

## LDO Regulator

### Features

- Output Current: 300mA or more
- Dropout Voltage: 270mV @ 300mA for 3.3V
- Operating Voltage Range: 1.8V to 5.5V
- Output Voltage Range: 1.2V to 3.3V (100mV Step)
- Low Power Consumption: 65µA
- Standby Current: 0.1µA
- High Ripple Rejection: 75dB @ 1kHz
- Output Current-Limit Protection
- Thermal Shutdown Protection
- Auto Output Discharge
- Operating Temperature Range: -40° C to +85° C
- Low ESR Capacitor Compatible: Ceramic Capacitor
- Lead Free Package: SOT23-5L, SC70-5L, SOT89-5L

### Applications

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

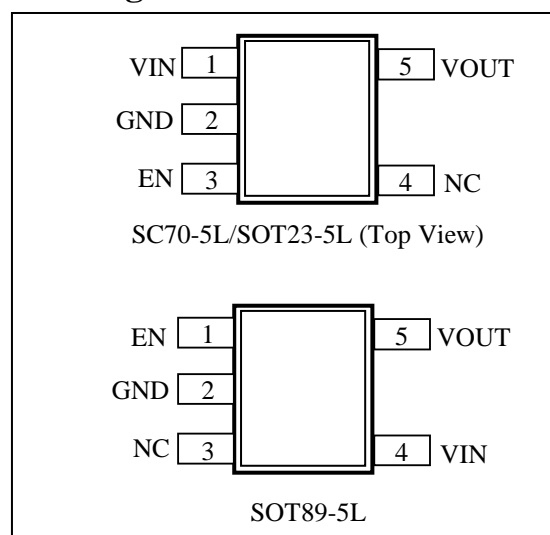
### Description

The PT7M8206 series are highly accurate, low dropout voltage regulators with low noise, high ripple rejection and low current consumption.

The PT7M8206 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 includes 2.85V. The PT7M8206 series are stable with low ESR ceramic capacitors.

### Pin Configuration



### Pin Description

Pin No.		I/O	Name	Descriptions
SOT23-5L/SC70-5L	SOT89-5L			
1	4	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	P	GND	Ground.
3	1	I	EN	ON/OFF Control of Regulator.
4	3	-	NC	No Connection.
5	5	O	VOUT	Output of Regulator. Bypass with a 1µF ceramic capacitor (X5R/X7R) to GND.

### Maximum Ratings

Storage Temperature.....	-55°C to +125°C
Ambient Temperature with Power Applied.....	-40°C to +85°C
Input Voltage.....	+6.0V
Output Voltage.....	-0.3 to V <sub>CC</sub> +0.3V
EN pin Voltage.....	+6.0V
DC Input/Output Current.....	700mA
Power Dissipation.....	SOT23/400mW SC70/300mW SOT89/550mW TDFN/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 <sub>CC</sub>	Operating Voltage	1.8	-	5.5	V
T <sub>A</sub>	Operating temperature	-40	25	85	°C

### Electrical Characteristics (T<sub>A</sub>=25°C, Bypass capacitor=22nF)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	V <sub>OUT(E)</sub> *2	V <sub>IN</sub> =V <sub>OUT(S)</sub> *1+1.0V, I <sub>OUT</sub> =30mA	V <sub>OUT(S)</sub> *0.98	V <sub>OUT(S)</sub>	V <sub>OUT(S)</sub> *1.02	V	
Maximum Output Current	I <sub>OUTMAX</sub>	V <sub>IN</sub> =V <sub>OUT(S)</sub> +1.0V	300	-	-	mA	
Dropout Voltage	Vdif*3	I <sub>OUT</sub> = 300mA	1.7V≤V <sub>OUT(S)</sub> ≤1.8V	-	0.39	0.51	V
			1.9V≤V <sub>OUT(S)</sub> ≤2.3V	-	0.33	0.43	
			2.4V≤V <sub>OUT(S)</sub> ≤2.7V	-	0.30	0.39	
			2.8V≤V <sub>OUT(S)</sub> ≤3.3V	-	0.27	0.35	
Supply Current	I <sub>SS</sub>	V <sub>IN</sub> = V <sub>OUT(S)</sub> + 1.0V, no load	-	65	100	µA	
Standby Current	I <sub>SB</sub>	V <sub>IN</sub> = V <sub>OUT(S)</sub> +1.0V EN=OFF	-	0.1	1	µA	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN}} * V_{OUT}$	V <sub>OUT(S)</sub> +1.0V≤V <sub>IN</sub> ≤5.5V I <sub>OUT</sub> =30 mA	-	0.05	0.2	%/V	
Load Regulation	ΔV <sub>OUT2</sub>	V <sub>IN</sub> = V <sub>OUT(S)</sub> +1.0V, 1.0mA≤I <sub>OUT</sub> ≤300mA	-	-	0.6	%	
Input Voltage	V <sub>IN</sub>	-	1.8	-	5.5	V	
Output Voltage Temperature Characteristic	$\frac{\Delta V_{OUT}}{\Delta T_{opr}} * V_{OUT}$	I <sub>OUT</sub> =30 mA -40°C≤T <sub>opr</sub> ≤85°C	-	+/-100	-	ppm/°C	
Ripple Rejection	PSRR	V <sub>IN</sub> =[V <sub>OUT(S)</sub> +1.0]V <sub>DC</sub> +1Vp-p AC V <sub>OUT</sub> =1.5V, I <sub>OUT</sub> =30mA, f=1kHz	-	75	-	dB	
Current Limit	I <sub>LIM</sub>	V <sub>OUT</sub> = V <sub>OUT(S)</sub> *0.9	400	450	600	mA	
Thermal Shutdown	T <sub>SD</sub>			170		°C	
Thermal Shutdown Hysteresis	ΔT <sub>SD</sub>			40			
EN"High" Voltage	V <sub>ENH</sub>	-	1.5	-	-	V	
EN"Low" Voltage	V <sub>ENL</sub>	-	-	-	0.3		
EN"High" Current	I <sub>ENH</sub>	V <sub>IN</sub> =V <sub>OUT(S)</sub> +1.0V	-0.10	-	0.10	µA	
EN"Low" Current	I <sub>ENL</sub>	V <sub>IN</sub> = V <sub>OUT(S)</sub> +1.0V, EN=OFF	-0.10	-	0.10		
Output Discharge Resistance	R <sub>dis</sub>	V <sub>IN</sub> = V <sub>OUT(S)</sub> +1.0V EN=OFF	-	200	-	Ω	

**Note:** \*1: V<sub>OUT(S)</sub>=Specified output voltage.

\*2: V<sub>OUT(E)</sub>=Effective output voltage.

(I.e. the output voltage when "V<sub>OUT(S)</sub>+1.0V" is provided at the VIN pin while maintaining a certain I<sub>OUT</sub> value).

\*3: Vdif={V<sub>IN1</sub><sup>(\*5)</sup>-V<sub>OUT1</sub><sup>(\*4)</sup>}.

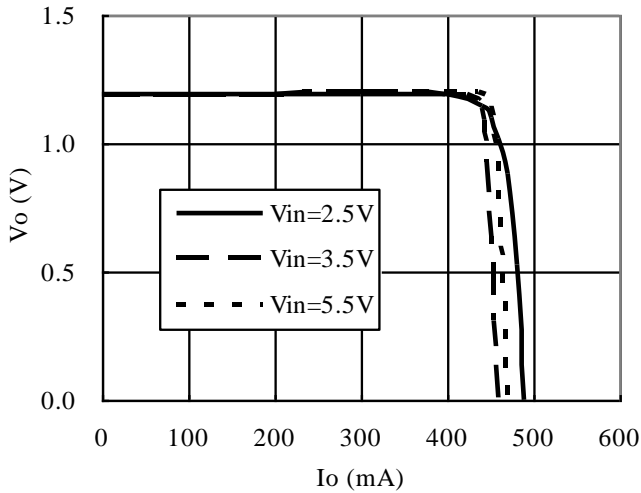
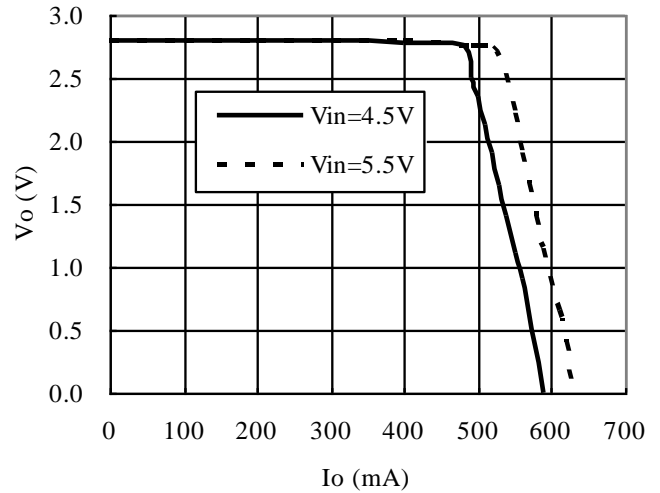
\*4: V<sub>OUT1</sub>=A voltage equal to 98% of the output voltage whenever an amply stabilized I<sub>OUT</sub> {V<sub>OUT(S)</sub>+ 1.0V} is input.

\*5: V<sub>IN1</sub>=The input voltage when V<sub>OUT1</sub> appears as input voltage is gradually decreased.

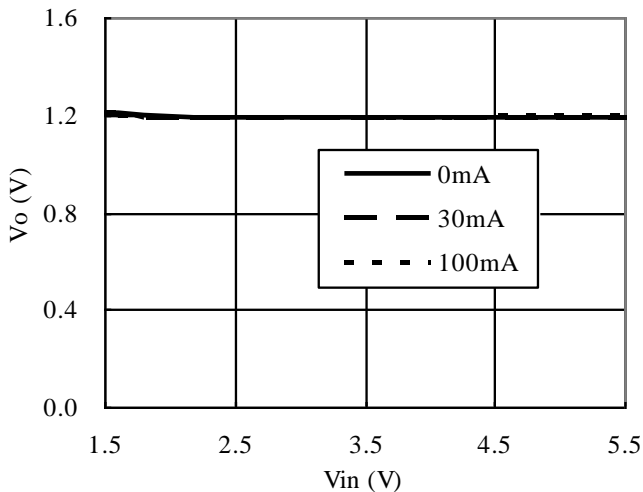
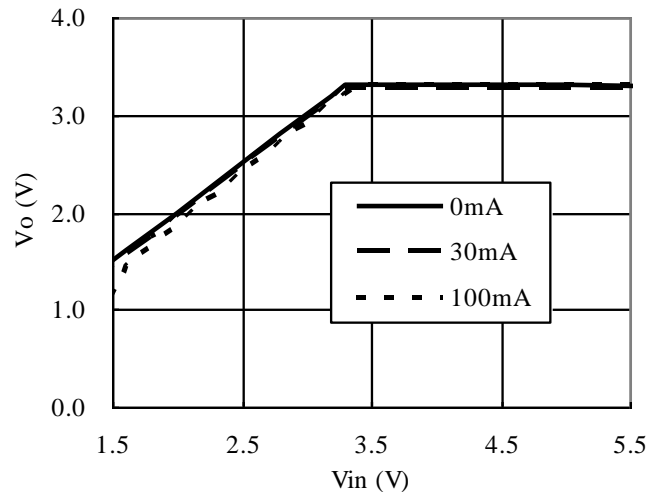
\*6: Unless otherwise stated, V<sub>IN</sub>=V<sub>OUT(S)</sub>+1.0V

## Typical Performance and Characteristics

### 1. Output Voltage vs. Output Current

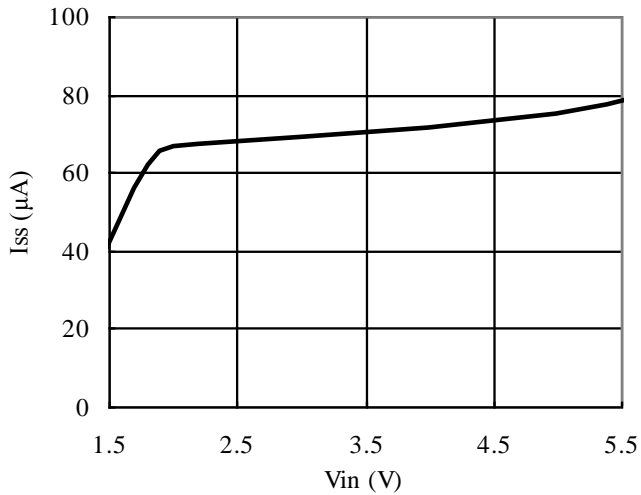
**PT7M8206 (1.2V)**
 $C_{in}=1\ \mu\text{F}(\text{Ceramics}), C_{out}=1\ \mu\text{F}(\text{Ceramics})$ 

**PT7M8206 (3.3V)**
 $C_{in}=1\ \mu\text{F}(\text{Ceramics}), C_{out}=1\ \mu\text{F}(\text{Ceramics})$ 


### 2. Output Voltage vs. Input Voltage

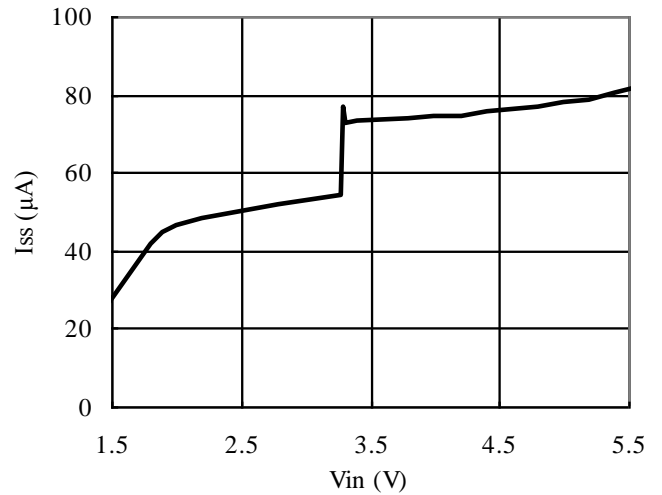
**PT7M8206 (1.2V)**
 $T_{opr}=25^\circ\text{C}$ 
 $C_{in}=1\ \mu\text{F}(\text{Ceramics}), C_{out}=1\ \mu\text{F}(\text{Ceramics})$ 

**PT7M8206 (3.3V)**
 $T_{opr}=25^\circ\text{C}$ 
 $C_{in}=1\ \mu\text{F}(\text{Ceramics}), C_{out}=1\ \mu\text{F}(\text{Ceramics})$ 


**3. Supply Current vs. Input Voltage**

**PT7M8206 (1.2V)**



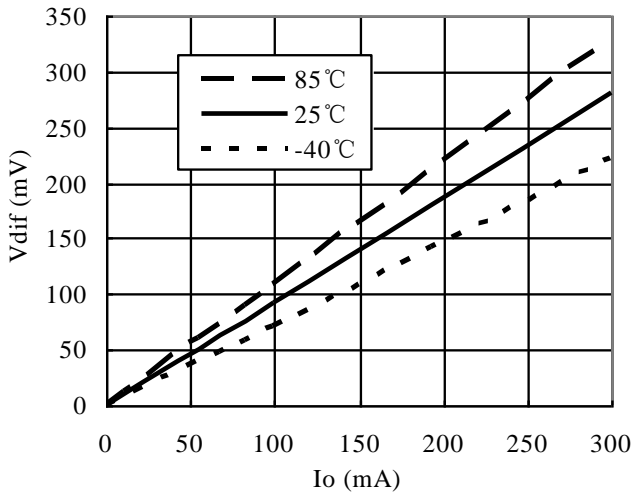
**PT7M8206 (3.3V)**



**4. Dropout Voltage vs. Output Current**

**PT7M8206 (3.3V)**

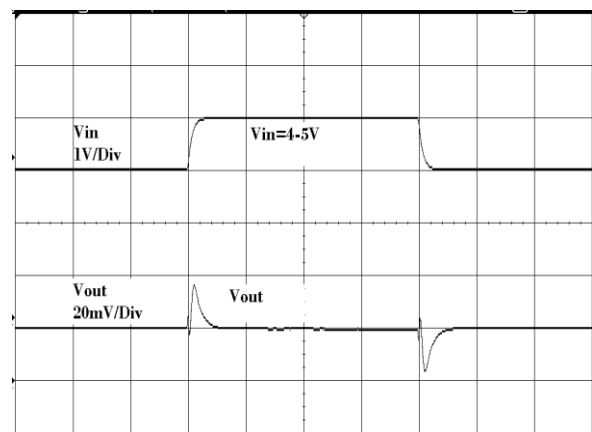
C<sub>in</sub>=1 μF(Ceramics), C<sub>out</sub>=1 μF(Ceramics)



**5. Line Transient Response**

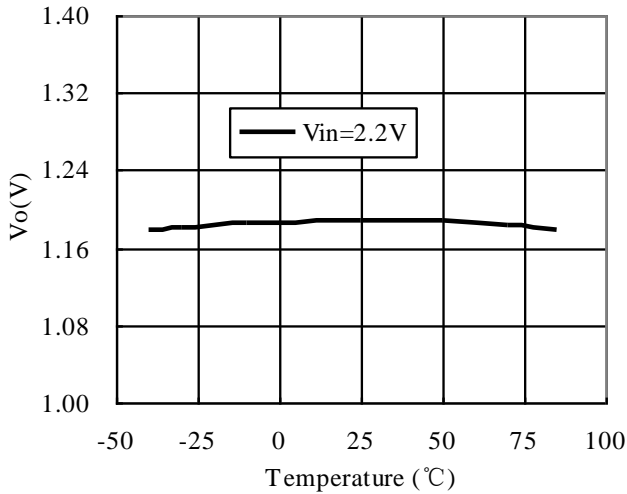
**PT7M8206 (3.3V)**

C<sub>in</sub>=C<sub>out</sub>=1 μF(Ceramics), I<sub>out</sub>=100mA  
Time (50 μs/Div)

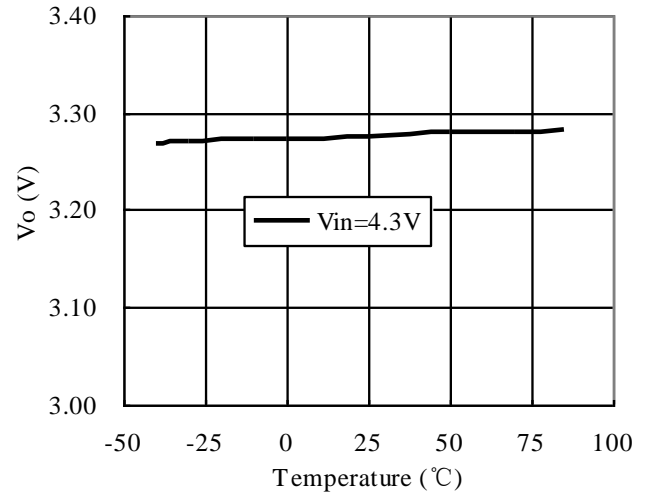


**6. Output Voltage vs. Ambient Temperature**
**PT7M8206 (1.2V)**

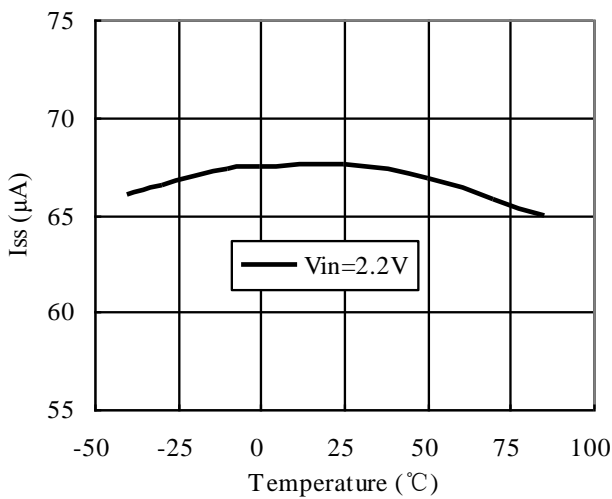
Vin=2.2V

 Cin=1  $\mu$ F(Ceramics), Cout=1  $\mu$ F(Ceramics)

**PT7M8206 (3.3V)**

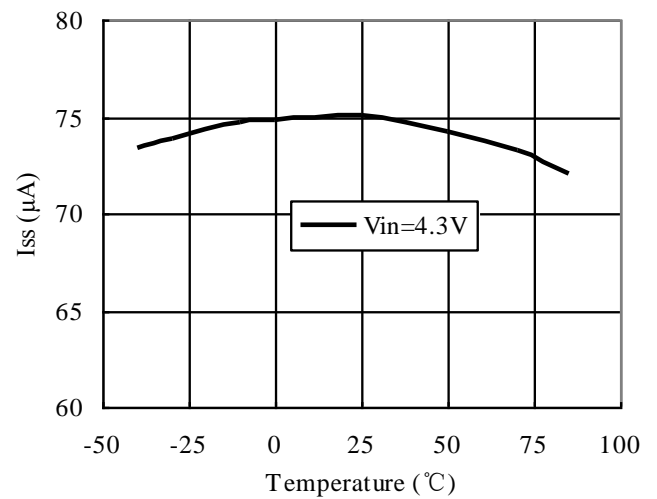
Vin=4.3V

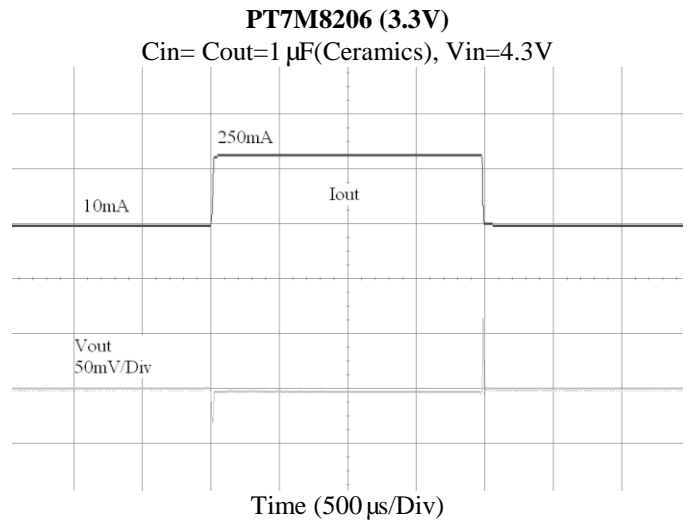
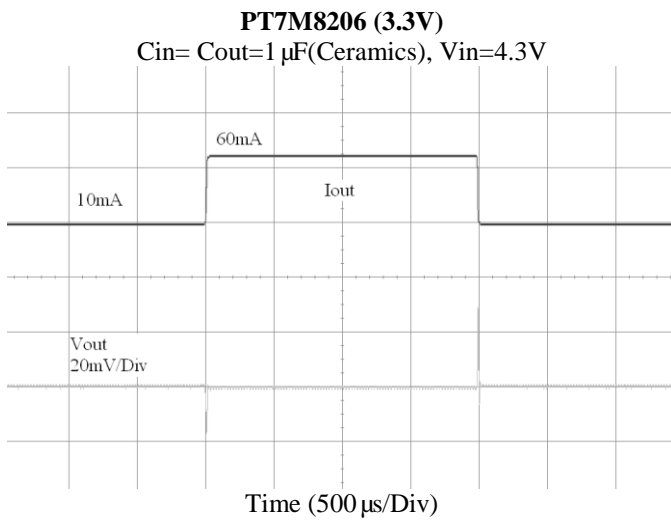
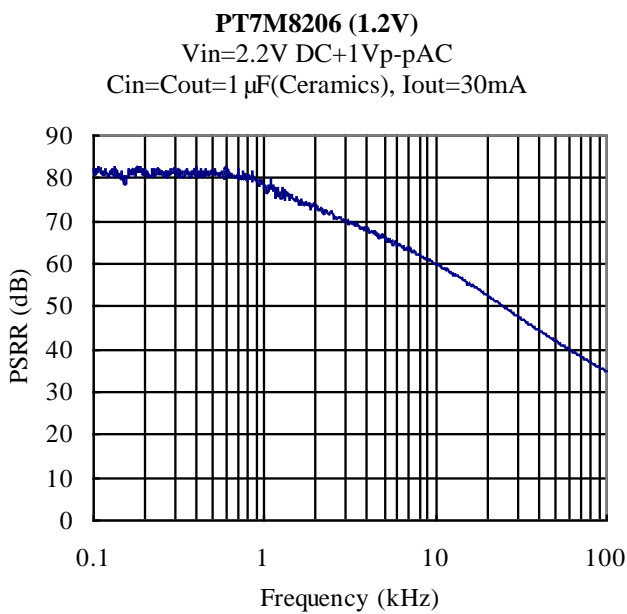
 Cin=1  $\mu$ F(Ceramics), Cout=1  $\mu$ F(Ceramics)

**7. Supply Current vs. Ambient Temperature**
**PT7M8206 (1.2V)**

Vin=2.2V

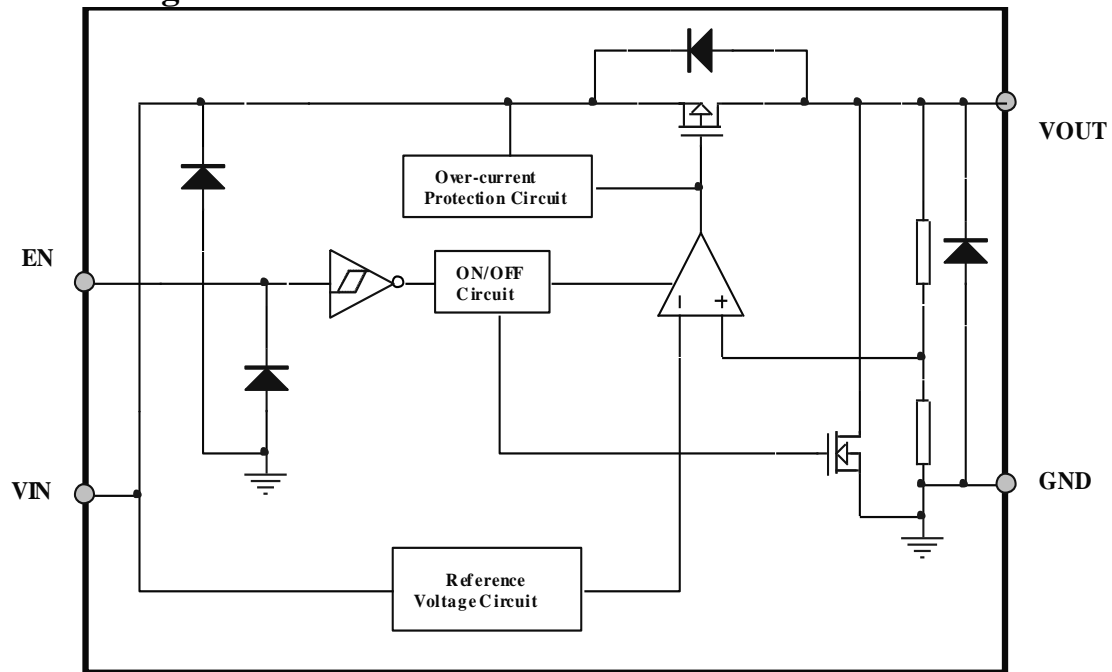
 Cin=1  $\mu$ F(Ceramics), Cout=1  $\mu$ F(Ceramics)

**PT7M8206 (3.3V)**

Vin=4.3V

 Cin=1  $\mu$ F(Ceramics), Cout=1  $\mu$ F(Ceramics)


**8. Load Transient Response**

**9. PSRR**


## 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. 1 $\mu$ F low ESR (X5R/X7R) ceramic capacitor located as close as possible to the IC's pins is recommended.

### Current Limit and Thermal Shutdown Protections

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 °C.

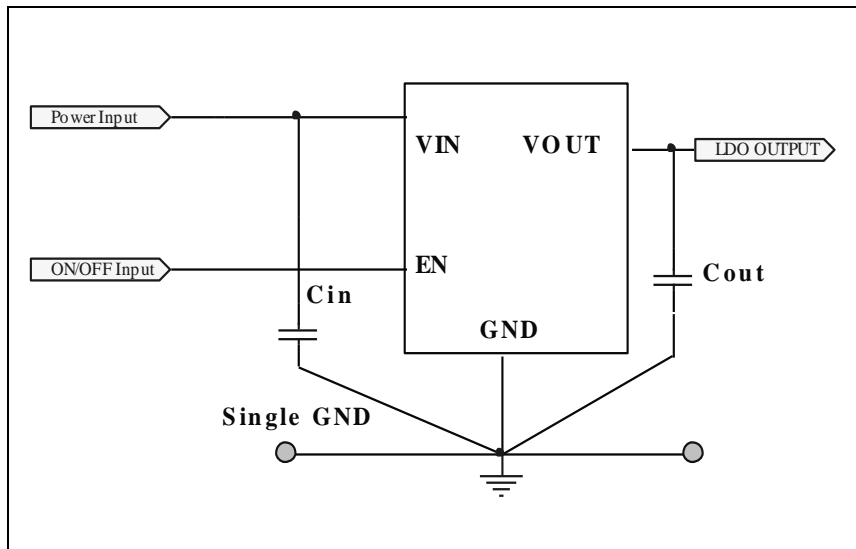
### EN Pin

The output of the regulator in PT7M8206 can be controlled with EN pin. The EN pin should be connected to a "VIN" or a "GND" voltage as a floating input applied to inverter input of the enable circuitry will increase the current consumption.

### ■ 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 between VIN and GND wiring in particular.
3. Please wire the input capacitor (C<sub>in</sub>) and the output capacitor (C<sub>out</sub>) as close to the IC as possible.

**Application Circuit**

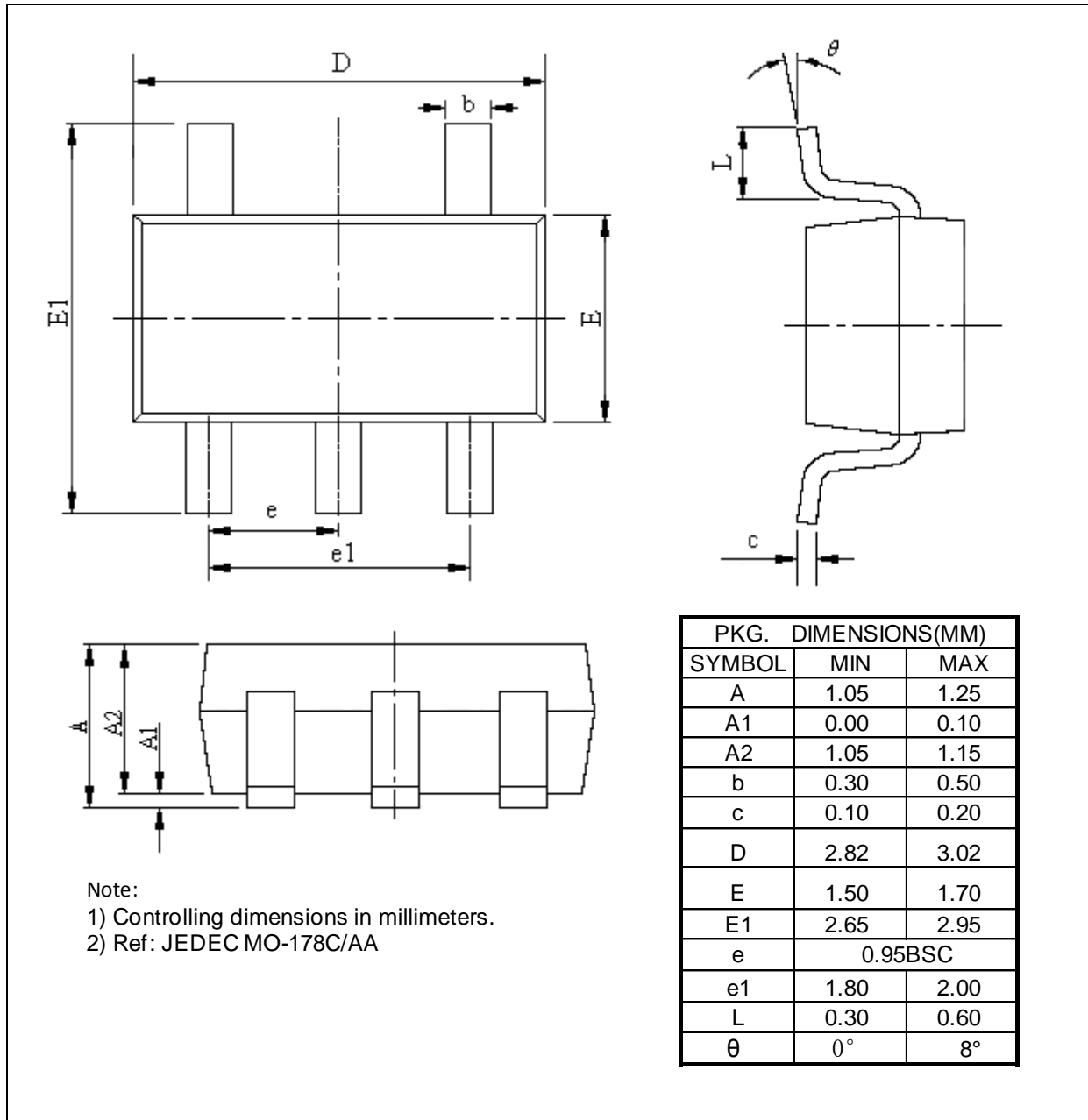


Note:  $C_{in}=C_{out}=1\ \mu F$

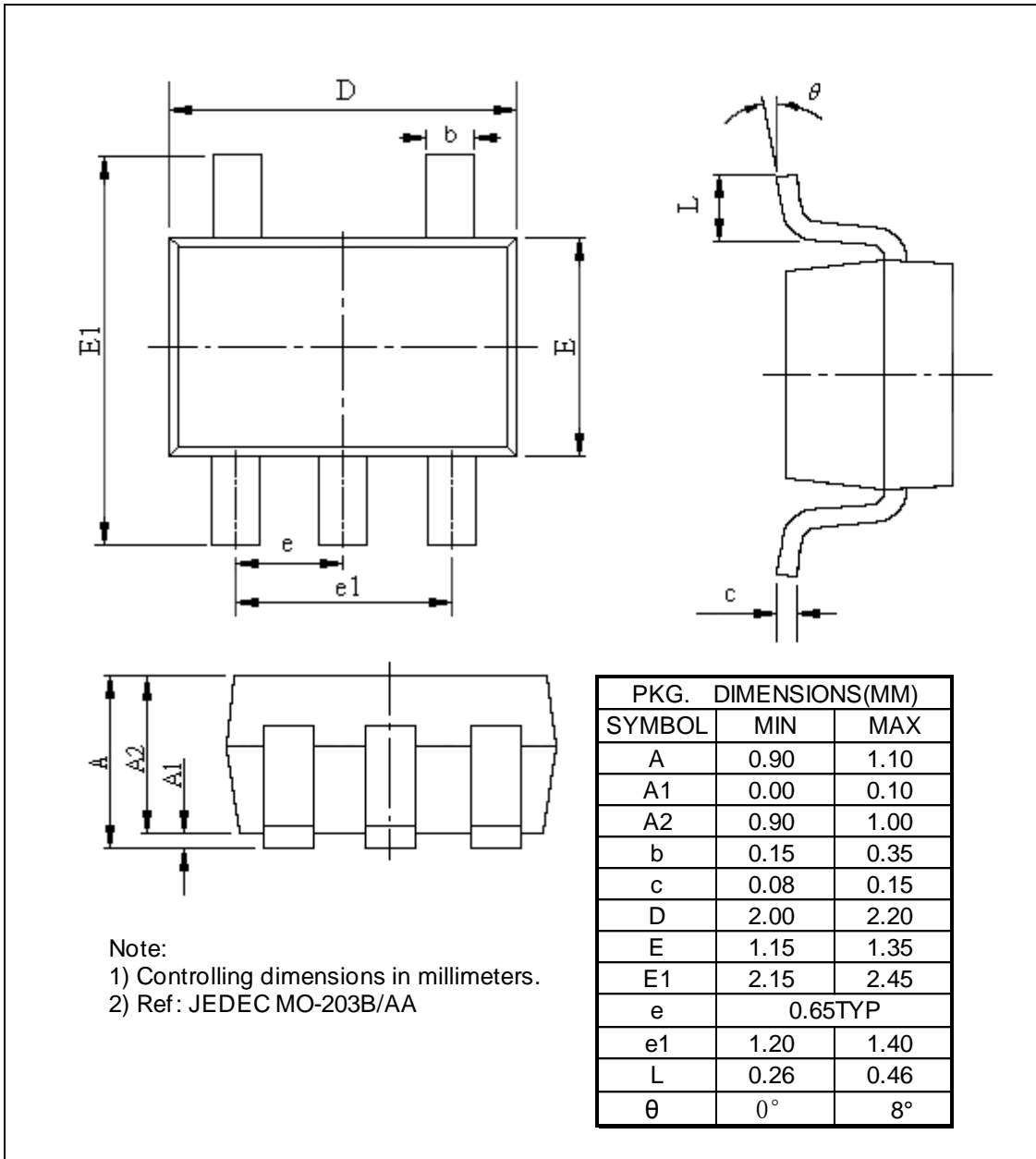


**Mechanical Information**

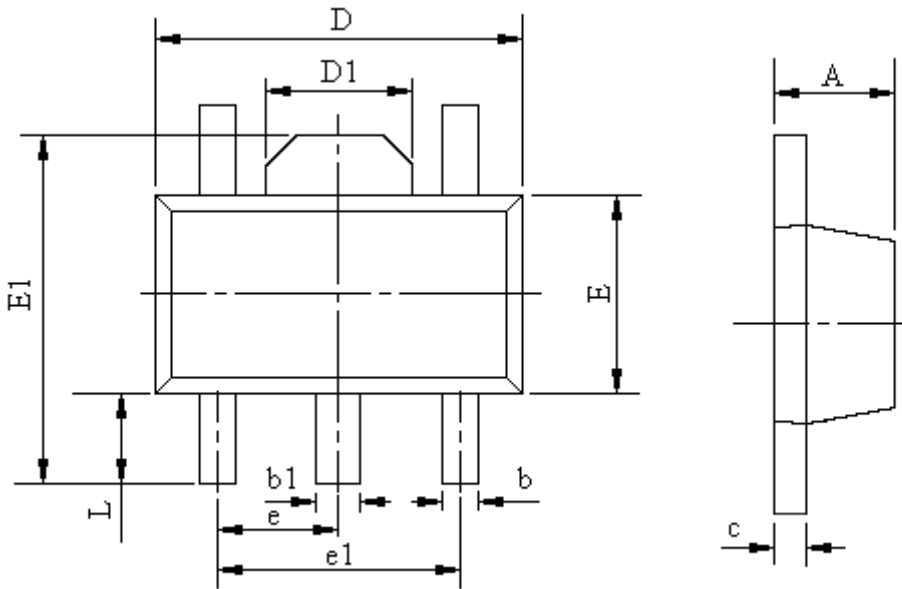
TA (SOT23-5L)



C (SC70-5L)



TD(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
PT7M8206①②③TAE	TA	Lead free and Green SOT23-5L
PT7M8206①②③CE	C	Lead free and Green SC70-5L
PT7M8206①②③TDE	TD	Lead free and Green SOT89-5L

**Notes:**

- “①②③” refer to different functions. See below Table 1 and Table 2.
- E = Pb-free and Green
- Adding X Suffix= Tape/Reel

**Table 1 Option Definition Table**

Designator	Symbol	Description
① Regulators EN type	A	Low active
	B	High active
②③ Regulator Output voltage	12-33, 2A	Internally set sequential number relating output voltage of regulator , the detail is in Table 2

**Table 2 Definition of designator**

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

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