

3-Terminal 100mA Positive Voltage Regulator

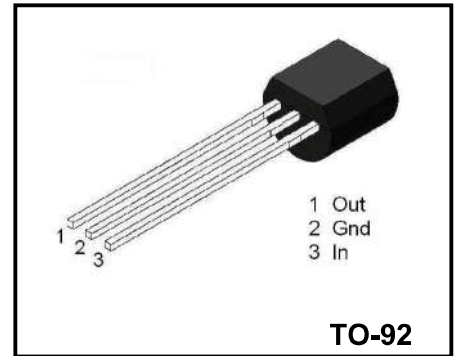
FEATURES

- ✦ Output Current up to 100mA
- ✦ Output Voltages of 3.3,5,6,8,9 , 12, 15, 18, 24V
- ✦ Thermal Overload Protection Short Circuit Protection
- ✦ No External Components are required
- ✦ Available in either $\pm 5\%$ (AC) or $\pm 10\%$ (C) selection

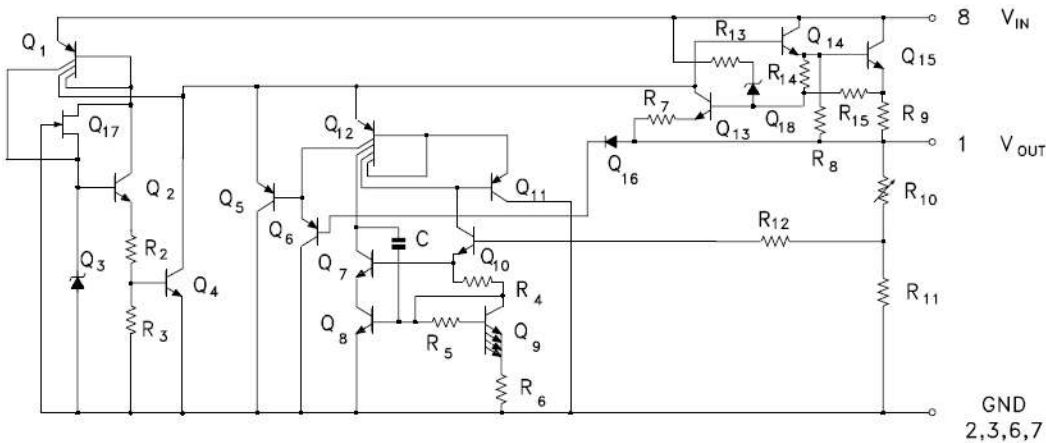
Description

The 78LXX series of three-terminal positive regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heat-sink is provided, they can deliver up to 100mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators.

The 78LXX series used as Zener diode/resistor combination replacement, offers an effective Output impedance improvement of typically two orders of magnitude, along with lower quiescent current and lower noise.



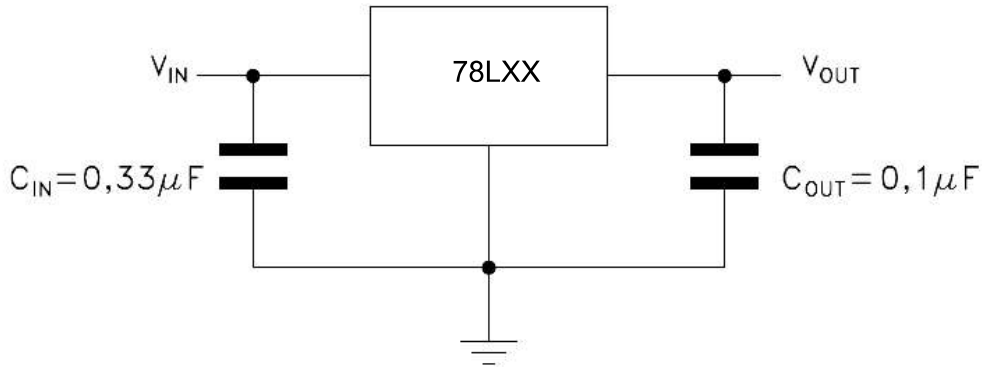
Internal Block Diagram



Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{IN}	Input Voltage	3.3 ~ 10V	30	V
		12 ~ 15V	35	
		18 ~ 24V	40	
I_O	Output Current		100	mA
$R_{thj-amb}$	Thermal Resistance Junction-ambient	MAX	200	$^{\circ}C/W$
T_{OPR}	Operating Junction Temperature Range		0 ~ 125	$^{\circ}C$
T_{STG}	Storage Temperature Range		-40 ~ + 125	$^{\circ}C$

Test Circuits



Electrical Characteristics (78L33)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=8.3\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 1\text{mA} \sim 40\text{mA}$ $V_I = 5.3 \sim 20\text{V}$	2.97	3.3	3.63	V
Line Regulation(Note)	ΔV_O	$V_I = 5.3\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			150	mV
		$V_I = 6.3\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			100	
Load Regulation	ΔV_O	$I_O = 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			60	mV
		$I_O = 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			30	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6	mA
Quiescent Current Change	ΔI_Q	$I_O = 1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 6.3 \sim 20\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		40		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L05)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_o=40\text{mA}$, $V_I=10\text{V}$, unless otherwise specified, $C_1 = 0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 1\text{mA} \sim 40\text{mA}$ $V_I = 7 \sim 20\text{V}$	4.8	5	5.2	V
Line Regulation(Note)	ΔV_o	$V_I = 8.5\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			200	mV
		$V_I = 9\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			150	
Load Regulation	ΔV_o	$I_o = 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			60	mV
		$I_o = 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			30	
Quiescent Current	I_q	$T_J = 25^{\circ}\text{C}$			6	mA
Quiescent Current Change	ΔI_q	$I_o = 1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 8 \sim 20\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		40		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L06)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_o=40\text{mA}$, $V_I=12\text{V}$, unless otherwise specified, $C_1 = 0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 1\text{mA} \sim 40\text{mA}$ $V_I = 8.5 \sim 20\text{V}$	5.7	6	6.3	V
Line Regulation(Note)	ΔV_o	$V_I = 8.5\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			200	mV
		$V_I = 9\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			150	
Load Regulation	ΔV_o	$I_o = 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			60	mV
		$I_o = 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			30	
Quiescent Current	I_q	$T_J = 25^{\circ}\text{C}$			6	mA
Quiescent Current Change	ΔI_q	$I_o = 1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 8 \sim 20\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		40		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L08)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=14\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O= 1\text{mA} \sim 40\text{mA}$ $V_I = 10.5 \sim 23\text{V}$	7.6	8	8.4	V
Line Regulation(Note)	ΔV_O	$V_I = 10.5\text{V} \sim 23\text{V}, T_J = 25^{\circ}\text{C}$			200	mV
		$V_I = 11\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			150	
Load Regulation	ΔV_O	$I_O= 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			80	mV
		$I_O= 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			40	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6	mA
Quiescent Current Change	ΔI_Q	$I_O=1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 11 \sim 23\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		60		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L09)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=15\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O= 1\text{mA} \sim 40\text{mA}$ $V_I = 11.5 \sim 23\text{V}$	8.55	9	9.45	V
Line Regulation(Note)	ΔV_O	$V_I = 11.5\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			250	mV
		$V_I = 11.5\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			200	
Load Regulation	ΔV_O	$I_O= 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			80	mV
		$I_O= 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			40	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6	mA
Quiescent Current Change	ΔI_Q	$I_O=1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 12 \sim 23\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		44		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L12)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=19\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O= 1\text{mA} \sim 40\text{mA}$ $V_I = 14.5 \sim 20\text{V}$	11.4	12	12.6	V
Line Regulation(Note)	ΔV_O	$V_I = 14.5\text{V} \sim 27\text{V}, T_J = 25^{\circ}\text{C}$			250	mV
		$V_I = 16\text{V} \sim 27\text{V}, T_J = 25^{\circ}\text{C}$			200	
Load Regulation	ΔV_O	$I_O= 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			100	mV
		$I_O= 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			50	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6.5	mA
Quiescent Current Change	ΔI_Q	$I_O=1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 16 \sim 27\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		80		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L15)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=23\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O= 1\text{mA} \sim 40\text{mA}$ $V_I = 17.5 \sim 30\text{V}$	14.25	15	15.75	V
Line Regulation(Note)	ΔV_O	$V_I = 17.5\text{V} \sim 30\text{V}, T_J = 25^{\circ}\text{C}$			300	mV
		$V_I = 23\text{V}, T_J = 25^{\circ}\text{C}$			250	
Load Regulation	ΔV_O	$I_O= 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			150	mV
		$I_O= 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			75	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6.5	mA
Quiescent Current Change	ΔI_Q	$I_O=1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 20 \sim 30\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		90		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L18)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=26\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 1\text{mA} \sim 40\text{mA}$ $V_I = 22 \sim 33\text{V}$	17.1	18	18.9	V
Line Regulation(Note)	ΔV_O	$V_I = 22\text{V} \sim 33\text{V}, T_J = 25^{\circ}\text{C}$			320	mV
		$V_I = 22\text{V} \sim 33\text{V}, T_J = 25^{\circ}\text{C}$			270	
Load Regulation	ΔV_O	$I_O = 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			170	mV
		$I_O = 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			85	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6.5	mA
Quiescent Current Change	ΔI_Q	$I_O = 1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 23 \sim 33\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		120		μV
Dropout Voltage	V_D			1.7		V

Electrical Characteristics (78L24)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=40\text{mA}$, $V_I=33\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 1\text{mA} \sim 40\text{mA}$ $V_I = 27 \sim 38\text{V}$	22.8	24	25.2	V
Line Regulation(Note)	ΔV_O	$V_I = 27\text{V} \sim 38\text{V}, T_J = 25^{\circ}\text{C}$			350	mV
		$V_I = 9\text{V} \sim 20\text{V}, T_J = 25^{\circ}\text{C}$			300	
Load Regulation	ΔV_O	$I_O = 1\text{mA} \sim 100\text{mA}, T_J = 25^{\circ}\text{C}$			200	mV
		$I_O = 1\text{mA} \sim 40\text{mA}, T_J = 25^{\circ}\text{C}$			100	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			6.5	mA
Quiescent Current Change	ΔI_Q	$I_O = 1\text{mA} \sim 40\text{mA}$			0.2	mA
		$V_I = 28 \sim 38\text{V}$			1.5	
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		200		μV
Dropout Voltage	V_D			1.7		V

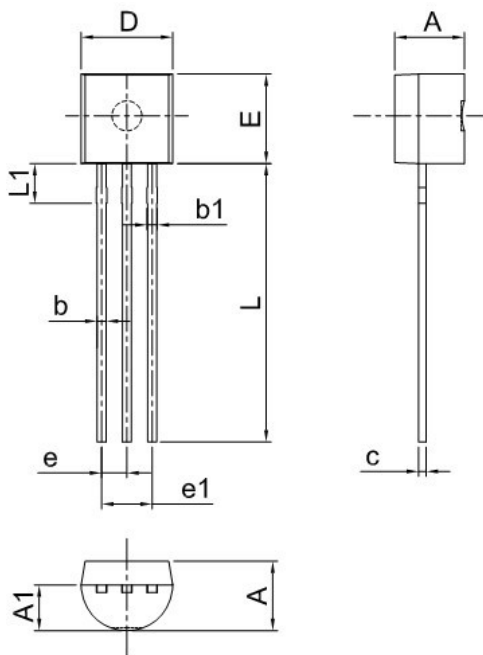
Ordering information

Package	Packing Description	Base Quantity
TO-92	Bulk	1000pcs/Bag
	Tape	2000pcs/Box

Package Dimensions

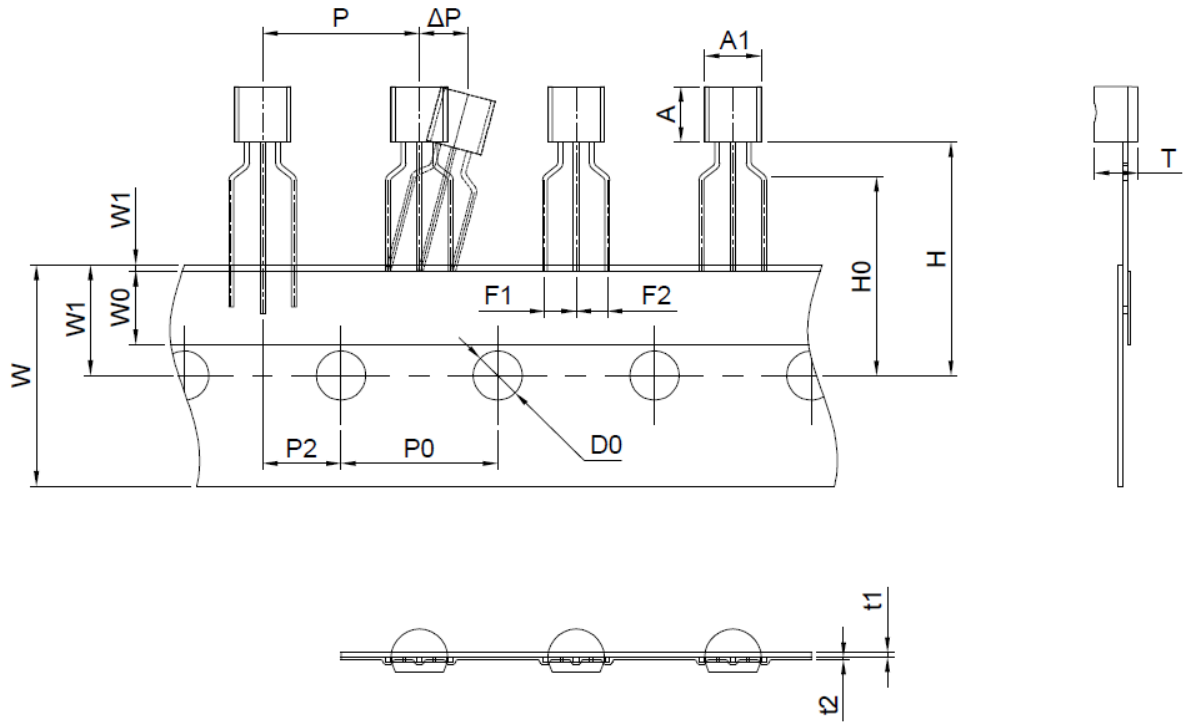
TO-92

Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	3.30	3.70	0.130	0.146
A1	2.30	2.70	0.091	0.106
b	0.40	0.50	0.016	0.020
b1	0.50	0.70	0.020	0.028
c	0.35	0.45	0.014	0.018
D	4.45	4.70	0.175	0.185
E	4.40	4.65	0.173	0.183
e	1.17	1.37	0.046	0.054
e1	2.34	2.64	0.092	0.104
L	13.50	14.50	0.531	0.571
L1	1.80	2.20	0.071	0.087

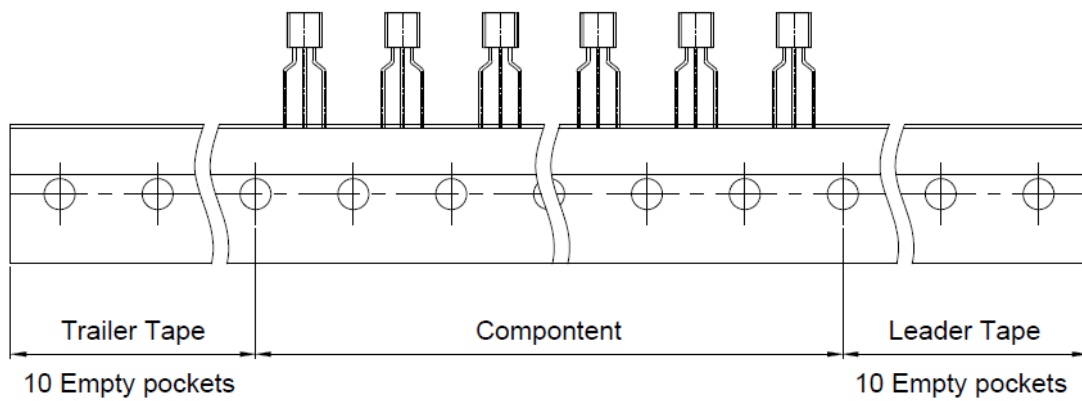


Taping Dimensions

TO-92



Dimensions are in millimeter								
A	A1	T	P	P0	P2	F1	F2	W
4.6	4.6	3.5	12.7	12.7	6.35	2.54	2.54	18.0
W0	W1	W2	H	H0	D0	t1	T2	ΔP
6.0	9.0	1.0Max	19.0	18.0	4.0	0.4	0.2	0



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