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TX7110

1A Bipolar Linear Regulator

Features

- Maximum output current is 1A
- Range of operation input voltage: Max 15V
- Line regulation: 0.03%/V (typ.)
- ESD HBM:8KV
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)
- Environment Temperature: -40°C~125°C

Applications

- Power Management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

General Description

TX7110 is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current. TX7110 features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version, $V_{out} = 1.2V, 1.5V, 1.8V, 2.5V, 3.3V,$ and $5V,$ TX7110 has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two

external resistors.

TX7110 offers thermal shut down function, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within 2%. Other output voltage accuracy can be customized on demand, such as 1%.

TX7110 is available in SOT89 package.

Selection Table

Part No.	Output Voltage	Package	Marking
TX7110-1.2V	1.2V	SOT89	7110 XX SSWW
TX7110-1.5V	1.5V		
TX7110-1.8V	1.8V		
TX7110-2.5V	2.5V		
TX7110-3.3V	3.3V		
TX7110-5.0V	5.0V		
TX7110-ADJ	adj		

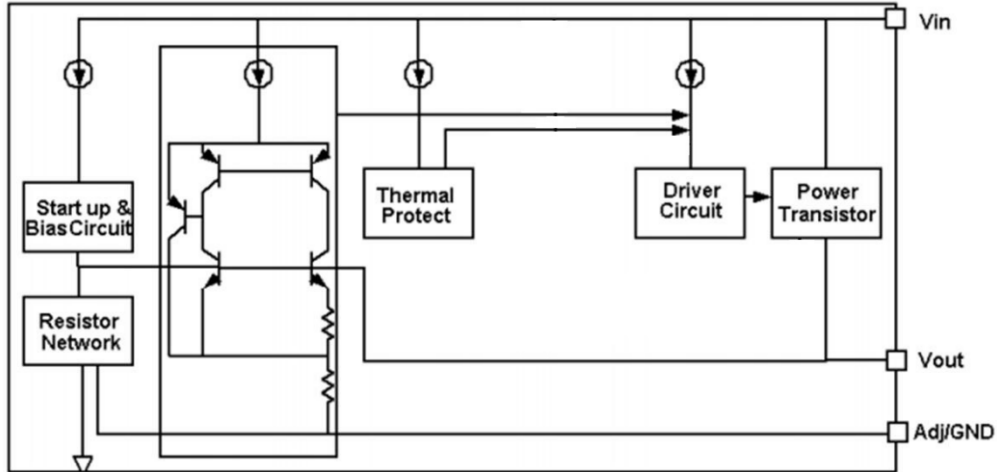
- Note: 1. "XX" stands for output voltage,
2. "SSWW" stands for order number and data code.

Ordering Information

Part No.	Package Type	Packing type
TX7110-XXPR	SOT89-3	1000 Tape&Reel



Block Diagram



Pin Configuration

SOT89 (Top View)

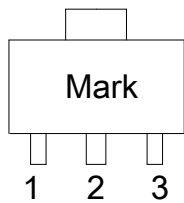


Table1: TX7110 series (SOT89 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VSS/ADJ	VSS/ADJ pin
2	VOUT	Output voltage pin
3	VIN	Input voltage pin

Absolute Maximum Ratings

Max Input Voltage 18V
 Max Operating Junction Temperature(Tj) 150°C
 Storage Temperature(Ts)..... -40°C~150°C
 Lead Temperature & Time..... 260°C 10S
 Caution: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.



Electrical Characteristics

T_A=25°C, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{ref}	Reference voltage	TX7110-Adj 10mA ≤ I _{out} ≤ 1A, V _{in} =3.25V	1.225	1.25	1.275	V
V _{out}	Output voltage	TX7110-1.2V 0 ≤ I _{out} ≤ 1A, V _{in} =2.5V	1.176	1.2	1.224	V
		TX7110-1.5V 0 ≤ I _{out} ≤ 1A, V _{in} =2.8V	1.47	1.5	1.53	V
		TX7110-1.8V 0 ≤ I _{out} ≤ 1A, V _{in} =3.1V	1.764	1.8	1.836	V
		TX7110-2.5V 0 ≤ I _{out} ≤ 1A, V _{in} =3.8V	2.45	2.5	2.55	V
		TX7110-3.3V 0 ≤ I _{out} ≤ 1A, V _{in} =4.6V	3.234	3.3	3.366	V
		TX7110-5.0V 0 ≤ I _{out} ≤ 1A, V _{in} =6.3V	4.9	5	5.1	V

ΔV _{out}	Line regulation	TX7110-1.2V I _{out} =10mA, 2.7V ≤ V _{in} ≤ 10V	--	4	19	mV
		TX7110-1.5V I _{out} =10mA, 3.0V ≤ V _{in} ≤ 10V	--	5	26	mV
		TX7110-ADJ I _{out} =10mA, 2.75V ≤ V _{in} ≤ 12V	--	5	24	mV
		TX7110-1.8V I _{out} =10mA, 3.3V ≤ V _{in} ≤ 12V	--	5	32	mV
		TX7110-2.5V I _{out} =10mA, 4.0V ≤ V _{in} ≤ 12V	--	8	41	mV
		TX7110-3.3V I _{out} =10mA, 4.8V ≤ V _{in} ≤ 12V	--	9	49	mV
		TX7110-5.0V I _{out} =10mA, 6.5V ≤ V _{in} ≤ 12V	--	10	56	mV

		TX7110-1.2V V _{in} = 2.5V, 10mA ≤ I _{out} ≤ 1A	--	2	12	mV
		TX7110-1.5V V _{in} = 2.8V, 10mA ≤ I _{out} ≤ 1A	--	2	15	mV
		TX7110-1.8V	--	3	18	mV



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ΔV_{out}	Load regulation	$V_{in} = 3.1V, 10mA \leq I_{out} \leq 1A$ TX7110-2.5V $V_{in} = 3.8V, 10mA \leq I_{out} \leq 1A$	--	4	25	mV		
		TX7110-3.3 $V_{in} = 4.6V, 10mA \leq I_{out} \leq 1A$	--	6	33	mV		
		TX7110-5.0 $V_{in} = 6.3V, 10mA \leq I_{out} \leq 1A$	--	9	50	mV		
		TX7110-ADJ $V_{in} = 2.55V, 10mA \leq I_{out} \leq 1A$	--	2	40	mV		
		Vdrop	Dropout voltage	$I_{out} = 100mA$	--	1.05	1.1	V
				$I_{out} = 1A$	--	1.1	1.3	V
I_{min}	Minimum load current	TX7110-ADJ	--	2	10	mA		
I_q	Quiescent Current	TX7110-1.2V, $V_{in} = 10V$	--	2	5	mA		
		TX7110-1.5V, $V_{in} = 10V$	--	2	5	mA		
		TX7110-1.8V, $V_{in} = 12V$	--	2	5	mA		
		TX7110-2.5V, $V_{in} = 12V$	--	2	5	mA		
		TX7110-2.85V, $V_{in} = 12V$	--	2	5	mA		
		TX7110-3.3V, $V_{in} = 12V$	--	2	5	mA		
		TX7110-5.0V, $V_{in} = 12V$	--	2	5	mA		
I_{Adj}	Adjust pin current	TX7110-ADJ $V_{in} = 5V, 10mA \leq I_{out} \leq 1A$	--	55	120	μA		
I_{change}	I_{adj} change	TX7110-ADJ $V_{in} = 5V, 10mA \leq I_{out} \leq 1A$	--	0.2	10	μA		
$\Delta V / \Delta T$	Temperature coefficient		--	± 100		ppm		

Note1: All test are conducted under ambient temperature 25° C and within a short period of time 20ms

Note2: Load current smaller than minimum load current of TX7110-ADJ will lead to unstable or oscillation output.



Detailed Description

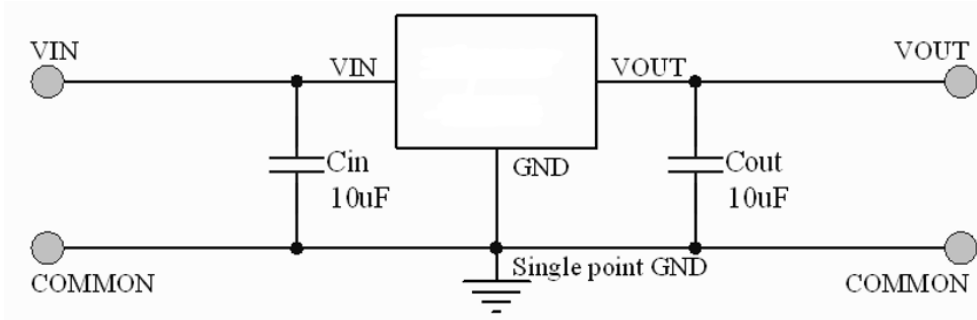
TX7110 is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, power transistors and its driver circuit and so on.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/°C. And the accuracy of output voltage is guaranteed by trimming technique.

Typical Application

TX7110 has an adjustable version and six fixed versions (1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5V)

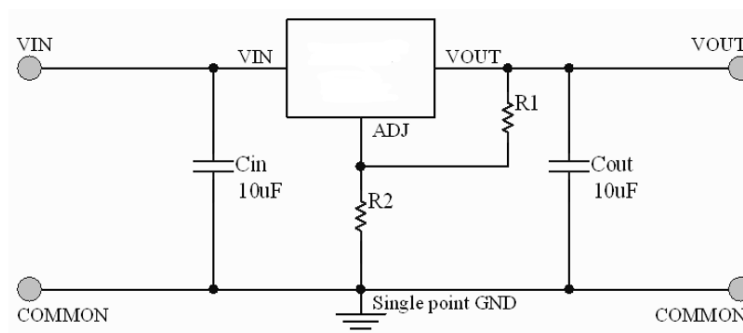
Fixed Output Voltage Version



Application circuit of TX7110 fixed version

- 1) Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.
- 2) Recommend using 10uF tan capacitor to assure circuit stability.

Adjustable Output Voltage Version



Application Circuit of TX7110-ADJ

The output voltage of adjustable version follows the equation: $V_{out} = 1.25 \times (1 + R2/R1) + I_{Adj} \times R2$. We can ignore I_{Adj} because I_{Adj} (about 50uA) is much less than the current of $R1$ (about 2~10mA).

- 1) To meet the minimum load current (>10mA) requirement, $R1$ is recommended to be 125ohm or lower. As TX7110-ADJ can keep itself stable at load current about 2mA, $R1$ is not allowed to be higher than 625ohm.



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2) Using a bypass capacitor (C_{ADJ}) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of C_{ADJ} should be less than $R1$ to prevent ripple from being amplified. As $R1$ is normally in the range of $100\Omega\sim 500\Omega$, the value of C_{ADJ} should satisfy this equation: $1/(2\pi \times f_{ripple} \times C_{ADJ}) < R1$.

Thermal Considerations

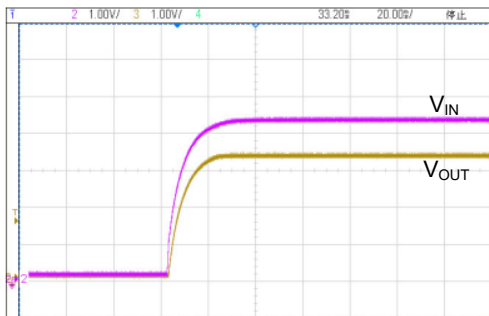
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by TX7110 is very large. TX7110 series uses SOT-223 package type and its thermal resistance is about $20^{\circ}\text{C}/\text{W}$. And the copper area of application board can affect the total thermal resistance. If copper area is $5\text{cm} \times 5\text{cm}$ (two sides), the resistance is about $30^{\circ}\text{C}/\text{W}$. So the total thermal resistance is about $20^{\circ}\text{C}/\text{W} + 30^{\circ}\text{C}/\text{W}$. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as $120^{\circ}\text{C}/\text{W}$, then the power dissipation of TX7110 could allow on itself is less than 1W. And furthermore, TX7110 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

Typical Performance Characteristics

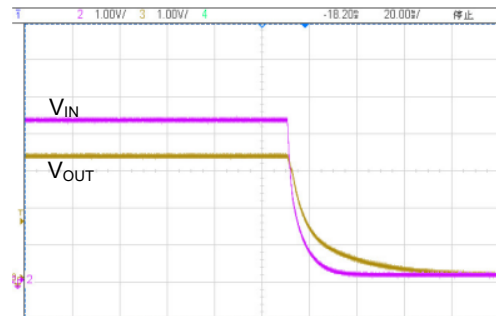
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Power ON / OFF

$V_{IN}=0\text{V to } 5.0\text{V}$ $I_{OUT}=10\text{mA}$

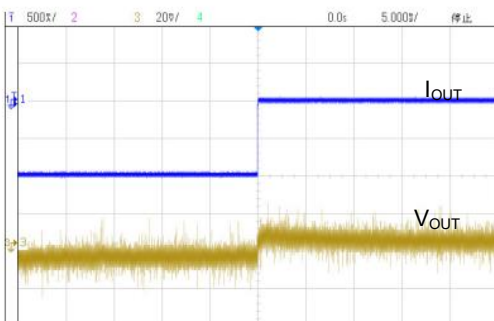


$V_{IN}=5.0\text{V to } 0\text{V}$ $I_{OUT}=10\text{mA}$

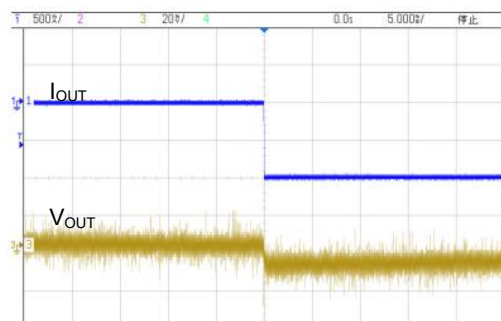


Load Transient Response

$I_{OUT}=1\text{mA to } 1\text{A}$



$I_{OUT}=1\text{A to } 1\text{mA}$





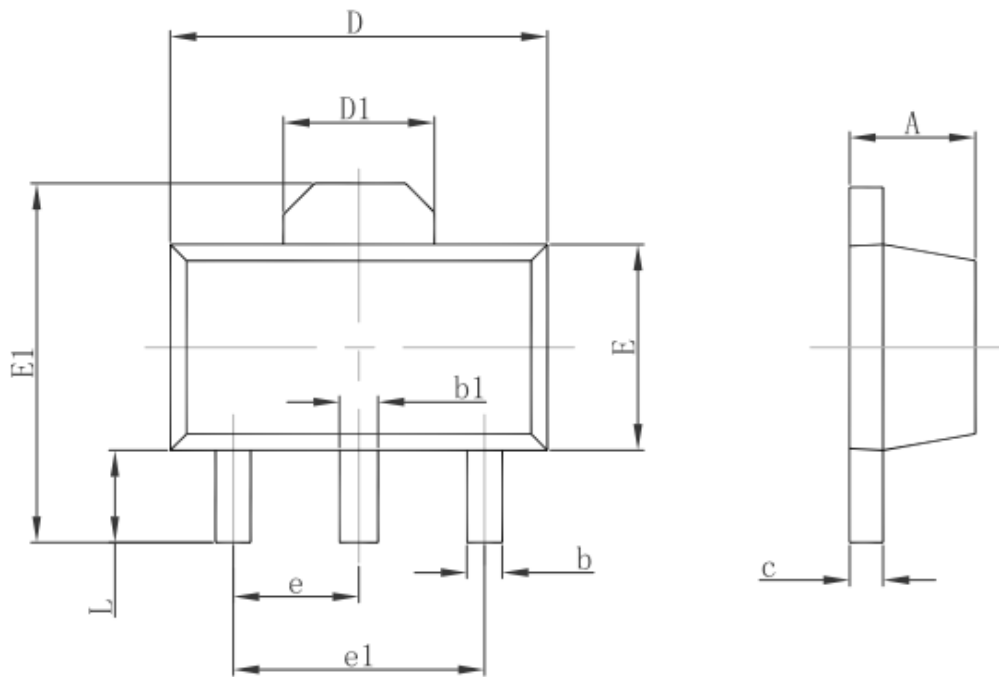
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Package Information

3-pin SOT89 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047



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