Ordering Information

Product Number	Package	Operating Temperature
LM78T05CT	TO-220	0 ~ +125°C
LM78T12CT		
LM78T15CT		

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.