700mA LDO Regulator

Features

- Output Current 700mA or more
- Dropout Voltage: 150mV@300mA
- Operating Voltage Range: 1.8V-5.5V
- Output Voltage Range: 1.2V to 3.3V (100 mV Step)
- Low Power Consumption: 80μA
- Standby Current: 0.1μA
- High Ripple Rejection: 70dB@1kHz
- Output Current-Limit Protection
- Thermal Shutdown Protection
- Operating Temperature Range: -40℃~+85℃
- Low ESR Capacitor Compatible: Ceramic Capacitor
- Lead Free and Green Package: SOT23-5L, SOT89-3L and SOT89-5L

Description

The PT7M8220B series are highly accurate, low dropout voltage regulators with high current, low noise, high ripple rejection and low current consumption.

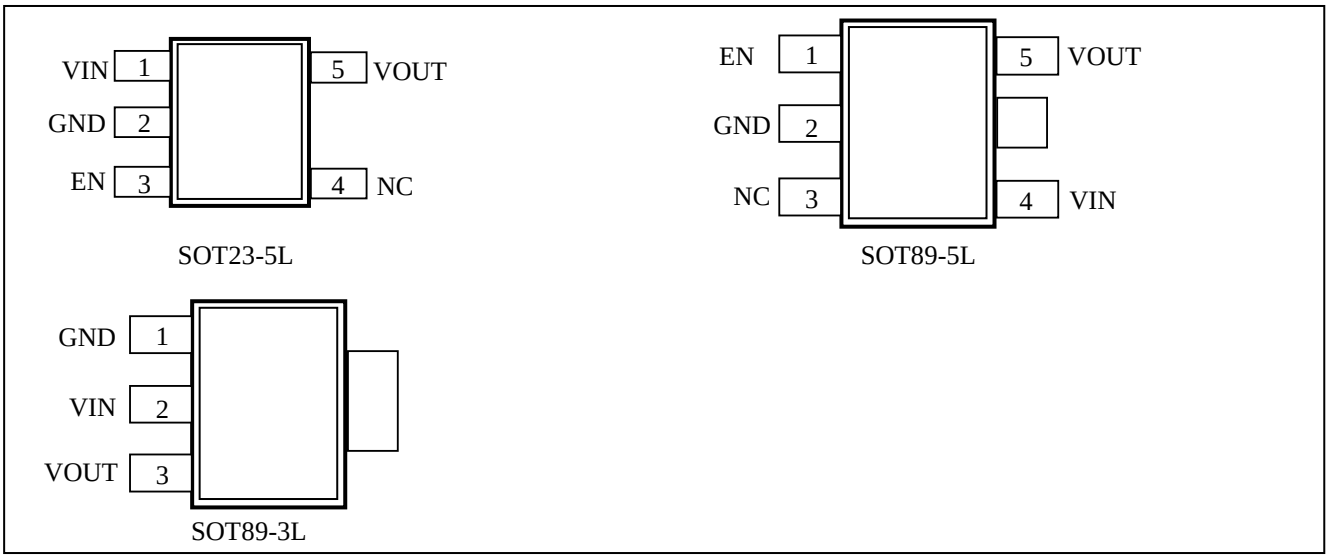
The PT7M8220B includes a reference voltage source, an error amplifier, a driver transistor, a current limit protection, a thermal protection and an internal phase compensator.

The output voltage for the regulator is set by factory trimming within a range of 1.2V to 3.3V in 100mV step including 2.85V. The PT7M8220B series are stable with low ESR ceramic capacitors.

Applications

- Mobile phones (PDC, GSM, CDMA, IMT2000 etc.)
- Cordless phones and radio communication
- Digital still cameras and video cameras
- PDAs
- MP3 players
- Portable devices

Pin Assignment



Pin Description

Pin No for SOT23-5L	Pin No for SOT89-5L	Pin No for SOT89-3L	I/O	Name	Descriptions
1	4	2	I	VIN	Regulator Supply Input. Supply voltage can range from 1.8V to 5.5V. Bypass with a 1μF ceramic capacitor (X5R/X7R) to GND.
2	2	1	P	GND	Ground.
3	1	-	I	EN	ON/OFF Control of Regulator. High active. No any pull-up/pull-down resistors internal.
4	3	-	-	NC	No Connection.
5	5	3	O	VOUT	Output of Regulator. Bypass with a 1μF ceramic capacitor (X5R/X7R) to GND.

Maximum Ratings

Storage Temperature…….. -55℃ to +125℃
Ambient Temperature with Power Applied.....-40℃ to +85℃
Input Voltage……..……+6.0V
Output Voltage ……..-0.3 to V_{CC} +0.3V
EN pin Voltage…… +6.0V
DC Input/Output Current ……..700mA
Power Dissipation…….SOT23/400mW
SOT89/550mW
UDFN/600mW

Note:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Operating Voltage	1.8	-	5.5	V
T_A	Operating temperature	-40	25	85	℃

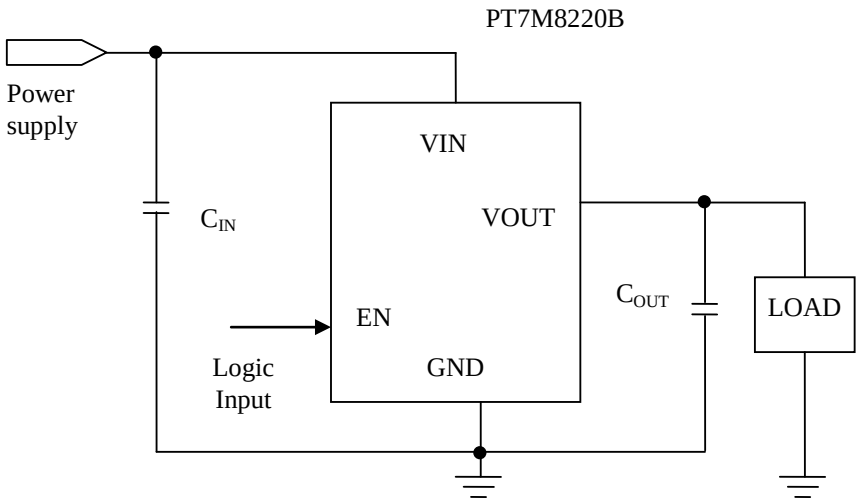
Electrical Characteristics (T_A=25℃)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Output Voltage	$V_{OUT(E)}$ *2	$V_{IN}=V_{OUT(S)}$ *1+1.0V, I_{OUT}=30mA		$V_{OUT(S)}$ *0.98	$V_{OUT(S)}$	$V_{OUT(S)}$ *1.02	V
Maximum Output Current	I_{OUTMAX}	$V_{IN}=V_{OUT(S)}$+1.0V, $V_{OUT(E)}$ >=1.6V		700	-	-	mA
		$V_{IN}=V_{OUT(S)}$+1.0V, $V_{OUT(E)}$ <=1.5V		500	-	-	
Dropout Voltage	Vdif*3	I_{OUT}=150mV @ 300mA	1.2V≤$V_{OUT(S)}$ ≤1.4V	-	0.30	0.45	V
			1.5V≤$V_{OUT(S)}$ ≤1.9V	-	0.27	0.41	
			2.0V≤$V_{OUT(S)}$ ≤2.4V		0.24	0.36	
			2.5V≤$V_{OUT(S)}$ ≤2.9V	-	0.18	0.27	
			3.0V≤$V_{OUT(S)}$≤3.3V	-	0.15	0.23	
Supply Current	I_{SS}	V_{IN} = $V_{OUT(S)}$ +1.0V, no load		-	80	100	μA
Standby Current	I_{SB}	V_{IN} = $V_{OUT(S)}$+1.0V EN=OFF		-	0.1	1	μA
Line Regulation	ΔV_{OUT}/ ΔV_{IN}*V_{OUT}	$V_{OUT(S)}$+1.0V≤V_{IN}≤5.5V I_{OUT}=30mA		-	0.05	0.2	%/V
Load Regulation	ΔV_{OUT2}	V_{IN} = $V_{OUT(S)}$+1.0V, 1.0mA≤I_{OUT} ≤300mA		-	-	0.6	mV
Input Voltage	V_{IN}	-		1.8	-	5.5	V
Output Voltage Temperature Characteristic	ΔV_{OUT}/ ΔTopr*V_{OUT}	I_{OUT}=30mA -40℃≤T_A≤85℃		-	+/-100	-	ppm/℃
Ripple Rejection	PSRR	V_{IN}=[$V_{OUT(S)}$+1.0]V_{DC}+1Vp-p AC I_{OUT}=30mA, f=1kHz		-	70	-	dB
Current Limit	I_{LIM}	V_{OUT} = $V_{OUT(S)}$*0.9		700	900	-	mA
Short-Circuit Limit	I_{SHORT}	V_{IN}=$V_{OUT(S)}$+1.0V, EN=ON		-	150	-	mA
Thermal Shutdown	TSD	-		-	170	-	℃
Thermal Shutdown Hysteresis	ΔTSD	-		-	40	-	
EN "High" Voltage	V_{ENH}	-		1.5	-	-	V
EN "Low" Voltage	V_{ENL}	-		-	-	0.3	
EN "High" Current	I_{ENH}	V_{IN}=$V_{OUT(S)}$+1.0V		-0.10	-	0.10	μA
EN "Low" Current	I_{ENL}	V_{IN}= $V_{OUT(S)}$+1.0V		-0.10	-	0.10	
Output Discharge Resistance	Rdis	V_{IN}= $V_{OUT(S)}$+1.0V EN=Low		-	1	-	kΩ

Note:
*1: $V_{OUT(S)}$=Specified output voltage.
*2: $V_{OUT(E)}$=Effective output voltage.
(I.e. the output voltage when "$V_{OUT(S)}$+1.0V" is provided at the VIN pin while maintaining a certain I_{OUT} value).

*3: Vdif={$V_{IN1}^{(*5)}$-$V_{OUT1}^{(*4)}$}.
*4: V_{OUT1}=A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} {$V_{OUT(S)}$+1.0V} is input.
*5: V_{IN1}=The input voltage when V_{OUT1} appears as input voltage is gradually decreased.
*6: Unless otherwise stated, $V_{IN}=V_{OUT(S)}$ + 1.0V

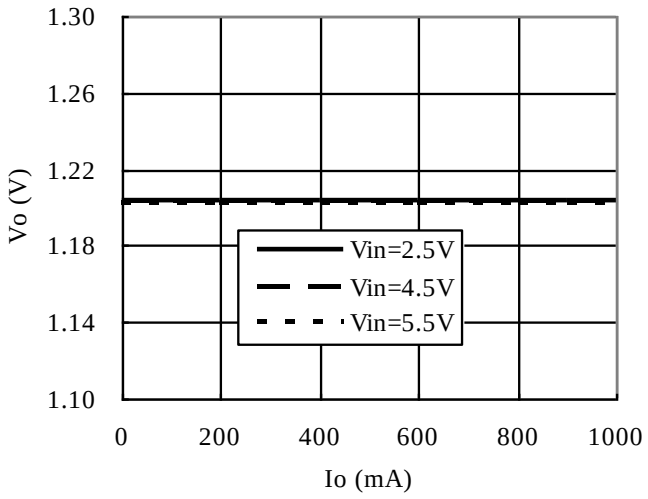
Application Circuit



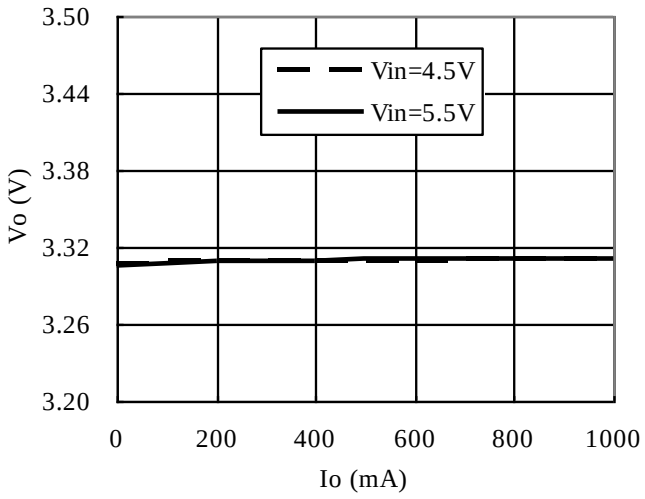
Typical Performance and Characteristics

1. Output Voltage vs. Output Current

PT7M8220B (1.2V)
Cin=1μF(Ceramics), Cout=1μF(Ceramics)

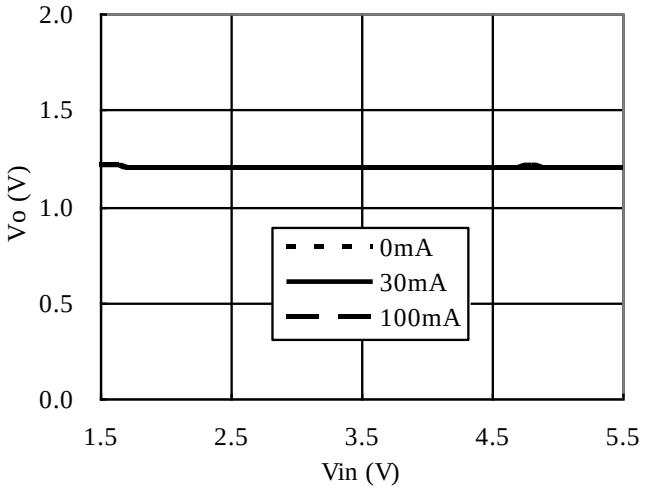


PT7M8220B (3.3V)
Cin=1μF(Ceramics), Cout=1μF(Ceramics)

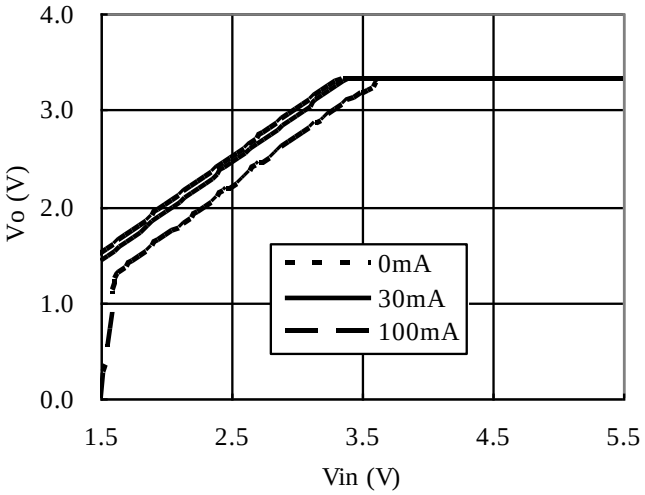


2. Output Voltage vs. Input Voltage

PT7M8220B (1.2V)
Topr=25℃
Cin=1μF(Ceramics), Cout=1μF(Ceramics)

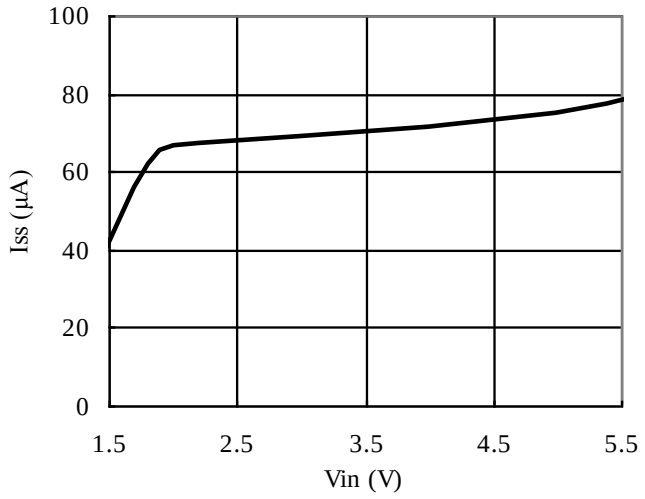


PT7M8220B (3.3V)
Topr=25℃
Cin=1μF(Ceramics), Cout=1μF(Ceramics)

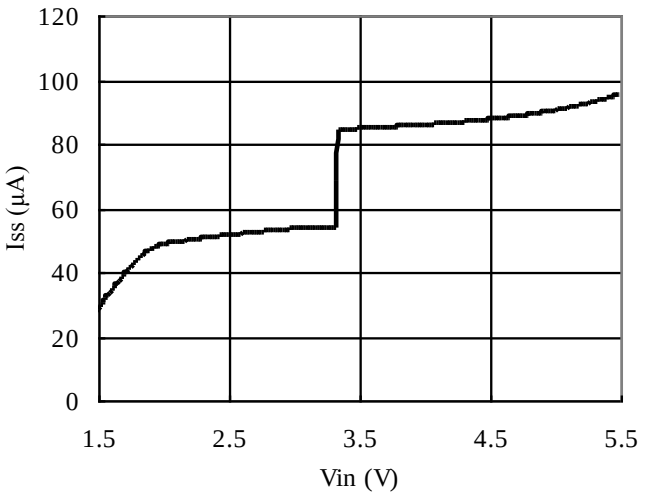


3. Supply Current vs. Input Voltage

PT7M8220B (1.2V)

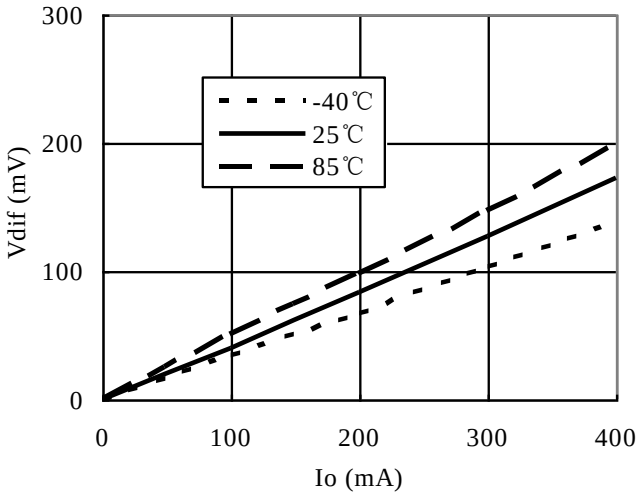


PT7M8220B (3.3V)



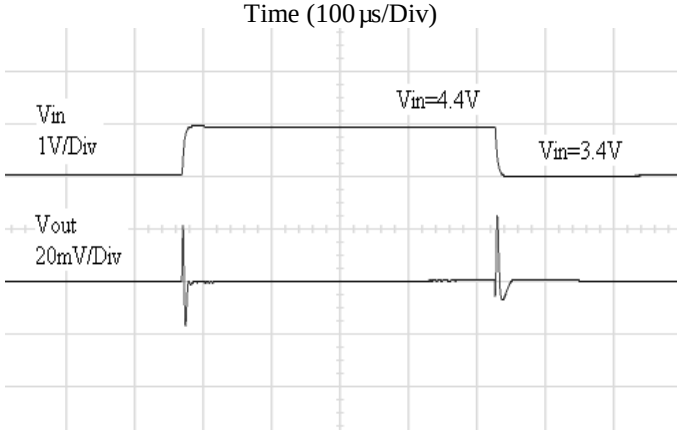
4. Dropout Voltage vs. Output Current

PT7M8220B (3.3V)
Cin=1 µF(Ceramics), Cout=1 µF(Ceramics)



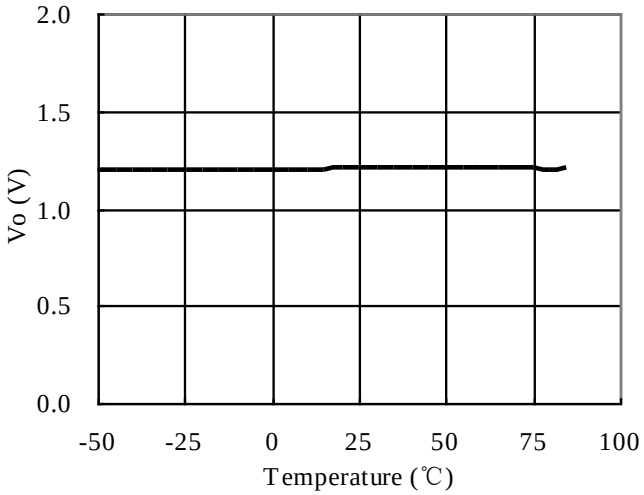
5. Line Transient Response

PT7M8220B (3.3V)
Cin=Cout=1 µF(Ceramics), Iout=100mA, tr=tf=5 µs
Time (100 µs/Div)

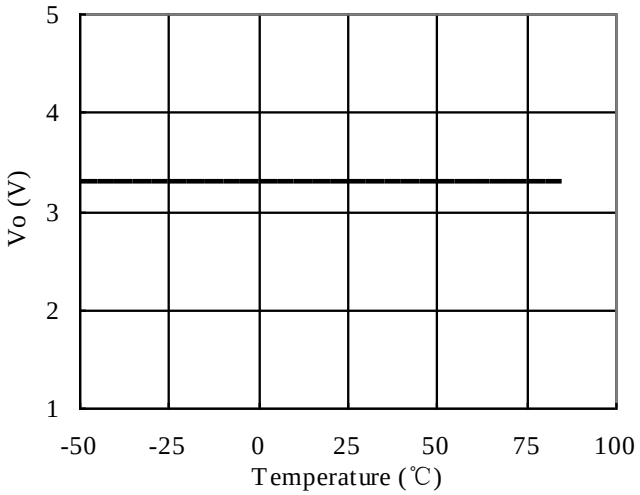


6. Output Voltage vs. Ambient Temperature

PT7M8220B (1.2V)
Vin=2.2V
Cin=1 µF(Ceramics), Cout=1 µF(Ceramics)

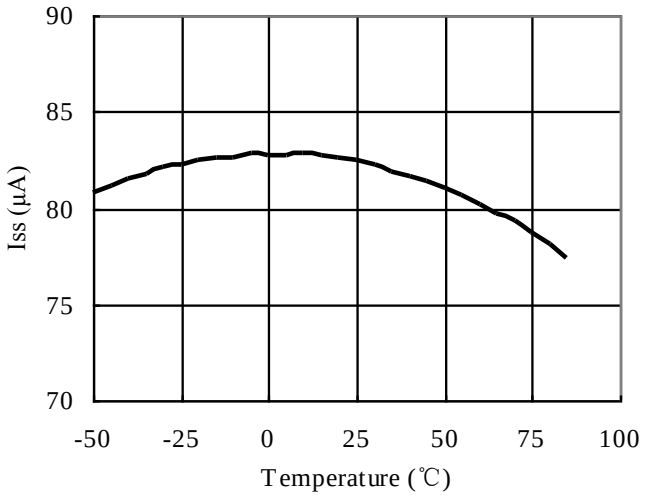


PT7M8220B (3.3V)
Vin=4.3V
Cin=1 µF(Ceramics), Cout=1 µF(Ceramics)

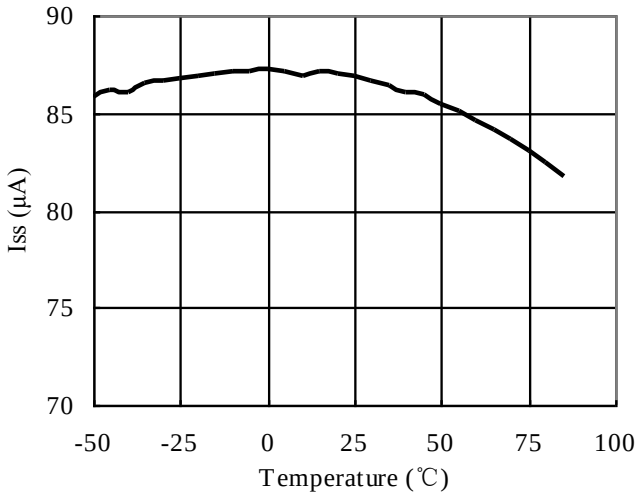


7. Supply Current vs. Ambient Temperature

PT7M8220B (1.2V)
Vin=2.2V
Cin=1 µF(Ceramics), Cout=1 µF(Ceramics)

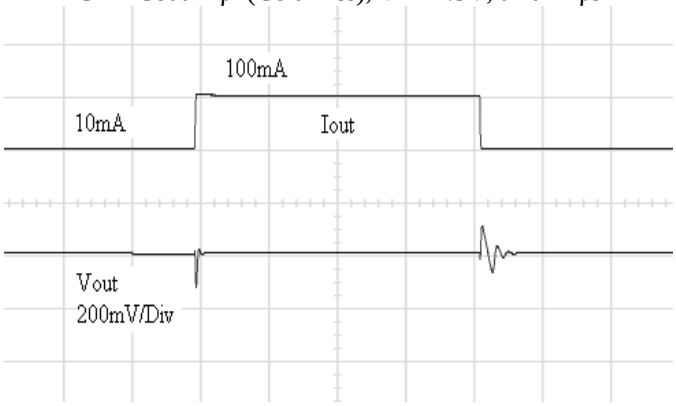


PT7M8220B (3.3V)
Vin=4.3V
Cin=1 µF(Ceramics), Cout=1 µF(Ceramics)

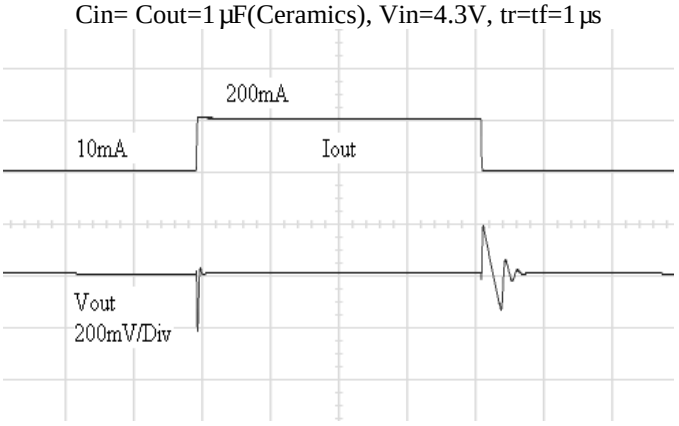


8. Load Transient Response

PT7M8220B (3.3V)
Cin= Cout=1 µF(Ceramics), Vin=4.3V, tr=tf=1 µs

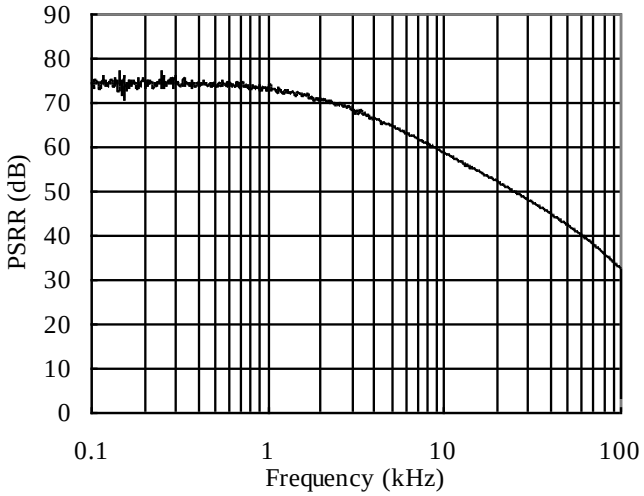


PT7M8220B (3.3V)
Cin= Cout=1 µF(Ceramics), Vin=4.3V, tr=tf=1 µs

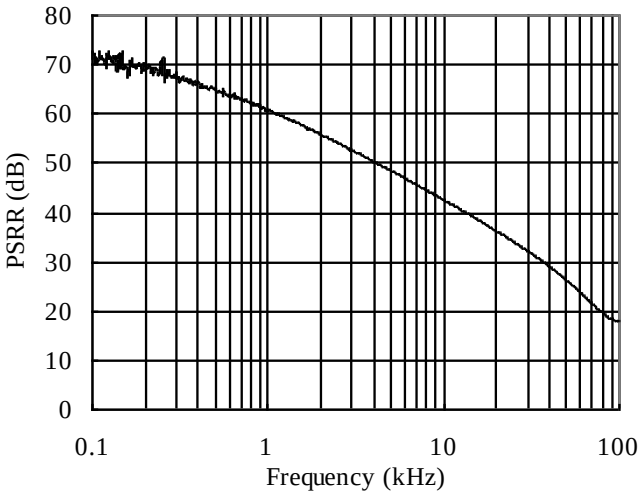


9. PSRR

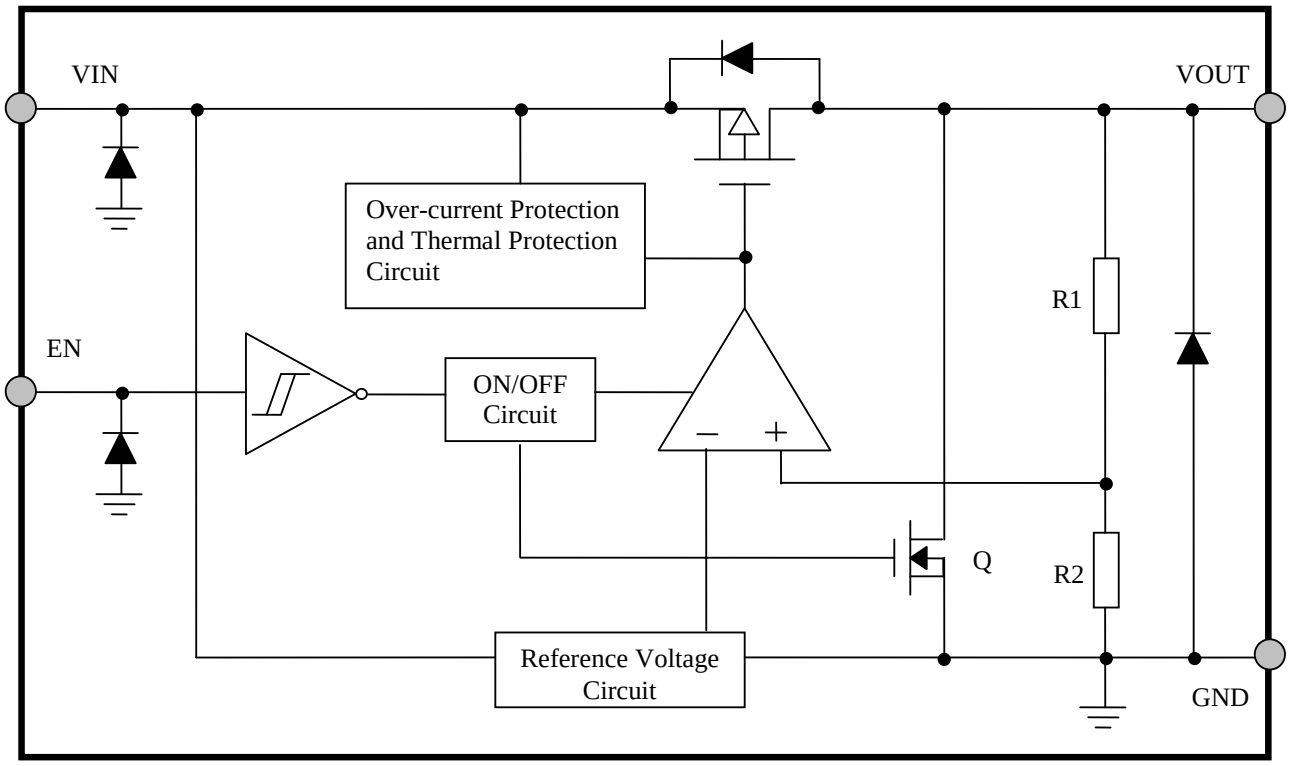
PT7M8220B (1.2V)
Vin=2.2V DC+1Vp-pAC
Cout=1uF(Ceramics), Iout=30mA



PT7M8220B (3.3V)
Vin=4.3V DC+1Vp-pAC
Cout=1uF(Ceramics), Iout=30mA



Function block diagram



Functional Description *(Refer to Function Block Diagram)*

Output Voltage

The divided output voltage is compared with the internal reference voltage by the error amplifier with internal phase compensator. The output of the error amplifier then drives the P-channel MOSFET to maintain a stable and constant output voltage.

Low ESR Capacitors

The internal phase compensator maintains the stable output voltage with low ESR ceramic input and output capacitors. 1μF low ESR (X5R/X7R) ceramic capacitor located as close as possible to the IC's pins is recommended.

Current Limit and Thermal Shutdown Protection

Current limit protection is used to limit the output current when an overload condition occurs. As a result, the output voltage will drop. Thermal shutdown protection will turn off the output to reduce the power dissipation when the operation junction temperature exceeds 170 ℃.

EN Pin

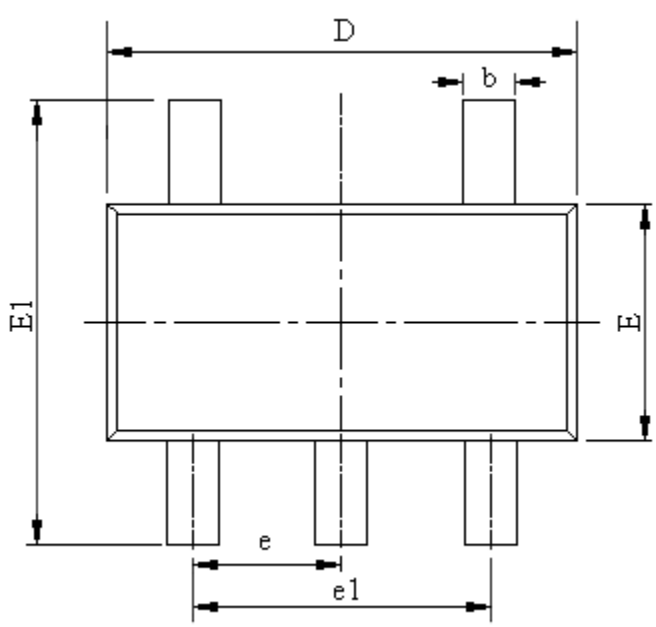
The output of the regulator in PT7M8220B can be controlled with EN pin. When EN is high, LDO is enabled, while when EN is low, IC enters shutdown mode. The EN pin must be fixed to constant level, not allow floating. In shutdown mode, output at the V_{OUT} pin will be pulled down to the GND level via R1 & R2.

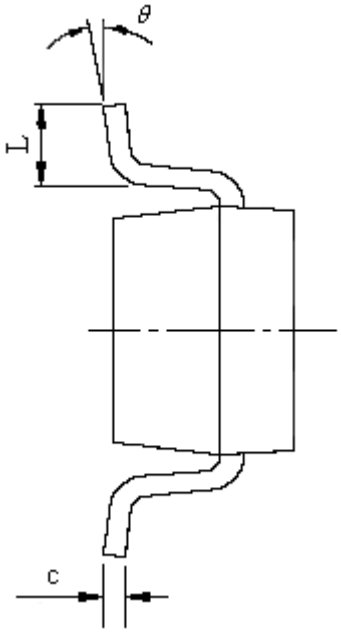
■ **NOTE ON USE**

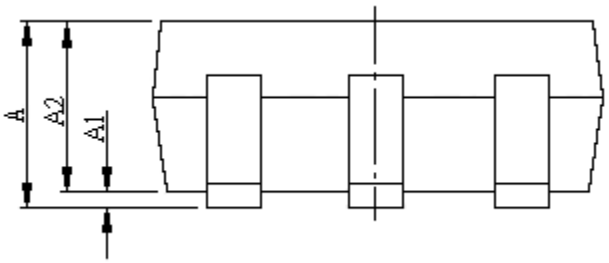
1. Please use this IC within the stated absolute maximum ratings.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please keep the resistance low for VIN and GND wirings in particular.
3. Please wire the input capacitor (Cin) and the output capacitor (Cout) as close to the IC as possible.

Mechanical Information

TAE (SOT23-5L)



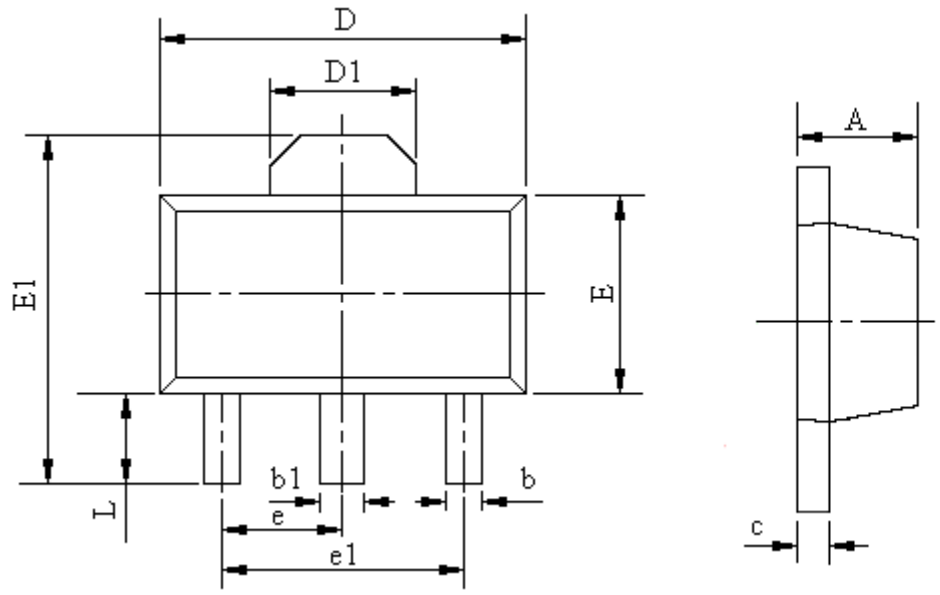




Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MO-178C/AA

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	1.05	1.25
A1	0.00	0.10
A2	1.05	1.15
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	1.50	1.70
E1	2.65	2.95
e	0.95BSC	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°

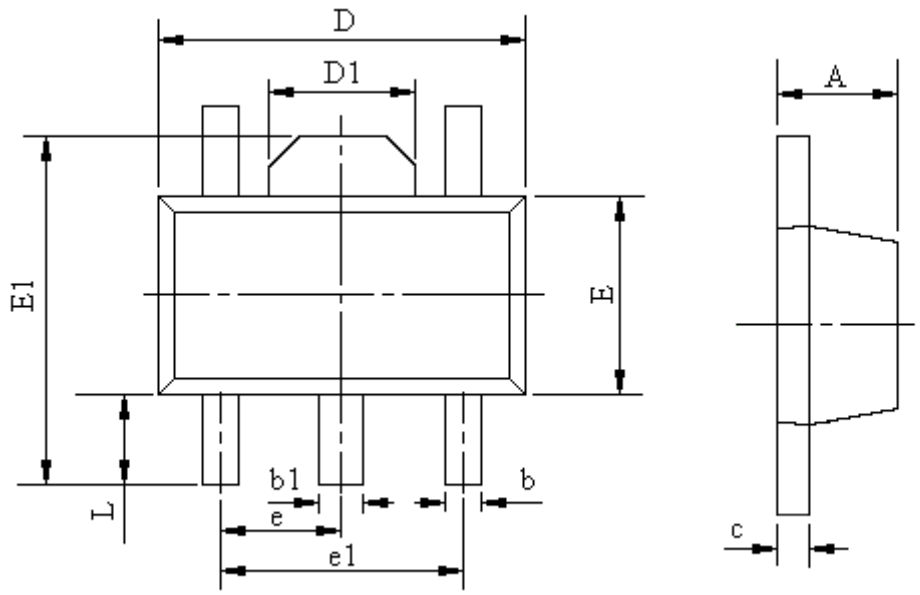
TD3E (SOT89-3L)



Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC TO-243C/AA

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	1.4	1.6
b	0.32	0.52
b1	0.4	0.58
c	0.35	0.44
D	4.4	4.6
D1	1.55REF	
E	2.3	2.6
E1	3.94	4.25
e	1.50TYP	
e1	3.00TYP	
L	0.9	1.2

TD5E (SOT89-5L)



Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC T0243C

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	1.4	1.6
b	0.32	0.52
b1	0.36	0.56
c	0.35	0.44
D	4.4	4.6
D1	1.4	1.8
E	2.3	2.6
E1	3.94	4.25
e	1.50TYP	
e1	2.9	3.1
L	0.9	1.1

Ordering Information

Part Number	Package Code	Package
PT7M8220B①②TA5E	TA5	Lead free and Green SOT23-5L
PT7M8220B①②TD3E	TD3	Lead free and Green SOT89-3L
PT7M8220B①②TD5E	TD5	Lead free and Green SOT89-5L

Notes:

- "①②" refer to different functions. See below Table 1.
- E = Pb-free and Green
- Adding X Suffix= Tape/Reel

Table 1 Definition of output voltage

Designator ①②	VOUT (V)	Designator ①②	VOUT (V)
12	1.2	24	2.4
13	1.3	25	2.5
14	1.4	26	2.6
15	1.5	27	2.7
16	1.6	28	2.8
17	1.7	29	2.9
18	1.8	30	3.0
19	1.9	31	3.1
20	2.0	32	3.2
21	2.1	33	3.3
22	2.2	2A	2.85
23	2.3		