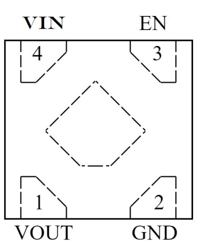
Features

- ◆ Input voltage range: 2.3V to 5.5V
- ◆ 1.0μA(typical) low quiescent current
- ◆ Output current up to 300mA
- ◆ ±2.0% initial voltage reference accuracy
- ◆ Low dropout voltage: 370mV@300mA
- ◆ Low shutdown current: 1μA (typical)
- ◆ High PSRR: 78 dB at 1KHz
- ◆ Fast transient response over line and load transient
- ◆ Low inrush current during soft start
- ◆ Built-in soft start
- ◆ Over current protection
- ◆ Short circuit protection
- ◆ Over temperature protection
- ◆ Stable with 1μF minimum ceramic output capacitor
- ◆ Green Product RoHS Compliant and Halogen Free

Applications

- ◆ Smartphones and Tablets
- ◆ Portable and Battery-Powered Applications
- ◆ Ultra Low Power Micro-controller
- ◆ Real Time Clock Backup Power
- ◆ Micro-controller Power Supply
- ◆ Electronic Sensors



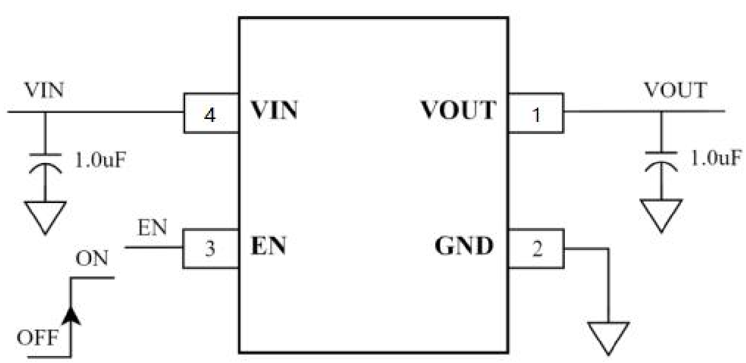
Package Type: DFN1*1-4L

Description

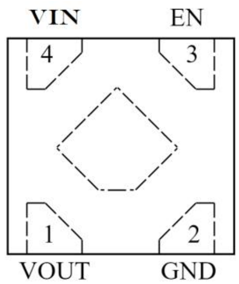
The ITE9107 is a 1.0μA supply current and fast response low dropout voltage regulator designed for applications requiring low quiescent current, low dropout voltage and high power supply rejection ratio. It guarantees delivery of 300mA output current, and supports preset output voltage versions range include 1.1V, 1.2V, 1.3V, 1.5V, 1.7V, 1.8V, 1.9V, 2.0V, 2.3V, 2.5V, 2.6V, 2.7V, 2.8V, 2.9V, 3.0V, 3.3V, 3.6V.

The ITE9107 features a precise ±2% output regulation over temperature, load and line variations, also integrates many functions. The function of thermal shutdown and over current limit protect the device against thermal and current over-loads. Based on its low quiescent current consumption and its less than 0.1μA (typical) shutdown mode current, besides with high power supply rejection ratio make the device holds well for low input voltages typically encountered in battery operation systems. The regulator is stable with small ceramic capacitor (typical 1.0μF).

Typical Application



Pin Configuration

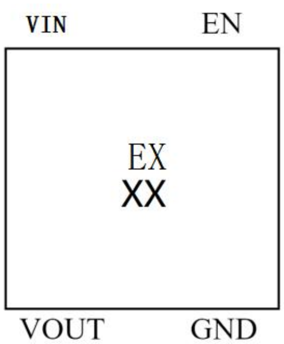


DFN1*1-4L

Pin Description

NO.	NAME	DESCRIPTION
1	VOUT	Regulated output voltage. The power output of the device, a 1.0μF ceramic capacitor is recommended at this pin.
2	GND	IC ground.
3	EN	EN: Pulling this pin to high/low will enable/disable the device. EN floating is not recommend allowed
4	VIN	Power supply voltage iInput. A 1.0uF ceramic capacitor is recommended at this pin.

Marking Information



As shown in the left figure：
First row：
E: Model code
X: Output voltage code
(for example, G: VOUT = 2.8V, E: VOUT = 3.0V, D: VOUT = 3.3V)
Second row：
Y: Age code
W: Week Code

PART NUMBER	PACKAGE TYPE	MARKING
ITE9107A12F4M	DFN1*1-4L	EN XX
ITE9107A13F4M	DFN1*1-4L	EP XX
ITE9107A15F4M	DFN1*1-4L	EM XX
ITE9107A18F4M	DFN1*1-4L	EL XX
ITE9107A25F4M	DFN1*1-4L	EI XX
ITE9107A28F4M	DFN1*1-4L	EG XX
ITE9107A30F4M	DFN1*1-4L	EE XX
ITE9107A33F4M	DFN1*1-4L	ED XX

Absolute Maximum Ratings (Note 1)

SYMBOL	PARAMETER	LIMITS	UNIT
V_{IN}	Power Supply Operation Voltage	$-0.3 < V_{IN} < 6$	V
V_{OUT}	Output Voltage	$-0.3 < V_{OUT} <$ VIN+0.3	V
V_{EN}	Enable Input Voltage	-0.3 < VIN < 6	V
I_{OUT}	Output Operation Current	300	mA
P_{D_SOT23}	Package Power Dissipation at $T_A \leqq 25°C$	420	mW
T_J	Junction Temperature	-40 to 150	℃
T_{STG}	Storage Temperature	-65 to 150	℃
T_{LEAD}	Lead Temperature Soldering Time	260 (10S)	℃
V_{ESD_HBM}	ESD (Human Body Model) (Note 2)	2	kV
V_{ESD_MM}	ESD (Machine Model) (Note 2)	200	V

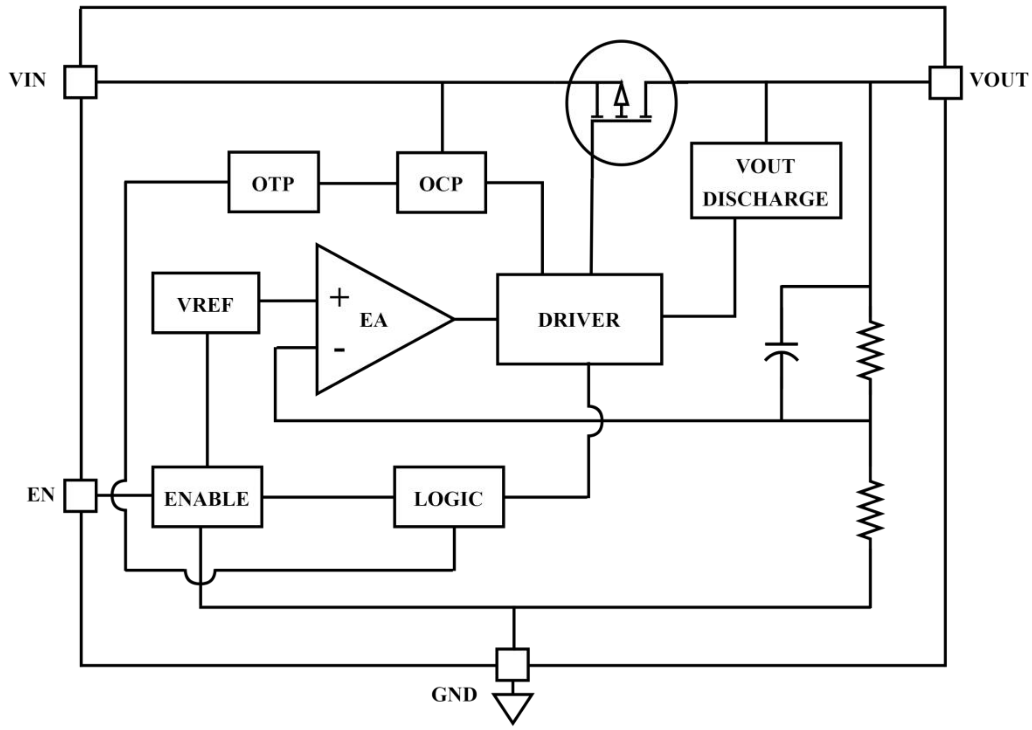
Thermal Information (Note 3)

SYMBOL	PARAMETER	LIMITS	UNIT
$\theta_{JA\_DFN1*1-4L}$	Thermal Resistance, Junction to Ambient	200	℃/W

Recommended Operating Conditions (Note 4)

SYMBOL	PARAMETER	LIMITS	UNIT
VIN	Power Supply Operation Voltage	2.3 to 5.5	V
T_J	Junction Temperature	-40 to 125	℃
T_A	Operating Temperature Range	-40 to 85	℃
V_{EN}	Enable Range	0 to VIN	V

Functional Block Diagram



ITE9107 Functional Block Diagram

Electrical Characteristics

(V_{IN}=V_{OUT}(NOM)+1V or 2.3V (whichever is greater), C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃ for typical specifications, unless otherwise specified)

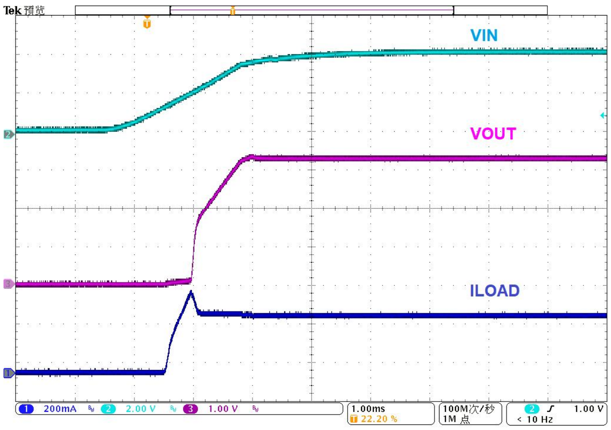
SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage Section						
V_{IN}	VIN Operation Voltage Range	V_{IN} Input Range	2.3		5.5	V
V_{OUT}	VOUT Output Regulated Voltage	V_{OUT} Output Range	1.1		3.6	V
I_{VIN}	VIN Supply Current	V_{IN} = EN = 5V, Unload		1		μA
I_{SHDN}	Input Current at IC Shutdown	V_{IN} = 5V, EN = 0V		0.1	1	μA
I_{OUT}	Output Current (Note 5)	Normal Operation Output Current	300			mA
Enable						
V_{ENH}	EN Input Voltage High	V_{IN} = 5V, I_{OUT} = 1mA	1.2			V
V_{ENL}	EN Input Voltage Low	V_{IN} = 5V, I_{OUT} = 1mA			0.3	V
Output Voltage Section						
V_{OUT}	Output Voltage Accuracy	I_{OUT} = 1mA	-2		+2	%
$\triangle V_{LNR}$	Line Regulation For VIN	V_{IN}=(V_{OUT}+1V, 2.3V) to 5.5V I_{OUT}=1mA		0.5		%/V
$\triangle V_{LDR}$	Load Regulation For VOUT	V_{IN} = V_{OUT} + 1V, I_{OUT}=1mA to 100mA		12		mV
RDischarge	Auto-Discharge Resistance	V_{IN} = 5V, V_{EN} = 0V		2		KΩ
V_{DROP}	Dropout Voltage (Note 6)	V_{OUT} = 3.3V, I_{OUT} = 300mA		370		mV
		V_{OUT} = 3.3V, I_{OUT} = 150mA		185		mV
PSRR						
PSRR	Power Supple Rejection Ratio	V_{IN} = Max{V_{OUT}+1V,2.3V}, F = 1KHz Ripple = 0.2Vpp, I_{OUT} = 50mA		78		dB
		VIN=Max{V_{OUT}+1V,2.3V}, F = 10KHz Ripple = 0.2Vpp, I_{OUT} = 50mA		40		dB
Over Current Protection						
I_{LIM}	Limit Current	V_{IN} = V_{EN} = 5V	350			mA
I_{SHORT}	Short Current	V_{OUT} < 0.2V		500		mA
Thermal shutdown						
T_{SD}	Thermal Shutdown Temperature	T_J Rising		150		℃
	Thermal Shutdown Returned Temperature			130		℃

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only . Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
Note 2. Devices are ESD sensitive. Handling precaution is recommended.
Note 3. θJA is measured in the natural convection at TA = 25°C on a high effective thermal conductivity test board of JEDEC 51-7 thermal measurement standard.
Note 4. The device is not guaranteed to function outside its operating conditions.
Note 5. The output current at which the output voltage becomes 95% of VOUT after gradually increasing the output current. Also The output current can be at least this value. Due to restrictions on the package power dissipation, this value may not be satisfied. Attention should be paid to the power dissipation of the package when the output current is large.The specification is guaranteed by design.
Note 6. The dropout voltage is defined as VIN - VOUT, which is measured when VOUT is 98%*VOUT.

Typical Performance Characteristics

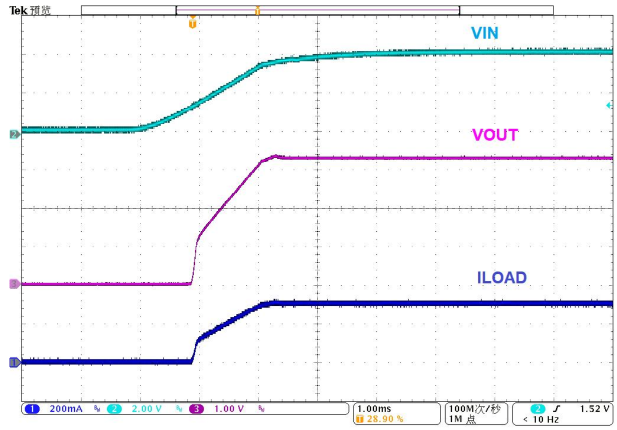
(T_A = 25°C, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise specified)

Power On from VIN With 300mA LOAD



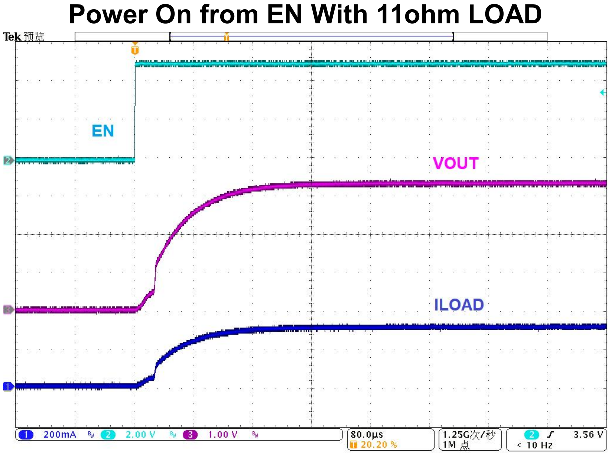
VIN=4.3V, V_{OUT}=3.3V, ILOAD=300mA

Power On from VIN With 11ohm LOAD



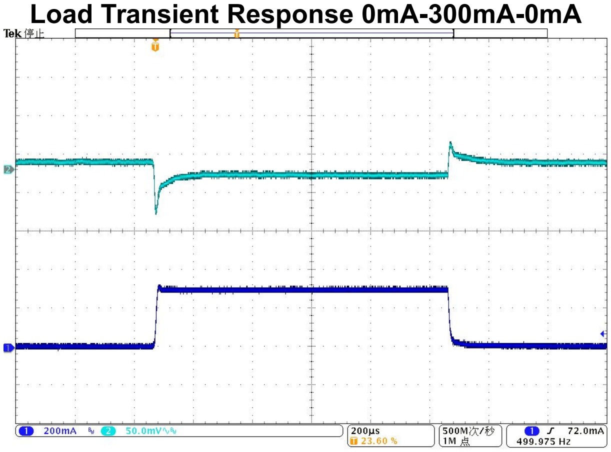
EN=5.0V, VIN=4.3V, V_{OUT}=3.3V, RLOAD=11ohm

Power On from EN With 11ohm LOAD



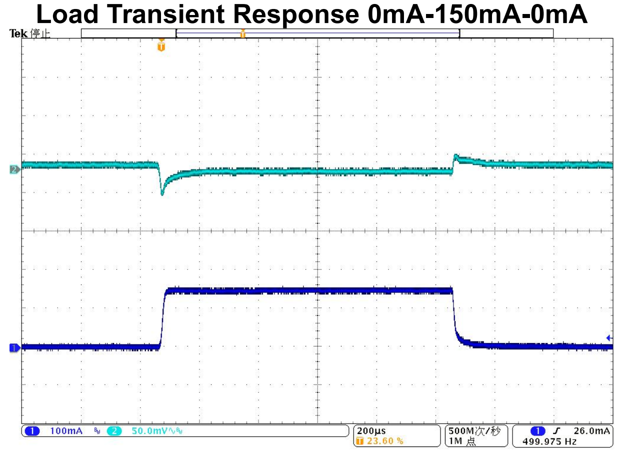
VIN=4.3V, V_{OUT}=3.3V, RLOAD=11ohm

Load Transient Response 0mA-300mA-0mA



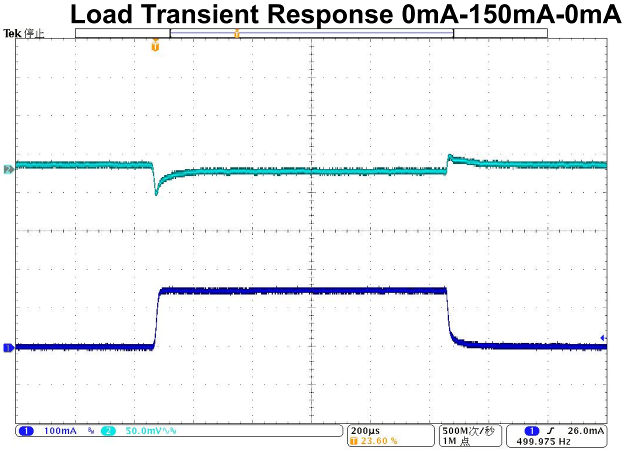
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-300mA-0mA

Load Transient Response 0mA-150mA-0mA



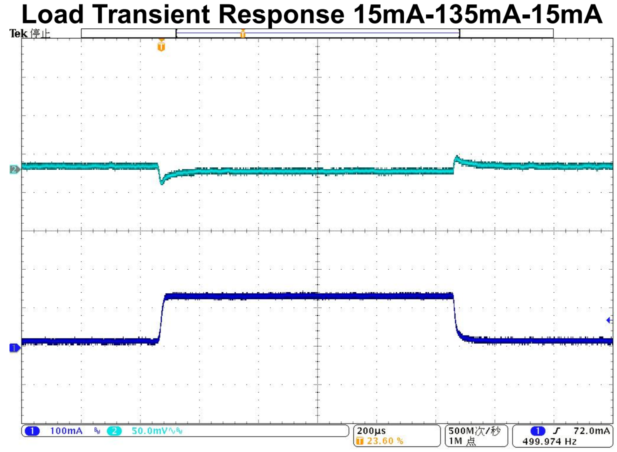
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-150mA-0mA

Load Transient Response 0mA-150mA-0mA



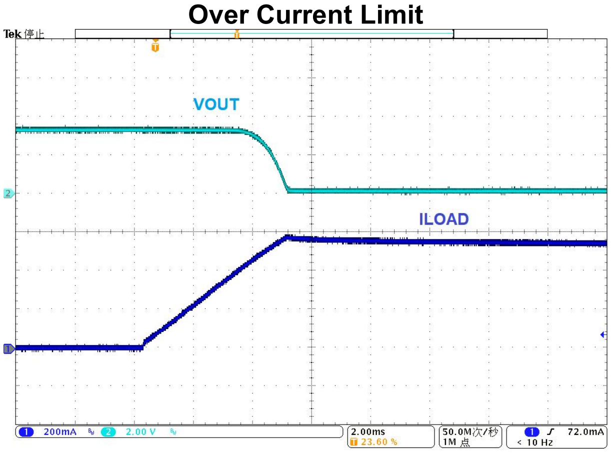
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-150mA-0mA

Load Transient Response 15mA-135mA-15mA



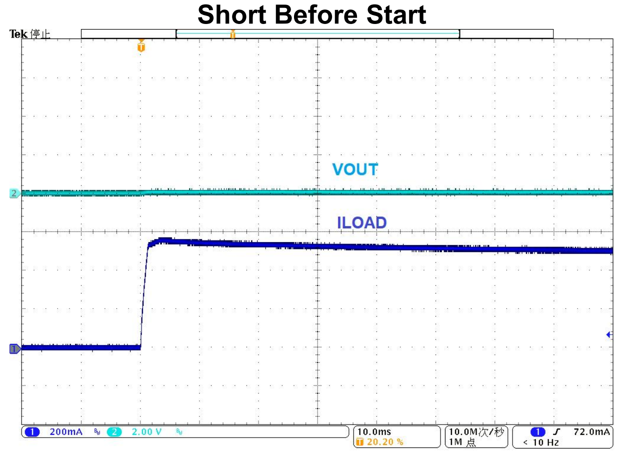
VIN=4.3V, V_{OUT}=3.3V, ILOAD=15mA-135mA-15mA

Over Current Limit



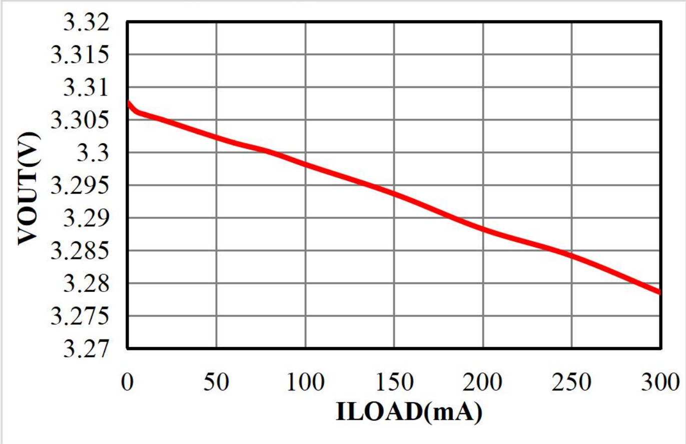
VIN=4.3V, V_{OUT}=3.3V

Short Before Start



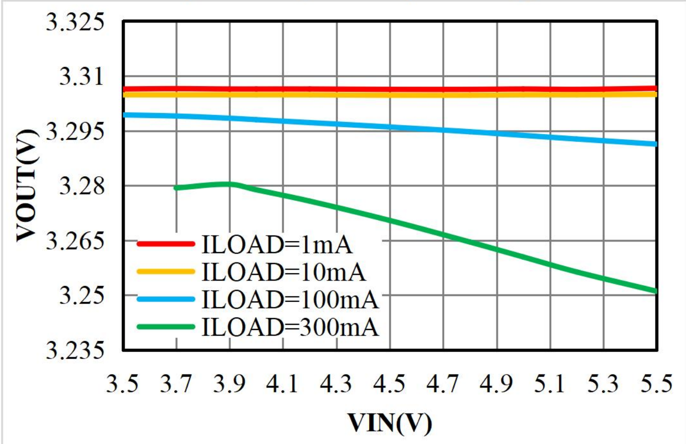
VIN=4.3V, V_{OUT}=0V

Output Voltage vs. Load Current



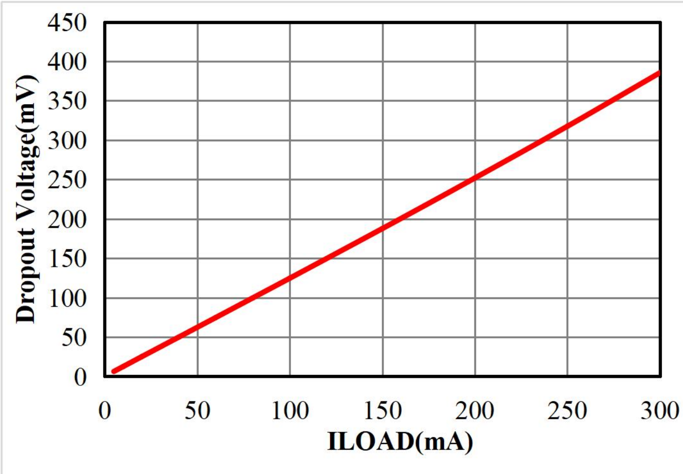
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-300mA

Output Voltage vs. Input Voltage



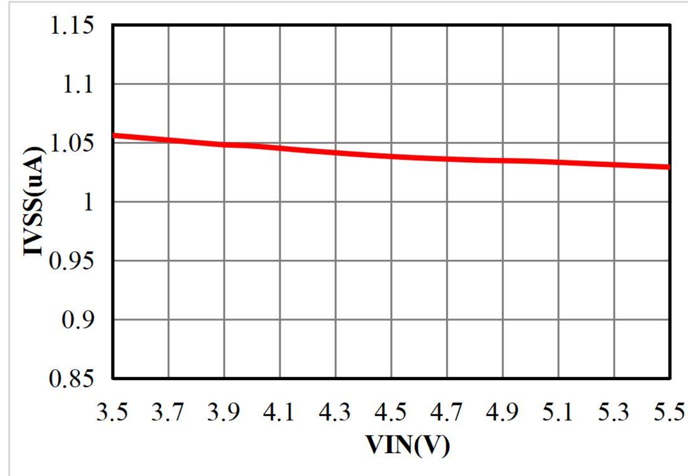
VIN=3.5-5.5V, V_{OUT}=3.3V, ILOAD=1mA-300mA

Dropout Voltage vs. Load Current



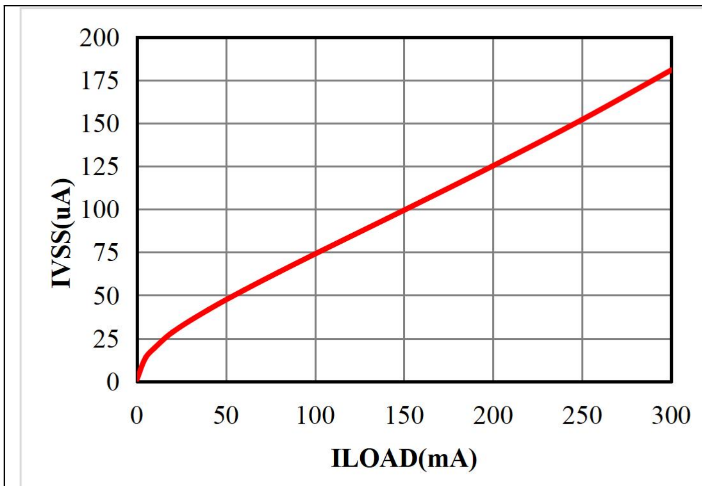
V_{OUT}=3.3V, ILOAD=0mA-300mA

Ground Current vs. Input Voltage



VIN=3.5-5.5V, V_{OUT}=3.3V, ILOAD=0mA

Ground Current vs. Load Current



VIN=4.3V, V_{OUT}=3.3V, ILOAD=0-300mA

Application Information

Input Capacitor

Good bypassing capacitor is recommended from input to ground to help improve AC performance. External input and output capacitors must be properly selected for stability and performance. Using a 1.0μF or larger input capacitor is suitable. Place the capacitors physically as close as possible to the device with wide and direct PCB traces to supply current during stepping load transients to prevent the input voltage rail from dropping.

Output Capacitor

Place the output capacitor close to the IC's VOUT and GND pins. Increasing capacitance and decreasing ESR can improve the circuit's PSRR and line transient response. The ITE9107 is specifically designed to employ ceramic output capacitors as low as 1.0μF. The ceramic capacitors offer significant cost and space savings, along with high frequency noise filtering. Place the capacitors physically as close as possible to the device with wide and direct PCB traces. The Capacitor's ESR should be less than 1.0mohm.

Current Limit

The ITE9107 provides a current limit function to prevent damages during output over-load or shorted-circuit conditions. The output current is detected by an internal sensing transistor and limited the output current to at least 350mA in typical applications.

When the output voltage is less than 0.2V, the short circuit current protection starts and remains the load current about to 500mA. The output can be shorted to ground without damaging the device.

Error Amplifier

The ITE9107 includes a built-in low on-resistance P-MOSFET transistor. The error amplifier compares the output feedback voltage from an internal feedback voltage divider to an internal reference voltage and then directly controls the gate voltage of P-MOSFET to maintain output voltage into good regulation.

OTP Protection

A thermal shutdown protection circuit disables the ITE9107 when the junction temperature of the pass transistor rises to 150℃ (typical). Thermal shutdown hysteresis assures that the device resets (turns on) when the temperature falls to 130℃ (typical).

The thermal shutdown feature provides the protection against overheating power dissipation due to some application failure and it is not intended to be used as a normal working function.

Enable

The ITE9107 has a dedicated enable pin with an active high(EN) function. When the EN is in logic low, the ITE9107 will be turned off. When the EN pin is in logic high, the ITE9107 will be turned on. EN Floating is not recommended.

Power Dissipation

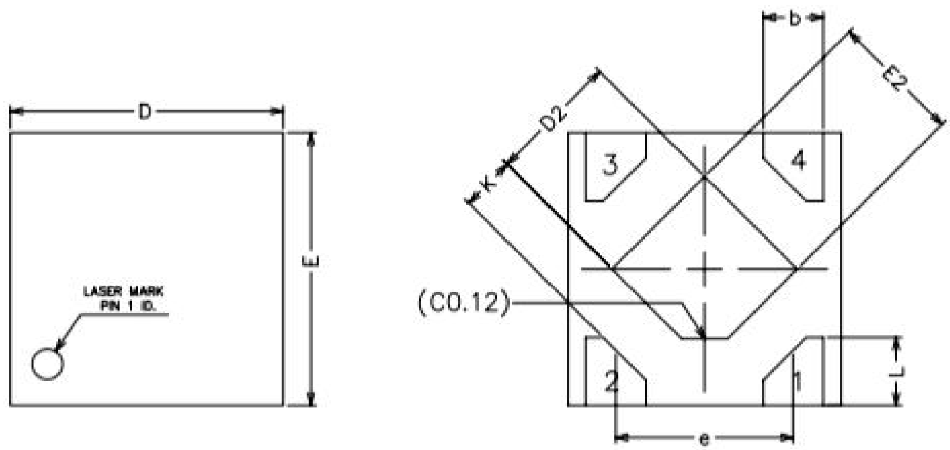
Power dissipation caused by voltage drop across the LDO and by the output current flowing through the device needs to be dissipated out from the chip. The maximum power dissipation is dependent on the PCB layout, number of used Cu layers, Cu layers thickness and the ambient temperature.

Power dissipation in the regulator depends on the input-to-output voltage difference and load conditions.

$$PD = (V_{IN} - V_{OUT}) \times I_{OUT}$$

Power dissipation can be minimized, and thus greater efficiency achieved, by proper selection of the system voltage rails. To avoid thermally overloading the ITE9107, refrain from exceeding the absolute maximum junction temperature rating of 150℃ under continuous operating condition. Over-stressing the regulator with high loading currents and elevated input-to-output differential voltages can increase the IC die temperature significantly.

Package Outline：DFN1*1-4L



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A3	0.100REF		
b	0.17	0.22	0.27
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
L	0.20	0.25	0.30
e	0.60	0.65	0.70
K	0.15	–	–