Description

The ITE9107 is a 1.0uA supply current and fast response low dropout voltage regulator which designed for applications requiring low quiescent current, low dropout voltage and high power supply ripple rejection. 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.

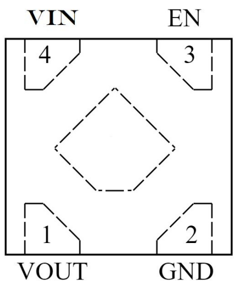
The ITE9107 features a precise ±2% output regulation over temperature, load and line variations, also the ITE9107 integrates many functions. The function of thermal shutdown and over current limit protect the device against thermal and current over-loads. Based on its low quiescent current consumption and its less than 0.1uA (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 1.0uF).

Feature

- Input voltage range: 2.3V~5.5V
- 1.0uA(typical) Low quiescent current
- Output current up to 300mA
- ±2.0% Initial voltage reference accuracy
- Low dropout voltage: 370mV@300mA
- Low shutdown current: 1uA (typical)
- High PSRR: 78 dB at 1KHz
- Fast transient response over line and load transient
- Low inrush current during soft start
- Build in internal soft start
- Over current protection
- Short circuit protection
- Over temperature protection
- Stable with1μF minimum ceramic output capacitor
- Green Product RoHS Compliant and Halogen Free

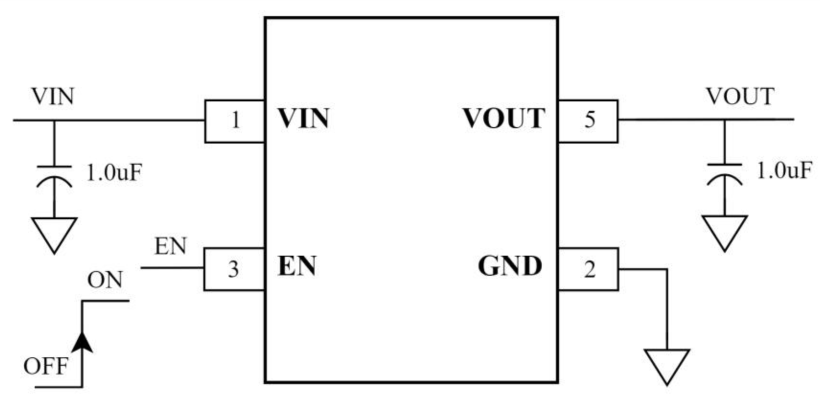
Applications

- Smartphones and Tablets
- Portable&Battery-Powered Applications
- Ultra Low Power Micro-Controller
- Real time clock backup power
- Micro-Controller Power Supply
- Electronic sensors



Package Type : DFN1*1-4L

Application Circuit



Pin Description

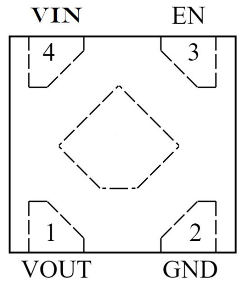
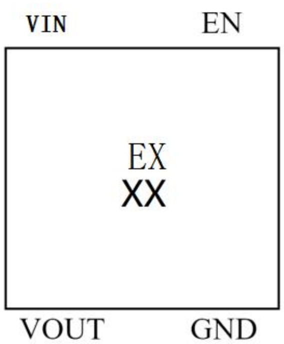


Figure 2 DFN1*1-4L Package

No	Name	Description
1	VOUT	Regulated Output Voltage.The power output of the device, A 1.0uF 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 Input. 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 Instance 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
ITE9107A28F4M	DFN1*1-4L	EG XX
ITE9107A30F4M	DFN1*1-4L	EE XX
ITE9107A33F4M	DFN1*1-4L	ED XX

Absolute Maximum Ratings (Note 1)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions. Extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Limit	Unit
V_{IN}	Power Supply Operation Voltage	$-0.3<V_{IN}<6.0$	V
V_{OUT}	Output Voltage	$-0.3V<V_{OUT}<VIN+0.3$	V
V_{EN}	Enable Input Voltage	-0.3<VIN<6.0	V
I_{OUT}	Output Operation Current	300	mA
P_{D_SOT23}	Package Power Dissipation at TA≦25°C	420	mW
T_J	Junction Temperature	-40.0~150.0	°C
T_{STG}	Storage Temperature	-65.0~150.0	°C
T_{LEAD}	Lead Temperature Soldering Time	260.0 (10S)	°C
V_{ESD_HBM}	ESD (Human Body Mode) (Note 2)	2K	V
V_{ESD_MM}	ESD (Machine Mode) (Note 2)	200	V

Thermal Information (Note 3)

Symbol	Parameter	Limits	Unit
$\theta_{JA\_DFN1*1-4L}$	Thermal Resistance Junction to Ambient	200	°C/W

Recommend Operating Condition (Note 4)

Symbol	Parameter	Limits	Unit
VIN	Power Supply Operation Voltage	2.3 to 5.5	V
T_J	Junction Temperature	-40.0~125.0	°C
T_A	Operating Temperature Range	-40.0~85.0	°C
V_{EN}	Enable Range	0.0 to VIN	V

Block Diagram

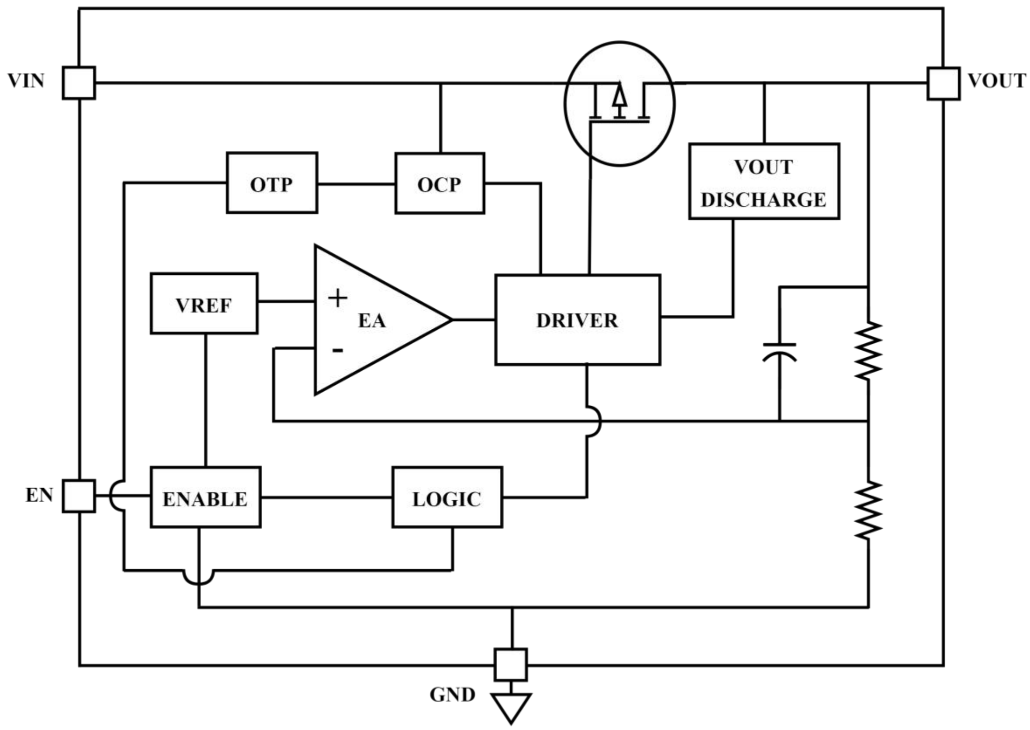


Figure 2. ITE9107 Functional Block Diagram

Electrical Characteristics

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

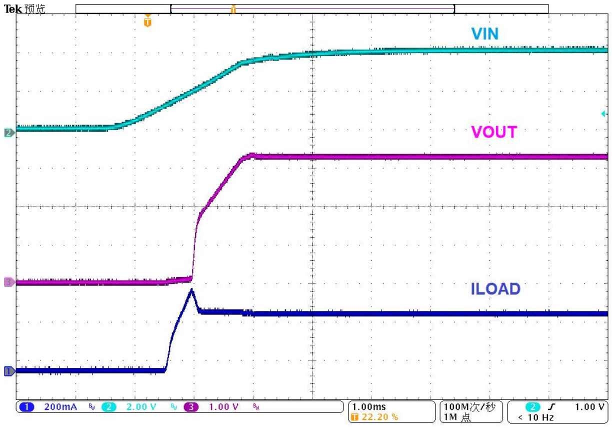
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Supply Voltage Section						
V_{IN}	VIN Operation Voltage Range	VIN Input Range	2.3		5.5	V
V_{OUT}	VOUT Output Regulated Voltage	VOUT Output Range	1.1		3.6	V
I_{VIN}	VIN Supply Current	VIN=EN=5.0V,Unload		1.0		uA
I_{SHDN}	Input Current At IC Shutdown	VIN=5.0V,EN=0.0V		0.1	1.0	uA
I_{OUT}	Output Current (Note 5)	Normal Operation Output Current	300			mA
Enable						
V_{ENH}	EN Input Voltage High	VIN=5.0V,IOUT=1.0mA	1.2			V
V_{ENL}	EN Input Voltage Low	VIN=5.0V,IOUT=1.0mA			0.3	V
Output Voltage Section						
V_{OUT}	Output Voltage Accuracy	IOUT=1mA	-2.0		+2.0	%
$\triangle V_{LNR}$	Line Regulation For VIN	VIN=(VOUT+1.0V,2.3V) to 5.5V IOUT=1.0mA		0.5		%/V
$\triangle V_{LDR}$	Load Regulation For VOUT	VIN=VOUT+1.0V IOUT=1.0mA to 100.0mA		12.0		mV
RDischg	Auto-Discharge Resistance	VIN=5.0V,VEN=0.0V		2.0		KΩ
V_{DROP}	Dropout Voltage (Note 6)	VOUT=3.3V,IOUT=300mA		370		mV
		VOUT=3.3V,IOUT=150mA		185		mV
PSRR						
PSRR	Power Supple Ripple Rejection Rate	VIN=Max{VOUT+1.0V,2.3V},F=1KHz Ripple=0.2Vpp,IOUT=50mA		78.0		dB
		VIN=Max{VOUT+1.0V,2.3V},F=10KHz Ripple=0.2Vpp,IOUT=50mA		40.0		dB
Over Current Protection						
I_{LIM}	Limit Current	VIN=VEN=5V	350			mA
I_{SHORT}	Short Current	VOUT < 0.2V		500		mA
Thermal shutdown						
T_{SD}	Thermal Shutdown Temperature	TJ Rising		150		°C
	Thermal Shutdown Returned Temperature			130		°C

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. 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 remain possibility to affect device reliability.
Note 2. Devices are ESD sensitive. Handling precaution recommended.
Note 3. θ_{JA} 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 (TBD)

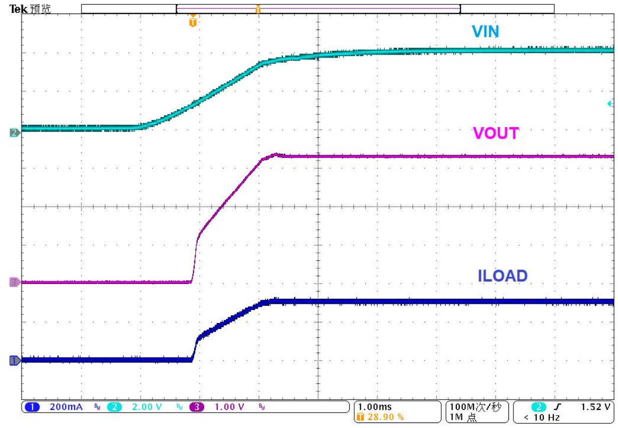
(T_A = 25°C, C_{IN}=1uF, C_{OUT}=1uF, unless otherwise specified)

Power On from VIN With 300mA LOAD



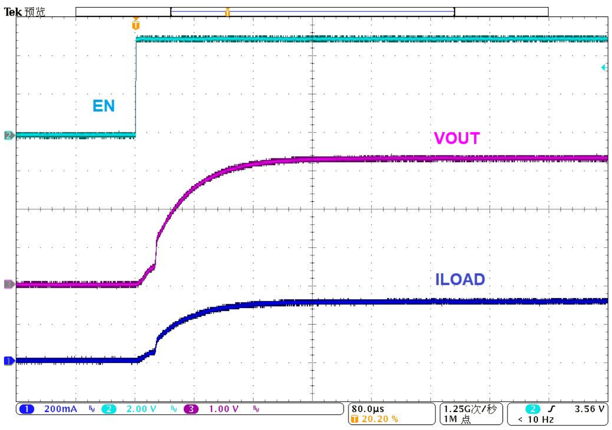
VIN=4.3V, V_{OUT}=3.3V, ILOAD=300mA

Power On from VIN With 11ohm LOAD



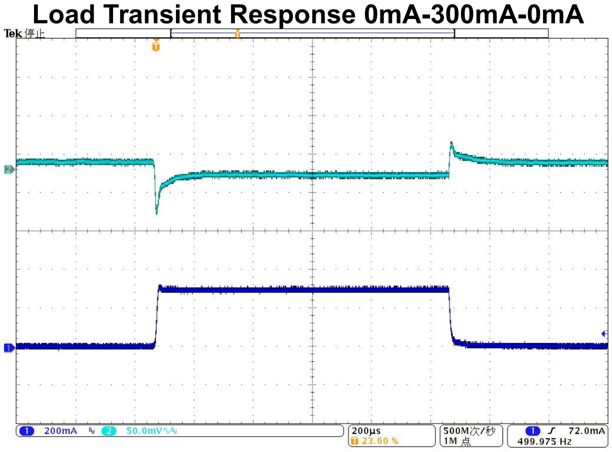
EN=5.0V, VIN=4.3V, V_{OUT}=3.3V, RLOAD=11ohm

Power On from EN With 11ohm LOAD



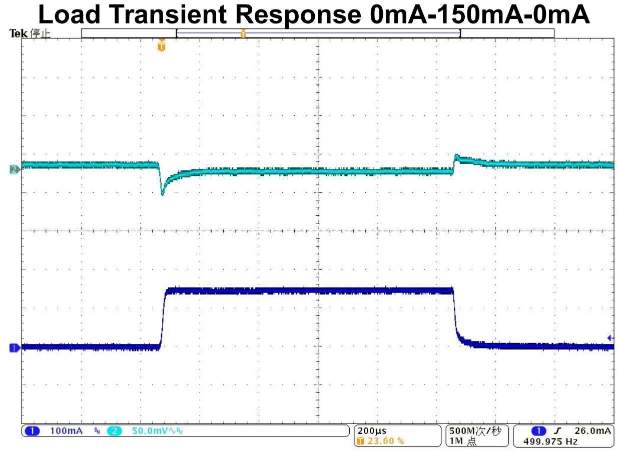
VIN=4.3V, V_{OUT}=3.3V, RLOAD=11ohm

Load Transient Response 0mA-300mA-0mA



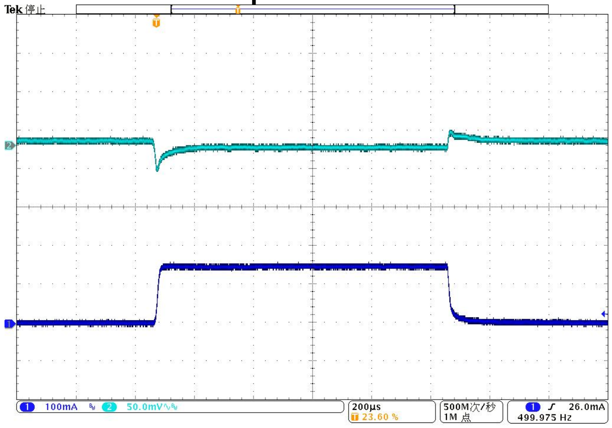
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-300mA-0mA

Load Transient Response 0mA-150mA-0mA



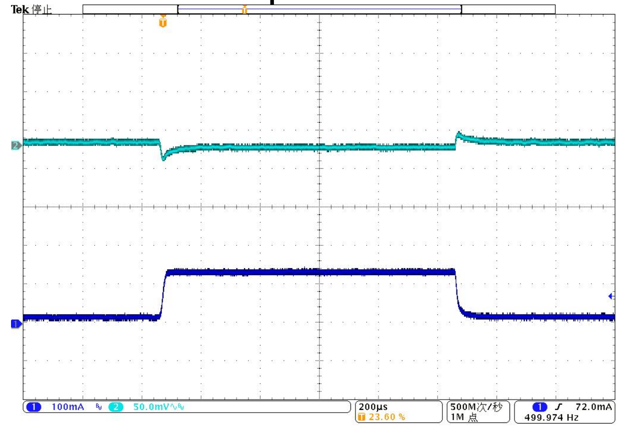
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-150mA-0mA

Load Transient Response 0mA-150mA-0mA



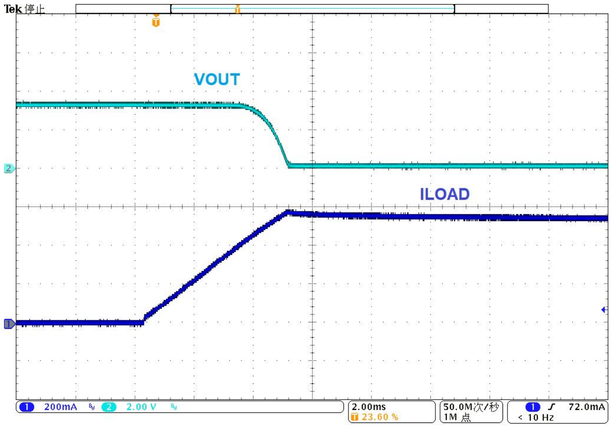
VIN=4.3V, V_{OUT}=3.3V, ILOAD=0mA-150mA-0mA

Load Transient Response 15mA-135mA-15mA



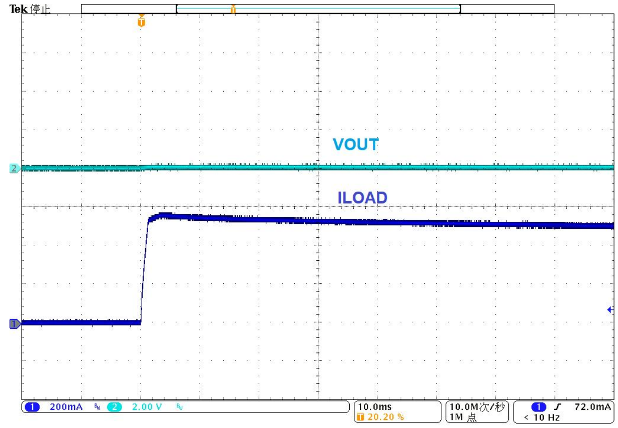
VIN=4.3V, V_{OUT}=3.3V, ILOAD=15mA-135mA-15mA

Over Current Limit



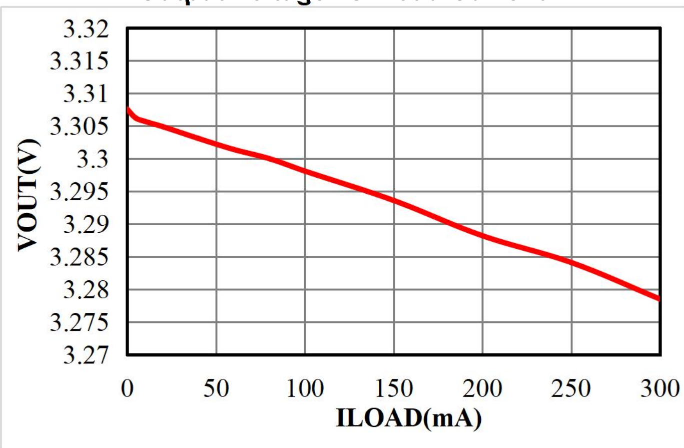
VIN=4.3V, V_{OUT}=3.3V

Short Before Start



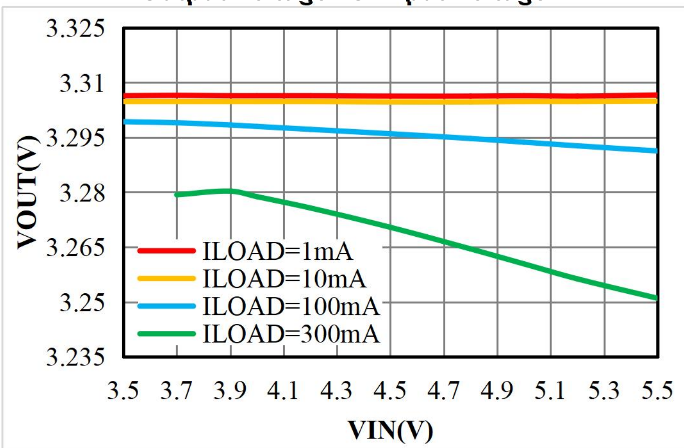
VIN=4.3V, V_{OUT}=0V

Output Voltage vs. Load Current



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

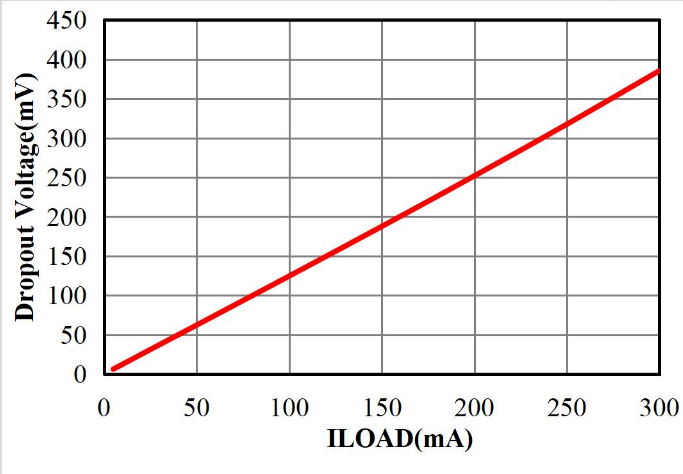
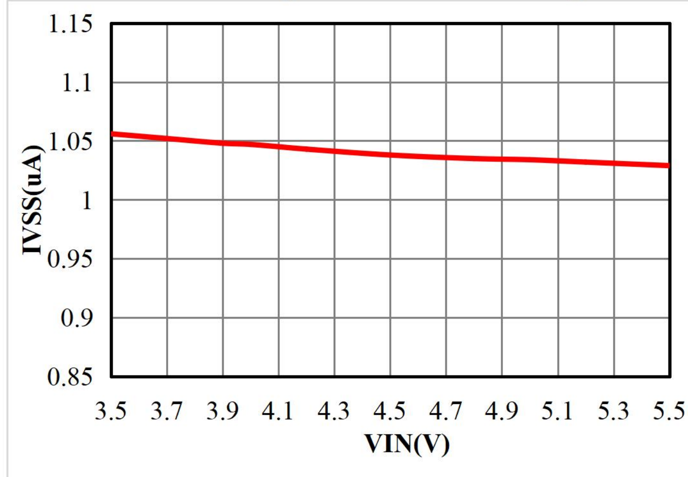
Output Voltage vs. Input Voltage



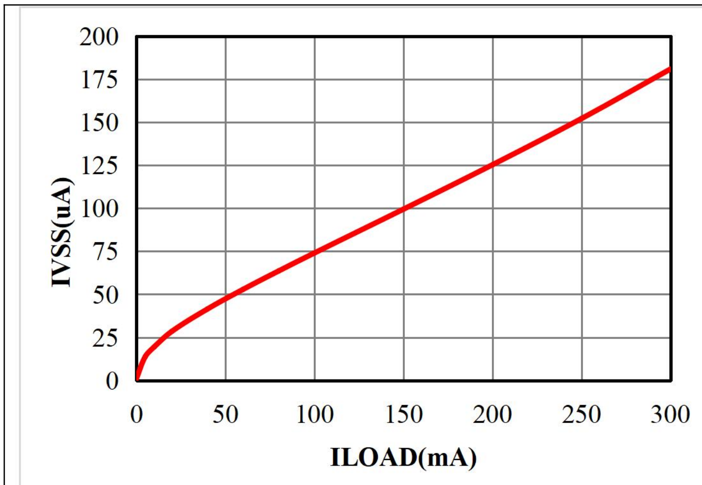
VIN=3.5-5.5V, V_{OUT}=3.3V, ILOAD=1mA-300mA

Dropout Voltage vs. Load Current

Ground Current vs. Input Voltage

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

Applications Information

Input Capacitor

Good bypassing is recommended from input to ground to help IC ac performance,External Input and Output Capacitors must be properly selected for stability and performance.Use a1.0uF or larger input capacitor and Also 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 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 1.0uF.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. capacitor ESR should be less than 1.0mohm.

Current Limit

The ITE9107 provides a current limit function to prevent damage during output over-load or In shorted-circuit conditions.The output current is detected by an internal sensing transistor and limiting the output current to higher than at least 350mA in typical application

When the output voltage less than 0.2V,so the short circuit current protection stars and remains the load Current about to 500.0mA,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 P-MOSFET Gate Voltage 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°C (typical). Thermal shutdown hysteresis assures that the device resets (turns on) when the temperature falls to 130°C (typical).

The thermal shutdown feature provides the protection IC 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 active high(EN) Function.When the EN pin 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 recommend allowed

Power Dissipation

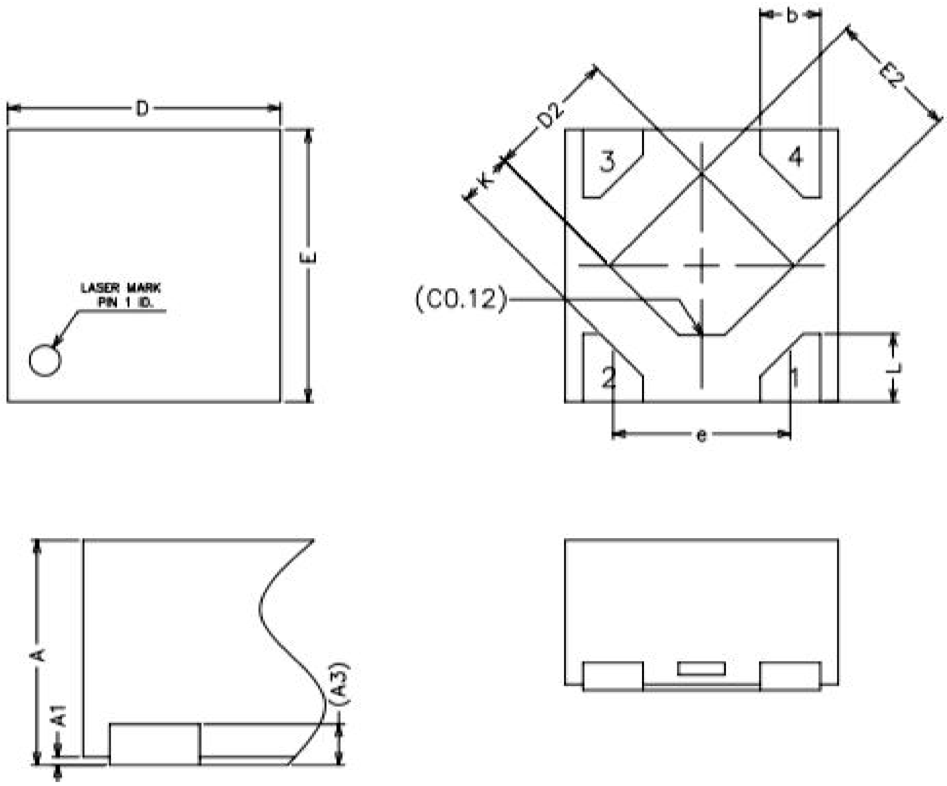
Power dissipation caused by voltage drop across the LDO and by the output current flowing through the device needs to be dissipated out from the chip. The maximum power dissipation is dependent on the PCB layout, number of used Cu layers, Cu layers thickness and the ambient temperature.

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

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

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°C 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	–	–