JW7805

6uA I_Q, 300mA

Low Noise, Low-Dropout Linear Regulator

Parameters Subject to Change Without Notice

DESCRIPTION

The JW®7805 is a low noise low-dropout (LDO) voltage regulator with enable function that operates from 1.8V to 5.5V. It provides up to 300mA of output current and offers low-power operation in miniaturized packaging. JW7805 supports fixed output voltage 0.9V, 1.0V, 1.05V, 1.1V,1.2V, 1.3V, 1.35V, 1.5V, 1.8V, 1.85V, 2.1V, 2.2V, 2.3V, 2.5V, 2.6V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V,3.1V, 3.3V, 3.6V, 4.2V, 4.4V and 5.0V.

The features of low quiescent current as low as 6uA and almost zero disable current are ideal for powering the battery equipment. JW7805's low output noise and high PSRR are also friendly to RF systems.

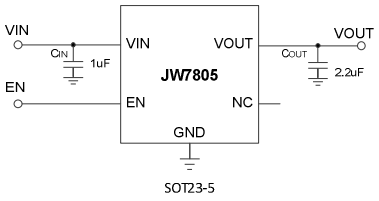
FEATURES

- 6uA Ground Current at no Load
- 1.8V to 5.5V Operating Input Voltage
- 300mA Output Current
- ±2% Output Voltage Accuracy
- Low Disable Current
- Low Dropout Voltage:
  0.84V (typ.) at 20mA when VOUT=0.9V
- Current Limit Protection
- Over Temperature Protection
- Output Voltage Discharge
- Available in SOT23-5 ,DFN1X1-4 package

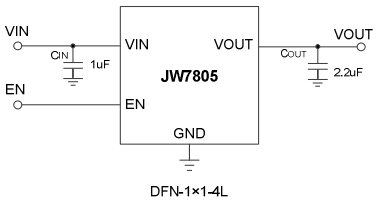
APPLICATIONS

- Cellular Telephones
- Portable, Battery Powered Equipment
- Ultra Low Power Micro-controllers
- Notebook Computers

TYPICAL APPLICATION



SOT23-5



DFN-1×1-4L

ORDER INFORMATION

DEVICE[1)]	PACKAGE	TOP MARKING[2)]
JW7805-0.9DFNG#TRPBF	DFN1X1-4	1X
JW7805-1.0DFNG#TRPBF	DFN1X1-4	2X
JW7805-1.05DFNG#TRPBF	DFN1X1-4	3X
JW7805-1.1DFNG#TRPBF	DFN1X1-4	4X
JW7805-1.2DFNG#TRPBF	DFN1X1-4	5X
JW7805-1.3DFNG#TRPBF	DFN1X1-4	6X
JW7805-1.35DFNG#TRPBF	DFN1X1-4	7X
JW7805-1.5DFNG#TRPBF	DFN1X1-4	8X
JW7805-1.8DFNG#TRPBF	DFN1X1-4	9X
JW7805-1.85DFNG#TRPBF	DFN1X1-4	0X
JW7805-2.1DFNG#TRPBF	DFN1X1-4	AX
JW7805-2.2DFNG#TRPBF	DFN1X1-4	BX
JW7805-2.3DFNG#TRPBF	DFN1X1-4	CX
JW7805-2.5DFNG#TRPBF	DFN1X1-4	DX
JW7805-2.6DFNG#TRPBF	DFN1X1-4	EX
JW7805-2.7DFNG#TRPBF	DFN1X1-4	FX
JW7805-2.8DFNG#TRPBF	DFN1X1-4	GX
JW7805-2.85DFNG#TRPBF	DFN1X1-4	HX
JW7805-2.9DFNG#TRPBF	DFN1X1-4	JX
JW7805-3.0DFNG#TRPBF	DFN1X1-4	KX
JW7805-3.1DFNG#TRPBF	DFN1X1-4	LX
JW7805-3.3DFNG#TRPBF	DFN1X1-4	MX
JW7805-3.6DFNG#TRPBF	DFN1X1-4	NX
JW7805-4.2DFNG#TRPBF	DFN1X1-4	PX
JW7805-4.4DFNG#TRPBF	DFN1X1-4	QX
JW7805-5.0DFNG#TRPBF	DFN1X1-4	RX
JW7805-0.9SOTA#TRPBF	SOT23-5	JWKRX YWLLL
JW7805-1.0SOTA#TRPBF	SOT23-5	JWKSX YWLLL
JW7805-1.05SOTA#TRPBF	SOT23-5	JWKTX YWLLL
JW7805-1.1SOTA#TRPBF	SOT23-5	JWKUX YWLLL
JW7805-1.2SOTA#TRPBF	SOT23-5	JWKVX YWLLL
JW7805-1.3SOTA#TRPBF	SOT23-5	JWKWX YWLLL

JW7805-1.35SOTA#TRPBF	SOT23-5	JWKXX YWLLL
JW7805-1.5SOTA#TRPBF	SOT23-5	JWKYX YWLLL
JW7805-1.8SOTA#TRPBF	SOT23-5	JWKZX YWLLL
JW7805-1.85SOTA#TRPBF	SOT23-5	JWL0X YWLLL
JW7805-2.1SOTA#TRPBF	SOT23-5	JWL1X YWLLL
JW7805-2.2SOTA#TRPBF	SOT23-5	JWL2X YWLLL
JW7805-2.3SOTA#TRPBF	SOT23-5	JWL3X YWLLL
JW7805-2.5SOTA#TRPBF	SOT23-5	JWL4X XXXXX
JW7805-2.6SOTA#TRPBF	SOT23-5	JWL5X YWLLL
JW7805-2.7SOTA#TRPBF	SOT23-5	JWL6X YWLLL
JW7805-2.8SOTA#TRPBF	SOT23-5	JWL7X YWLLL
JW7805-2.85SOTA#TRPBF	SOT23-5	JWL8X YWLLL
JW7805-2.9SOTA#TRPBF	SOT23-5	JWL9X YWLLL
JW7805-3.0SOTA#TRPBF	SOT23-5	JWLAX YWLLL
JW7805-3.1SOTA#TRPBF	SOT23-5	JWLBX YWLLL
JW7805-3.3SOTA#TRPBF	SOT23-5	JWLCX YWLLL
JW7805-3.6SOTA#TRPBF	SOT23-5	JWLDX YWLLL
JW7805-4.2SOTA#TRPBF	SOT23-5	JWLEX YWLLL
JW7805-4.4SOTA#TRPBF	SOT23-5	JWLFX YWLLL
JW7805-5.0SOTA#TRPBF	SOT23-5	JWLGX YWLLL

Notes:

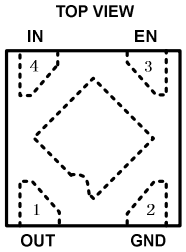
1) JW□□□# TRPBF
- PB Free
- Tape and Reel(If" TR" is not shown, it means tube)
- Package Code
- Part No.

2) SOT23-5: Line1: JW□□□
- Internal control code
- Product code of JWXXXX
- Joulwatt LOGO

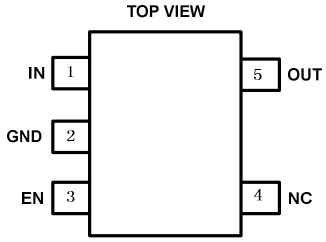
Line2: YWLLL
- Lot number
- Week code
- Year code

DFN1X1-4: Line1: PL
- Lot number
- Product code of JWXXXX

PIN CONFIGURATION



UTDFN1X1-4L



SOT-23-5

ABSOLUTE MAXIMUM RATING[1)]

VIN, EN, VOUT Pin ..... -0.3V to 6.5V
Junction Temp. [2) 3)] 160ºC
Lead Temperature 260ºC
ESD (HBM) 2kV
ESD (MM) 200V

RECOMMENDED OPERATING CONDITIONS

Input Voltage VIN .....1.8V to 5.5V
Junction Temperature Range ..... -40°C to 125°C

THERMAL PERFORMANCE[4)]

	θ_{JA}	θ_{Jc}
DFN1X1-4L	152	180.4ºC/W
SOT23-5	220	130ºC/W

Note:

1) Exceeding these ratings may damage the device.

2) The JW7805 guarantees robust performance from -40°C to 160°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.

3) The JW7805 includes thermal protection that is intended to protect the device in overload conditions. Thermal protection is active when junction temperature exceeds the maximum operating junction temperature. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.

4) Measured on JESD51-7, 4-layer PCB

ELECTRICAL CHARACTERISTICS

V_{OUT}+1<V_{IN}<5.5V, C_{OUT}=1uF, T_A=25℃，Unless otherwise stated。						
Item	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Output Voltage Range	V_{OUT}		0.9	--	5.0	V
DC Output Accuracy		ILOAD = 1mA	-2	--	2	%
Dropout Voltage[5] (ILOAD = 300mA)	V_{DROP}	0.9V ≤ V_{OUT} < 1.2V	-	0.88	1.1	V
		1.2V ≤ V_{OUT} < 1.5V		0.8	1	
		1.5V ≤ V_{OUT} < 1.8V		0.45	0.7	
		1.8V ≤ V_{OUT} < 2.5V		0.35	0.4	
		2.5V ≤ V_{OUT} < 3.0V		0.19	0.25	
		3.0V ≤ V_{OUT}		0.14	0.21	
Supply Current	I_Q	I_{LOAD} = 0mA, V_{OUT} ≤ 5.5V, V_{IN} ≥ V_{OUT} + V_{DROP}	-	6	10	uA
Shutdown GND Current	I_{S1}	V_{EN} = 0V	-	0.1	1	uA
Shutdown Leakage Current	I_{S2}	V_{EN} = 0V, V_{OUT} = 0V	-	0.1	1	uA
EN Input Current	I_{EN}	V_{EN} = 5.5V	-	-	0.1	uA
Line Regulation	ΔLINE	I_{LOAD} = 10mA, 1.8V ≤ VIN< 2.1V	-	0.1	-	%
		I_{LOAD} = 10mA, 2.1V ≤ VIN < 5.5V	-	0.15	-	
Load Regulation	ΔLOAD	5mA < I_{LOAD} < 250mA	-	1	-	%
Power Supply Rejection Ratio	PSRR	V_{IN} = 3V, I_{LOAD} = 50mA, C_{OUT} = 1uF, V_{OUT} = 2.5V, f =1kHz	--	43	--	dB
Output Voltage Noise		I_{LOAD}=50mA, BW=10Hz~100kHz, V_{IN}=V_{OUT}+2V, V_{OUT} = 1.8V,	-	170	-	uV_{RMS}
Output Current Limit	I_{LIM}	Peak output current	300			mA
Output Discharge Resistance	R_{DIS}			50		Ω
Enable Input Voltage Logic-High	V_{HL}	V_{IN} = 5V	1.2			V
Enable Input Voltage Logic-Low	V_{IL}	V_{IN} = 5V			0.4	
Thermal Shutdown[5]	T_{TSD}			160		° C
Thermal Shutdown hysteresis[5]	T_{TSD_HYST}			20		° C

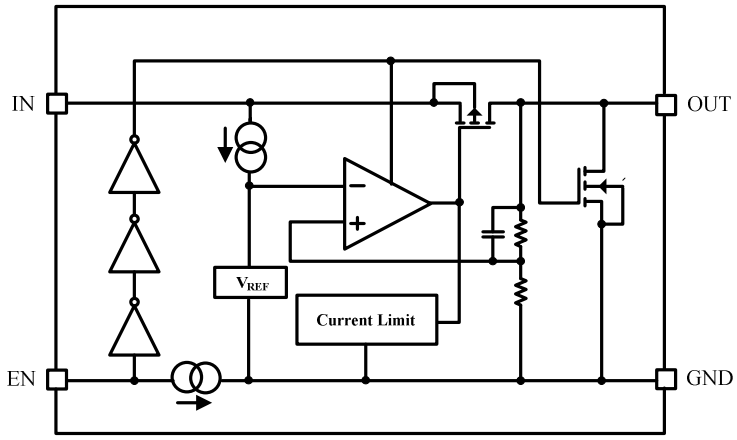
Note：

5) Guaranteed by design.

PIN DESCRIPTION

Pin No.		Name	Description
UTDFN1X1-4L	SOT23-5		
1	5	VOUT	Output of the regulator.
2	2	GND	Ground.
3	3	EN	Enable input.
4	1	VIN	Supply voltage input.
	4	NC	Not connected
Exposed Pad	-	-	The exposed pad should be connected to a large ground plane to maximize thermal performance.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The JW7805 is a low noise, low quiescent current linear regulator designed especially for battery equipment. The input voltage range is from 1.8V to 5.5V, and the output current is up to 300mA. The minimum required output capacitance for stable operation is 2.2uF effective capacitance after consideration of the temperature and voltage coefficient of the capacitor.

Output Transistor

The JW7805 builds in a P-MOSFET output transistor which provides a low switch-on resistance for low dropout voltage applications.

Error Amplifier

The Error Amplifier (EA) compares the internal reference voltage V_{REF} with the output feedback voltage V_{FB} through the internal divider. Output of the error amplifier (EA) is used to control the gate voltage of P-MOSFET and ensures that the device provides good line and load regulation at output voltage.

Enable

The device is active when EN pin is set to high. For proper operation, this pin must be terminated and must not be left floating. With EN pin set to low, the device enters shutdown mode with less than 1uA current consumption.

Current Limit Protection

JW7805 provides current limit function to prevent the device from damages during the over load or shorted-circuit condition. The current is detected by a sensing transistor, which monitors and controls the pass transistor's gate voltage, limiting the output current to 0.4A (typ.). The PMOS pass transistor dissipates (VIN – VOUT) × ILIMIT until thermal shutdown is triggered and the device turns off. When the device cools, the internal thermal shutdown circuit turns the device back on. If the fault condition continues, the device cycles between current limit and thermal shutdown.

Output Discharge

The device provides automatic output voltage discharge once it is disabled. This feature prevents residual charge voltage on the output capacitor, which may impact proper power up of the system connected to the converter. The discharge circuit at VOUT pin becomes active once the EN pin is pulled to low or the input voltage drops below UVLO comparator threshold.

Thermal Protection

When the temperature of the JW7805 rises above 160°C, it is forced into thermal shut-down. Only when core temperature drops below 140°C can the device becomes active again.

APPLICATION INFORMATION

Input Capacitor Requirement

It is recommended to connect at least a 1uF, low ESR Ceramic X5R or X7R capacitor as close as possible to the IN pin of the device. This capacitor will provide a low impedance path for unwanted AC signals or noise modulated onto constant input voltage. A good input capacitor will limit the influence of input trace inductance and source resistance during sudden load current changes. A higher-value capacitor may be required if large, fast rise-time load transients are anticipated or if the device is not located close to the power source in the application.

Output Capacitor Requirement

The JW7805 requires an output capacitor connected as close as possible to the output pin of the regulator to achieve the output voltage transient requirement and loop stability. Take the additional capacitance de-ratings for aging, temperature and DC bias into consideration, a 2.2uF X7R or X5R ceramic capacitor is recommended for most small, low-cost application.

Besides, the maximum value of ESR should be less than 200mΩ. Larger output capacitors and lower ESR could improve the load transient response or high frequency PSRR.

PCB Layout Note

1. Place the input decoupling capacitor as close to JW7805 (VIN pin and PGND) as possible and make the PCB traces wide. The loop area formed by input capacitor and GND must be minimized.
2. The ground plane on the PCB should be as large as possible for better heat dissipation.

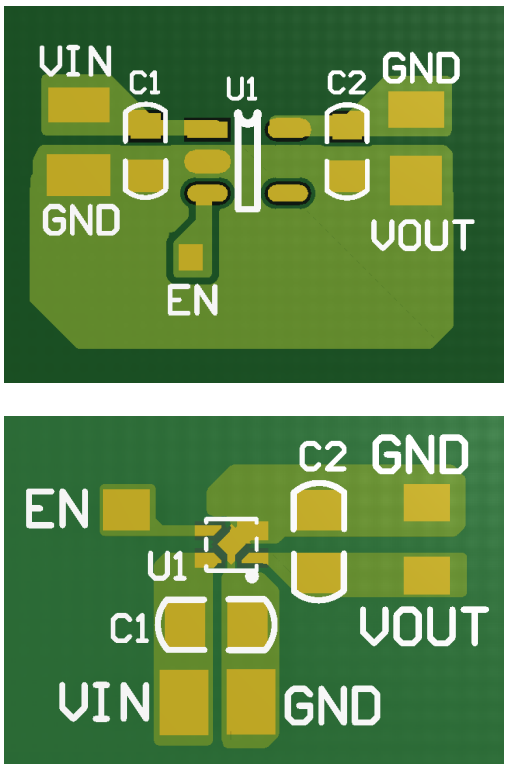
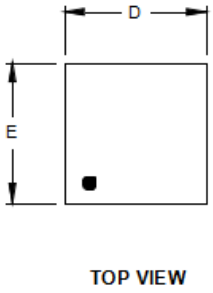


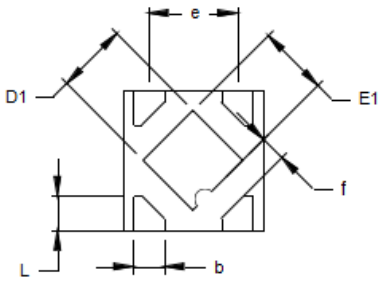
Figure1. PCB Layout Recommendation

PACKAGE OUTLINE

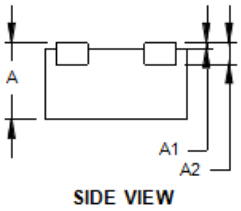
DFN1X1-4L UNIT: mm



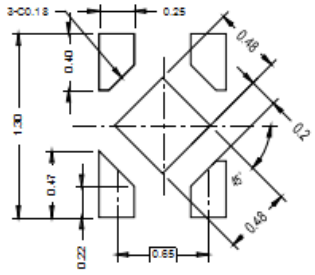
TOP VIEW



BOTTOM VIEW



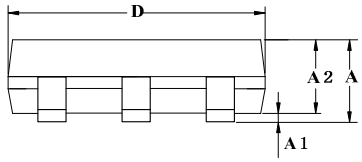
SIDE VIEW

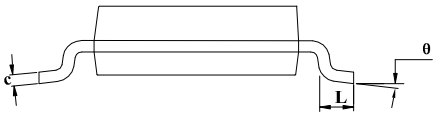


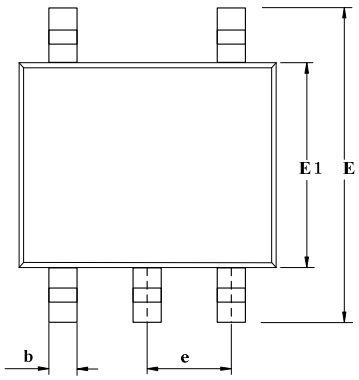
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.500	0.550	0.600
A1	0.000		0.050
A2	0.152 REF		
D	0.950	1.000	1.050
D1	0.450	0.500	0.550
E	0.950	1.000	1.050
E1	0.450	0.500	0.550
b	0.175	0.225	0.275
e	0.625 BSC		
f	0.195 REF		
L	0.200	0.250	0.300

SOT23-5 UNIT: mm







SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.05	1.15	1.25
A1	0	0.05	0.15
A2	0.95	1.05	1.20
b	0.20	0.40	0.60
c	0.05	—	0.21
D	2.72	2.92	3.12
E	2.60	2.80	3.00
E1	1.40	1.60	1.80
e	0.95（BSC）		
L	0.30	0.45	0.60
θ	0°	—	8°

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