



Description

The 78LxxE series of three terminal positive regulators is available with several fixed output voltages, making them useful in a wide range of applications. Used as a Zener-diode and resistor combination replacement, the 78LxxE usually provides an effective output impedance improvement of two orders of magnitude and lower quiescent current. These regulators can provide local, on-card regulation, elimination distribution problems associated with single-point regulation. The available voltages allow the 78LxxE to be used in logic systems, instrumentation, HiFi, and other solid-state electronic equipment.

With adequate heat sinking, the regulator can deliver 100-mA output current. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistors is provided to limit internal power dissipation. If internal power dissipation is too high for the heat sinking provided, the thermal shutdown circuit prevents the IC from overheating.

Features

- Input voltage up to 36 V
- Available output voltages: 5 V, 6V, 8 V, 9 V, 10 V, 12 V and 15 V
- Output current of 100 mA
- Internal thermal overload protection
- Internal short-circuit current limit

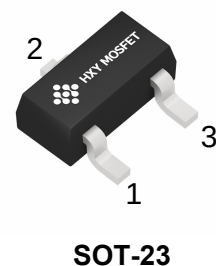
Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
78LxxE	SOT-23	3	Tape & Reel	3000

xx: 05-15

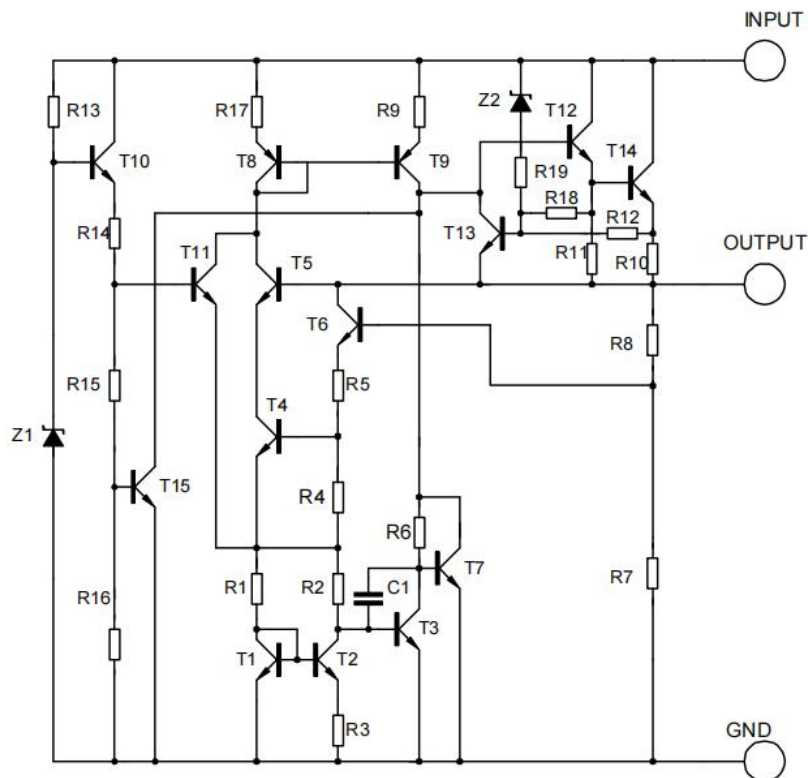
Connection Diagrams and Pin Description

Pin Number	I/O	Function
2	-	Ground
3	I	INPUT
1	O	OUTPUT





Block Diagram



Specifications

Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V _{CC}	Supply Voltage	-	38	V
PD	Power dissipation	Internally limited		
T _{stg}	Storage temperature	-65	150	°C
T _J	Operating Junction Temperature	-40	85	°C

Absolute maximum ratings are those values beyond which the device could be permanently damaged, These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

Recommended Operating conditions

over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter	MIN	MAX	Unit
V _I	Input voltage		36	V
V _O	Continuous Output current		0.1	A



Electrical Characteristics

DC Specifications (78L05E)

$V_{IN} = 10\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
V_O	Output voltage		4.8	5	5.2	V
		$8\text{ V} \leq V_{IN} \leq 20\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	4.75	5	5.25	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	4.75	5	5.25	V
I_{PK}	Peak output current		-	150	-	mA
VRLINE	Line regulation	$8\text{ V} \leq V_{IN} \leq 20\text{ V}$	-	-	75	mV
VRLOAD	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	60	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	30	mV
I_Q	Quiescent current		-	3	5.5	mA
ΔI_Q	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$8\text{ V} \leq V_{IN} \leq 20\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $8\text{ V} \leq V_{IN} \leq 16\text{ V}$	-	60	-	dB
V_d	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 0.7	-	mV/ $^\circ\text{C}$

DC Specifications (78L06E)

$V_{IN} = 12\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
V_O	Output voltage		5.75	6	6.25	V
		$8.5\text{ V} \leq V_{IN} \leq 20\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	5.7	6	6.3	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	5.7	6	6.3	V
I_{PK}	Peak output current		-	150	-	mA
VRLINE	Line regulation	$8.5\text{ V} \leq V_{IN} \leq 20\text{ V}$	-	-	120	mV
VRLOAD	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	80	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	40	mV
I_Q	Quiescent current		-	3	5.5	mA
ΔI_Q	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$9\text{ V} \leq V_{IN} \leq 20\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $10\text{ V} \leq V_{IN} \leq 20\text{ V}$	-	60	-	dB
V_d	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 0.75	-	mV/ $^\circ\text{C}$



DC Specifications (78L08E)

$V_{IN} = 14\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
Vo	Output voltage		7.7	8	8.3	V
		$10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	7.6	8	8.4	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	7.6	8	8.4	V
IPK	Peak output current		-	150	-	mA
VRLINE	Line regulation	$10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$	-	-	150	mV
VRLOAD	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	80	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	40	mV
IQ	Quiescent current		-	3	5.5	mA
ΔIQ	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$11\text{ V} \leq V_{IN} \leq 23\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $11\text{ V} \leq V_{IN} \leq 23\text{ V}$	-	60	-	dB
Vd	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 0.8	-	mV/ $^\circ\text{C}$

DC Specifications (78L09E)

$V_{IN} = 15\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
Vo	Output voltage		8.64	9	9.36	V
		$11.5\text{ V} \leq V_{IN} \leq 24\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	8.55	9	9.45	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	8.55	9	9.45	V
IPK	Peak output current		-	150	-	mA
VRLINE	Line regulation	$11.5\text{ V} \leq V_{IN} \leq 24\text{ V}$	-	-	200	mV
VRLOAD	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	90	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	45	mV
IQ	Quiescent current		-	3	5.5	mA
ΔIQ	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$11.5\text{ V} \leq V_{IN} \leq 24\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $13\text{ V} \leq V_{IN} \leq 24\text{ V}$	-	60	-	dB
Vd	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 0.9	-	mV/ $^\circ\text{C}$



DC Specifications (78L10E)

$V_{IN} = 15\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
V_O	Output voltage		9.6	10	10.4	V
		$12.5\text{ V} \leq V_{IN} \leq 24\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	9.55	10	10.45	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	9.55	10	10.45	V
I_{PK}	Peak output current		-	150	-	mA
VRLINE	Line regulation	$12.5\text{ V} \leq V_{IN} \leq 24\text{ V}$	-	-	200	mV
VRLOAD	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	90	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	45	mV
I_Q	Quiescent current		-	3	5.5	mA
ΔI_Q	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$13\text{ V} \leq V_{IN} \leq 24\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $14\text{ V} \leq V_{IN} \leq 24\text{ V}$	-	60	-	dB
V_d	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 1	-	mV/ $^\circ\text{C}$

DC Specifications (78L12E)

$V_{IN} = 19\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
V_O	Output voltage		11.5	12	12.5	V
		$14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	11.4	12	12.6	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	11.4	12	12.6	V
I_{PK}	Peak output current		-	150	-	mA
VRLINE	Line regulation	$14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$	-	-	250	mV
VRLOAD	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	100	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	50	mV
I_Q	Quiescent current		-	3	5.5	mA
ΔI_Q	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$16\text{ V} \leq V_{IN} \leq 27\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $15\text{ V} \leq V_{IN} \leq 25\text{ V}$	-	50	-	dB
V_d	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 1.1	-	mV/ $^\circ\text{C}$

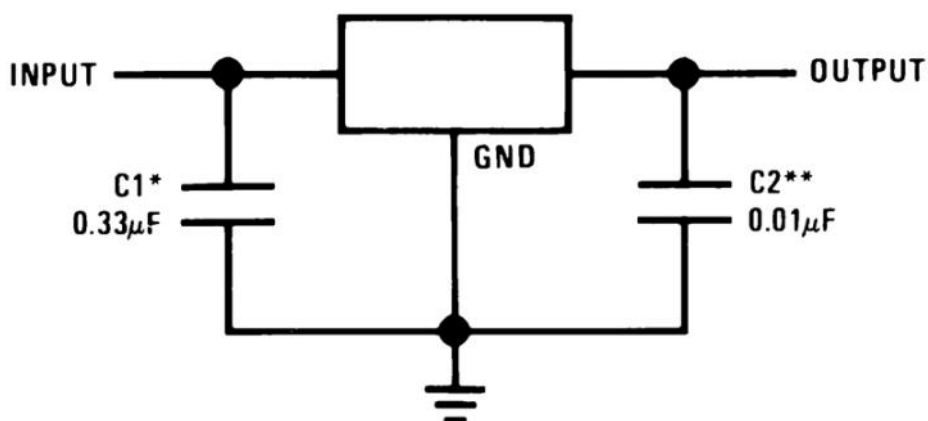


DC Specifications (78L15E)

$V_{IN} = 23\text{ V}$, $I_O = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted).

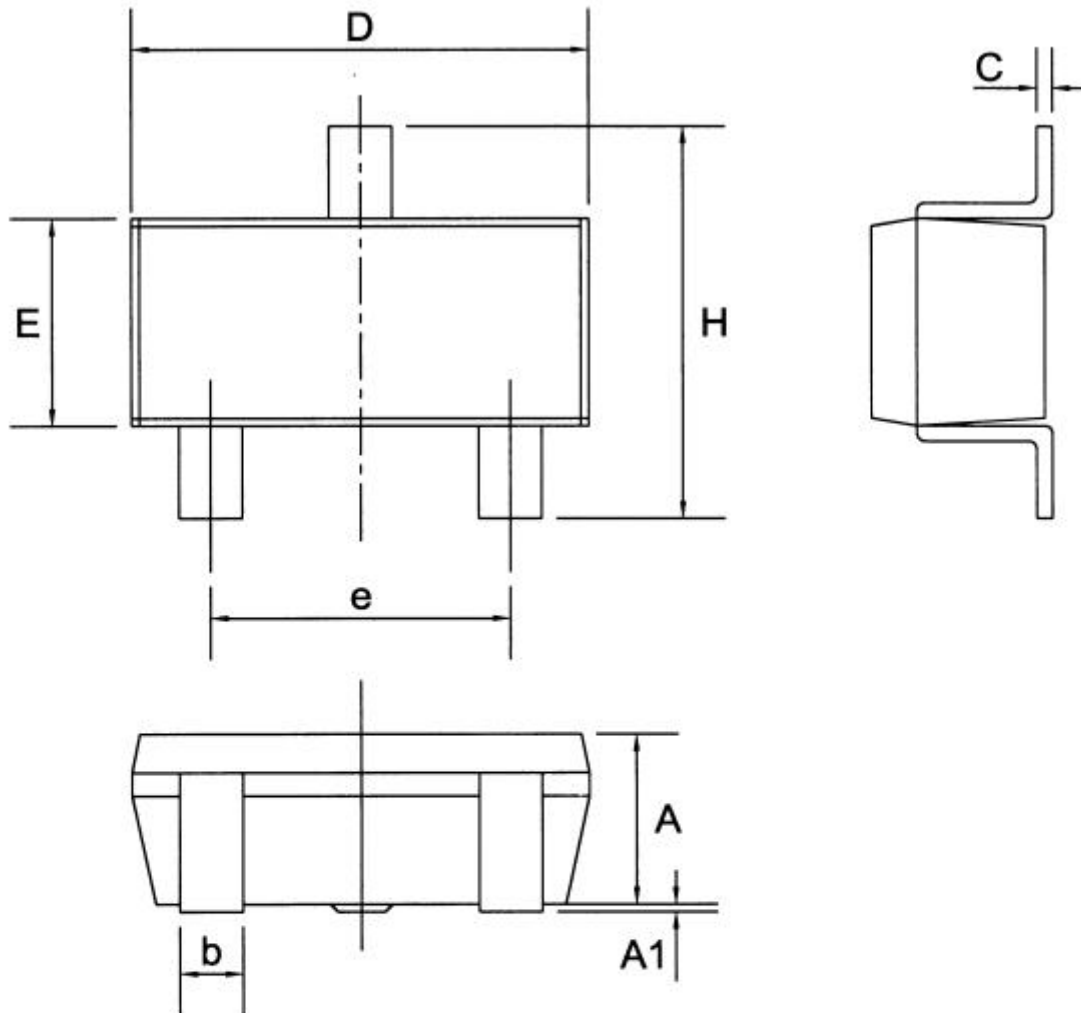
Symbol	Parameter	Test Condition	MIN	TYP	MAX	Unit
V_O	Output voltage		14.4	15	15.6	V
		$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$	14.25	15	15.75	V
		$1\text{ mA} \leq I_O \leq 70\text{ mA}$	14.25	15	15.75	V
I_{PK}	Peak output current		-	150	-	mA
V_{RLINE}	Line regulation	$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$	-	-	250	mV
V_{RLOAD}	Load regulation	$1\text{ mA} \leq I_O \leq 100\text{ mA}$	-	-	150	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	75	mV
I_Q	Quiescent current		-	3	5.5	mA
ΔI_Q	Quiescent current change	$1\text{ mA} \leq I_O \leq 40\text{ mA}$	-	-	0.1	mA
		$20\text{ V} \leq V_{IN} \leq 30\text{ V}$, $I_O = 0\text{ mA}$	-	-	1.5	mA
$\Delta V_{IN} / \Delta V_O$	Ripple rejection	$f = 120\text{ Hz}$, $18.5\text{ V} \leq V_{IN} \leq 28.5\text{ V}$	-	50	-	dB
V_d	Dropout voltage		-	1.7	--	V
$\Delta V_O / \Delta T$	Average output voltage temperature coefficient	$-40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, $I_O = 5\text{ mA}$	-	± 1.4	-	mV/ $^\circ\text{C}$

Application Circuit





SOT-23 Package Information



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.05	1.15	1.35	0.041	0.045	0.053
A1	—	0.05	0.10	—	0.002	0.004
b	0.35	0.40	0.55	0.014	0.016	0.022
C	0.08	0.10	0.20	0.003	0.004	0.008
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.20	1.35	1.50	0.047	0.053	0.059
e	1.70	1.90	2.10	0.067	0.075	0.083
H	2.35	2.55	2.75	0.093	0.100	0.108



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