Features

- Maximum 500mA peak output current
- Ultra Low Dropout Voltage
  Typically 200mV at 500mA Output Current
- High Output Accuracy over Line, Load and Temperature
- Build-In Soft-Start
- Excellent startup under load from 0 to 500mA
- Power-On-Reset Monitoring on V_{DD} Pin
- Foldback over Current Protection and Thermal shutdown
- Low ESR Output Capacitor(Multi-layer Chip Capacitors (MLCC)) Applicable
- TSOT-23-5,SOT-23-5 and TDFN6-2x2 packages
- Green Product (RoHS, Lead-Free, Halogen-Free Compliant)

General Description

The GS7116 is a high performance regulator which can deliver up to 500mA of continuous output current with a typical dropout voltage of only 200mV using internal p-channel MOSFETs.

The GS7116 allows the use of low-ESR ceramic capacitor as low as 4.7uF. Morecover the IC provides good performance on both line transient response and load transient response.

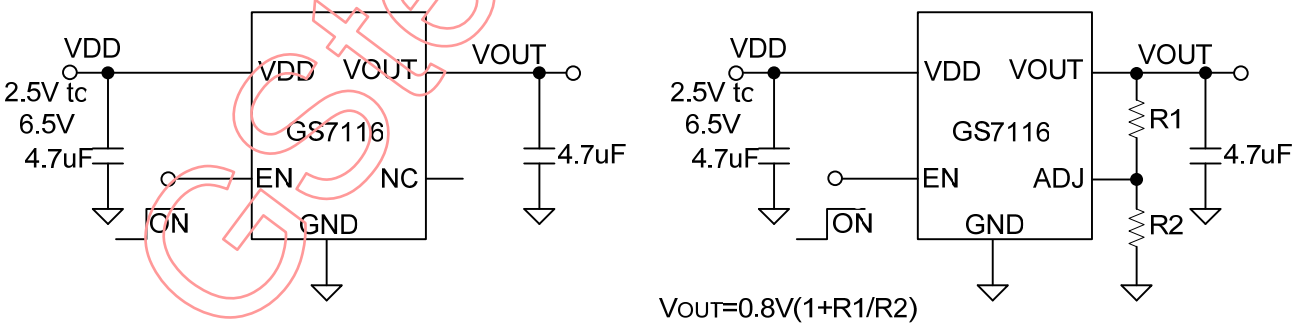
The GS7116 provides foldback over current limit and thermal shutdown to prevent the linear regulator from damage. Built-in soft-start minimizes stress on the input power source by reducing capacitive inrush current on start-up.

The GS7116 is available in the TSOT-23-5 ,SOT-23-5 and TDFN6-2x2 packages.

Applications

- Notebook PC Applications
- Motherboard Applications
- LCD Monitor
- Telecom Equipment
- Graphic Cards
- DVD-video Player

Typical Application



(a) FIX Voltage Version (b) Adjustable Voltage Version

Figure 1 Typical Application of GS7116

Function Block Diagram

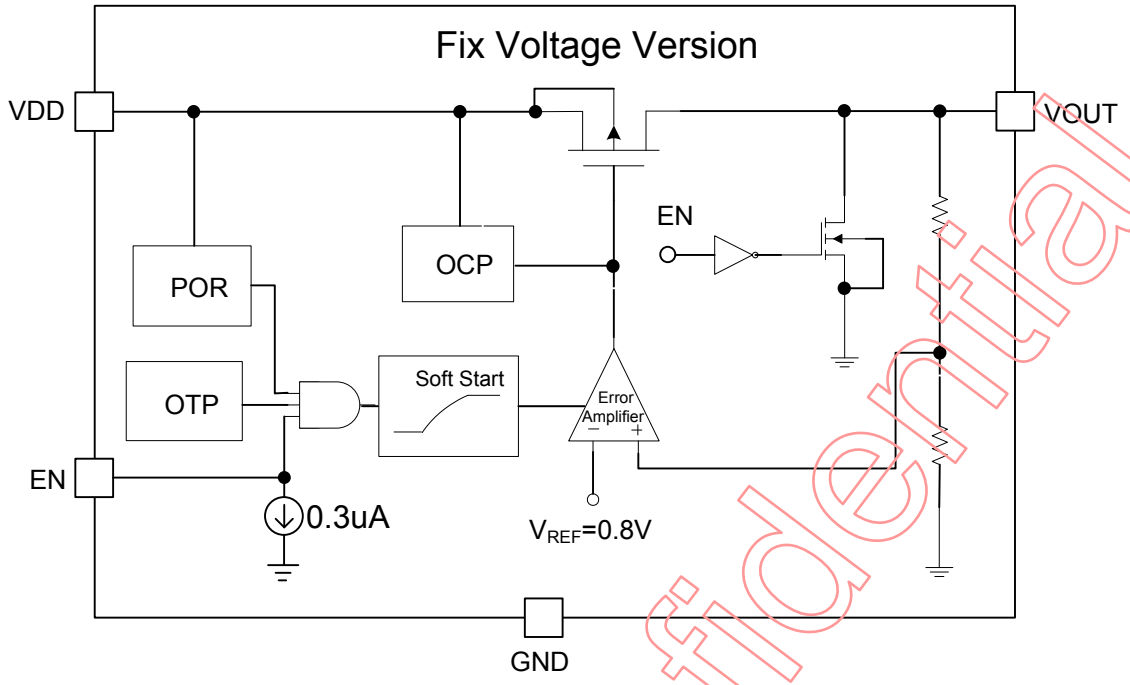


Figure 2a Function Block Diagram (Fix)

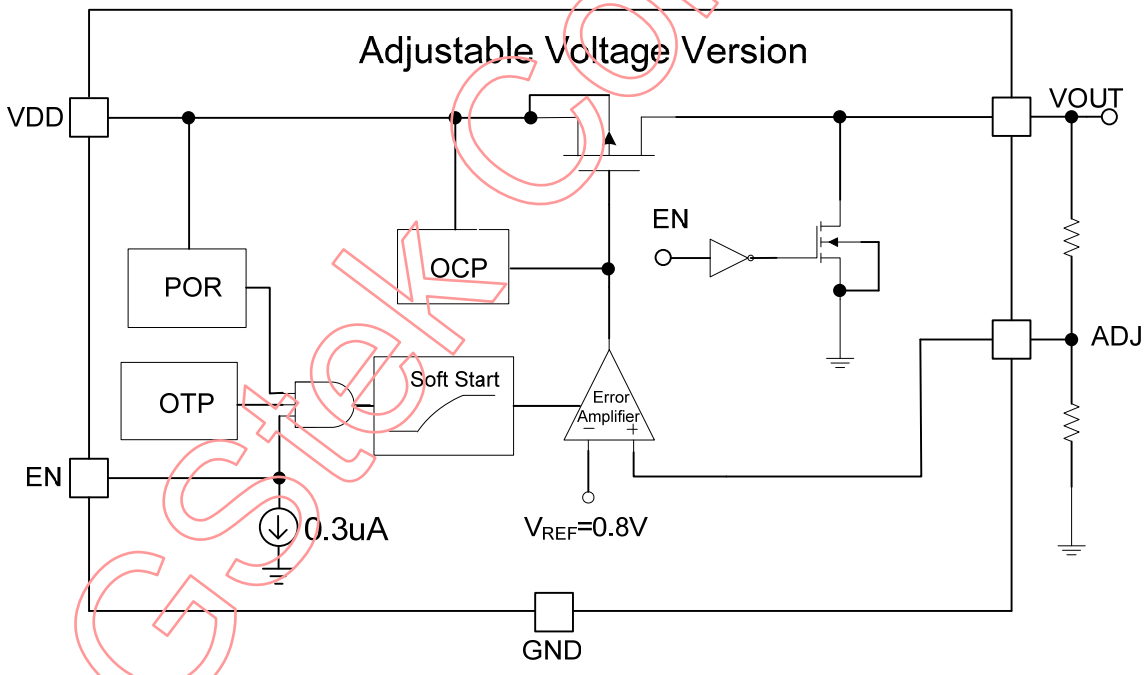


Figure 2b Function Block Diagram (ADJ)

Pin Configuration

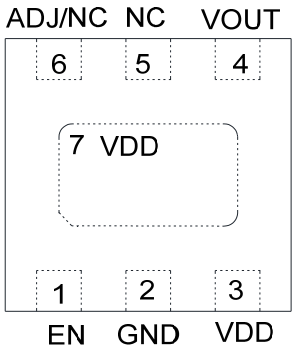


Figure 3a TDFN6-2x2 Package

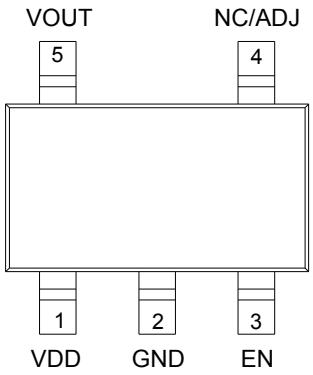


Figure 3b SOT-23-5(S5)/TSOT-23-5 Package

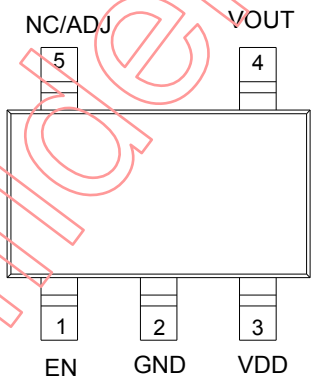
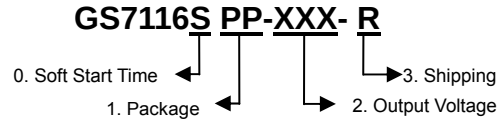


Figure 3c SOT-23-5(ST)

Pin Descriptions

No				Name	I/O type	Description
TSOT-23-5	SOT-23-5 (S5)	SOT-23-5 (ST)	TDFN6-2x2			
1	1	3	3,7	VDD	I/O	Supply voltage
2	2	2	2	GND	I/O	Ground.
3	3	1	1	EN	I	Enable input (active high)
4	4	5	6	ADJ	I	Adjustable input. Feedback pin connect to resistor divider.
			5/6	NC		No internal Connection.
5	5	4	4	VOUT	O	Output Voltage. The power output of the device.

Ordering Information



No	Item	Contents
0	Soft Start Time	Unmarked: Soft Start=150us A: Soft Start=650us
1	Package	T5: TSOT-23-5 S5:SOT-23-5 ST:SOT-23-5 TD: TDFN6-2x2
2	Output Voltage	ADJ: 0.8V to 6.5V 1P2:1.2V, 1P8:1.8V, 2P5: 2.5V, 2P8: 2.8V, 285: 2.85V, 3P0: 3.0V, 3P3: 3.3V, 5P0: 5.0V GS7116S5 only fix output voltage
3	Shipping	R: Tape & Reel

Example: GS7116 Soft Start=150us,TSOT-23-5,2.5V,Tape & Reel ordering information is "GS7116T5-2P5-R"

Absolute Maximum Rating (Note 1)

Parameter	Symbol	Maximum	Units
Control Voltage	V_{DD}	7	V
Package Power Dissipation at T_A =25°C	$P_{D\_TSOT-23-5}$	420	mW
Package Power Dissipation at T_A =25°C	$P_{D\_SOT-23-5}$	420	mW
Package Power Dissipation at T_A =25°C	$P_{D\_TDFN6-2x2}$	1087	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	- 65 ~ 150	°C
Lead Temperature (Soldering) 10S	T_{LEAD}	260	°C
ESD (Human Body Mode) (Note 2)	V_{ESD_HBM}	2K	V
ESD (Machine Mode) (Note 2)	V_{ESD_MM}	200	V

Thermal Information (Note 3)

Parameter	Symbol	Limits	Units
Thermal Resistance Junction to Ambient	$\theta_{JA\_TSOT-23-5}$	238	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_SOT-23-5}$	238	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_TDFN6-2x2}$	92	°C/W

Recommend Operating Condition (Note 4)

Parameter	Symbol	Limits	Units
Control Voltage	V_{DD}	$(V_{OUT}+V_{DROPOUT}) < V_{DD} < 6.5$	V
Junction Temperature	T_J	-40 ~ 125	°C
Ambient Temperature	T_A	-40 ~ 85	°C

Electrical Characteristics

$V_{IN}=V_{OUT}+1V$, $I_{OUT}=0.1mA$, $C_{VDD}=4.7\mu F$, $C_{LOAD}=4.7\mu F$, TA =25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Input Voltage	V_{DD}		$V_{OUT}+V_{DROPOUT}$ (VDD must≧2.3V)		6.5	V
Output Voltage accuracy	V_O		-2		2	%
Output Voltage Temp.Coefficient	T_{COUT}			50		ppm/°C
Dropout Voltage (Note 5)	V_{DROP}	I_O=500mA,V_O=3.3V		260	350	mV
Dropout Voltage (Note 6)	V_{DROP}	I_O=500mA,V_O=3.3V		300	450	mV
Line Regulation		V_{DD} = V_O +1V to 6.5V	-0.2		0.2	%
Load Regulation		I_O=0.1mA to 500mA			40	mV
Current limit	I_{LIMIT}		550	700	820	mA
Short current limit (Note 7)	I_{SC}	V_O <0.2		100		mA
Quiescent Current	I_Q			95	130	uA
V_{DD} Shutdown Current	I_{SHDN}				1	uA
V_{OUT} Pull Low Resistor		V_{EN}=0	65		100	Ω
Adjustable input voltage	V_{ADJ}	I_{OUT}=0.1mA		0.8		V
POR threshold				2.1		V

Power supply rejection		PSRR	I_O=150mA	f=1KHz		70		dB
				f=20KHz		43		
Enable Input								
EN Threshold	Logic-Low Voltage	V_{EN-L}					0.4	V
	Logic-High Voltage	V_{EN-H}			1.6			
EN Input Bias Current		I_{EN}	V_{EN}=5V			0.3	1	uA
Soft Start								
Soft Start Time		T_{SS}	For GS7116		50	150	200	us
			For GS7116A		500	650	800	
Thermal Protection								
Over temperature shutdown		T_{SD}				160		°C
Return temperature						130		

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 T_A=25°C on a high effective thermal conductivity test board (4 Layers, 2S2P) of JEDEC 51-7 thermal measurement standard.

Note 4. The device is not guaranteed to function outside its operating conditions.

Note 5. The Dropout voltage is defined as V_{IN}-V_{OUT}, which is measured when V_{OUT} is 0.98*$V_{OUT(NORMAL)}$. Specification for TSOT-23-5, TDFN6-2x2.

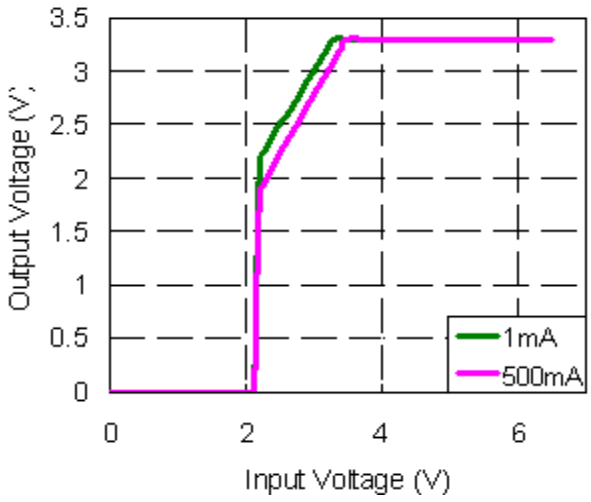
Note 6. The Dropout voltage is defined as V_{IN}-V_{OUT}, which is measured when V_{OUT} is 0.98*$V_{OUT(NORMAL)}$. Specification for SOT-23-5.

Note 7. If Vout is detected as <0.2V, then Io is restricted to typical 100mA.

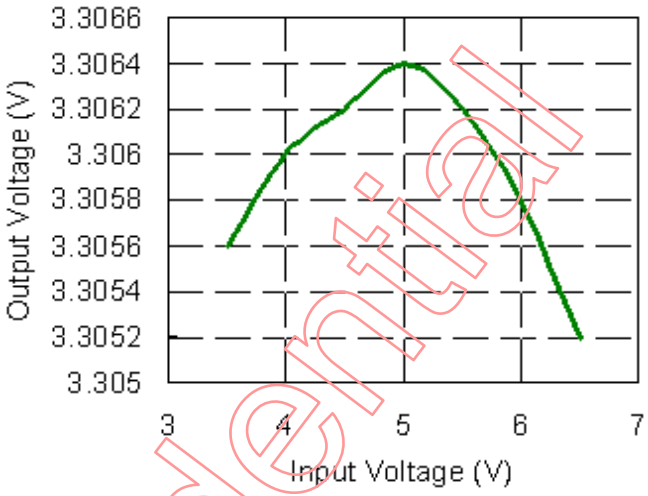
Typical Characteristics

(shown for 3.3V output option) V_{IN}=4.3V,C_{VDD}=4.7μF, C_{LOAD}=4.7μF, T_A=25°C,unless otherwise specified.

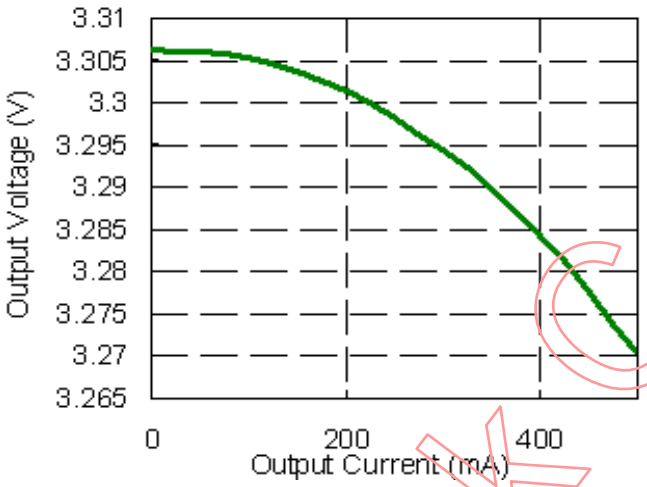
Output Voltage vs. Input Voltage



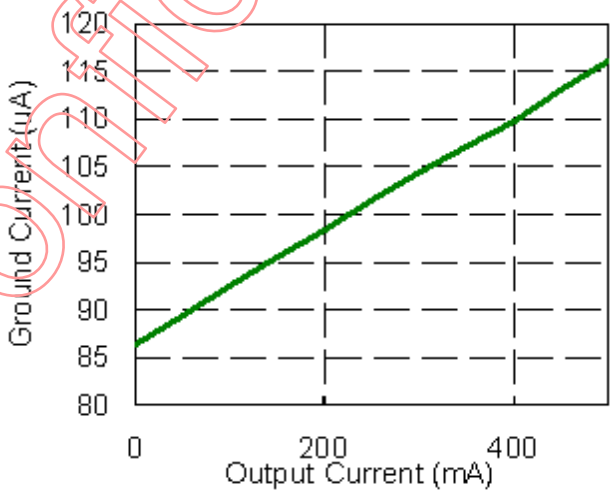
Line Regulation



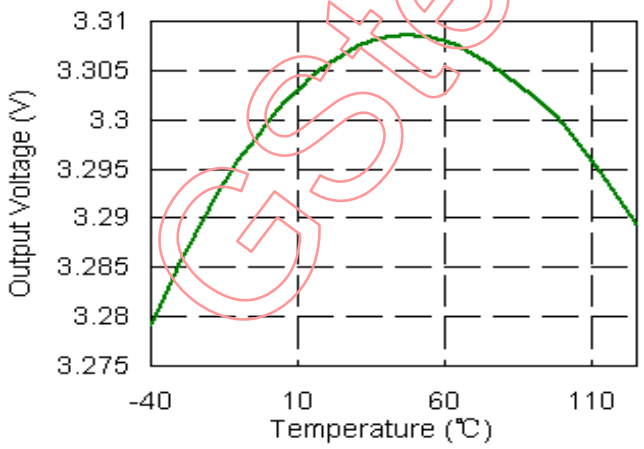
Load Regulation



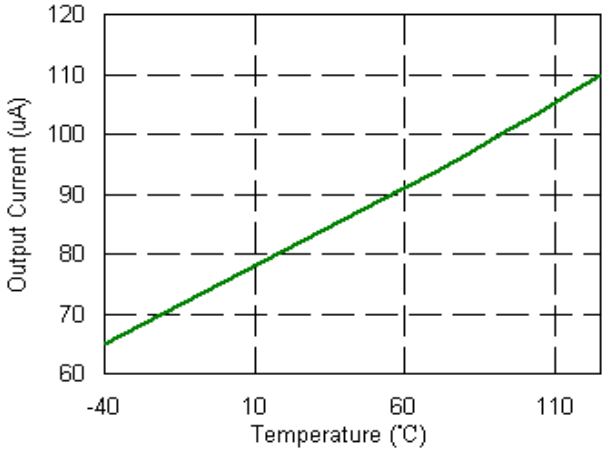
Ground Current vs. Load Current



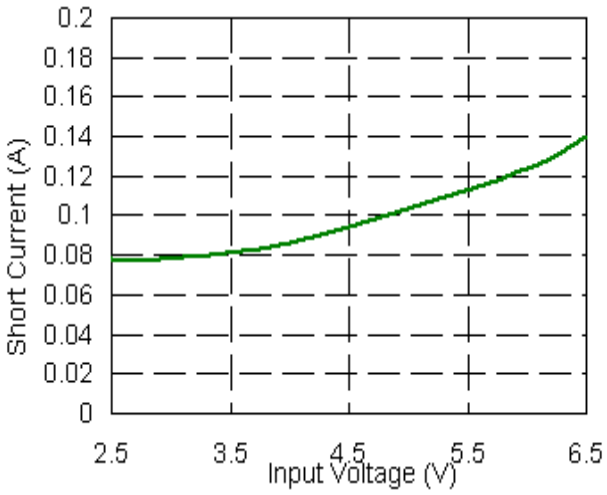
Output Voltage vs. Temperature



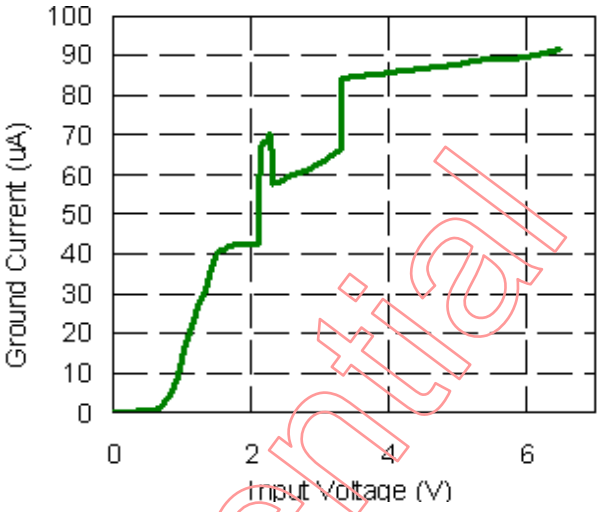
Ground Current vs. Temperature



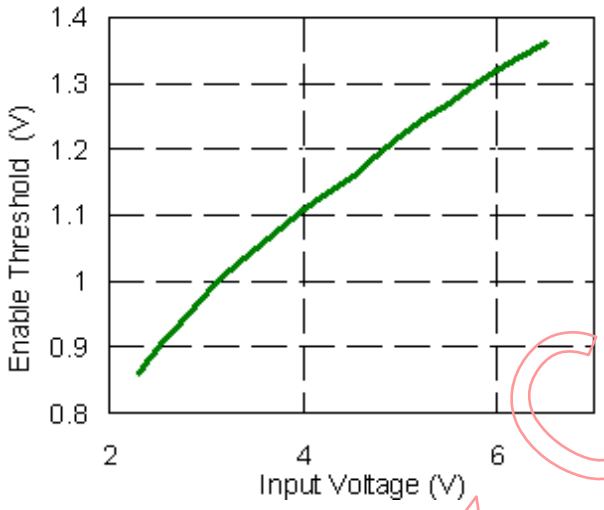
Short-circuit Current vs. Input Voltage



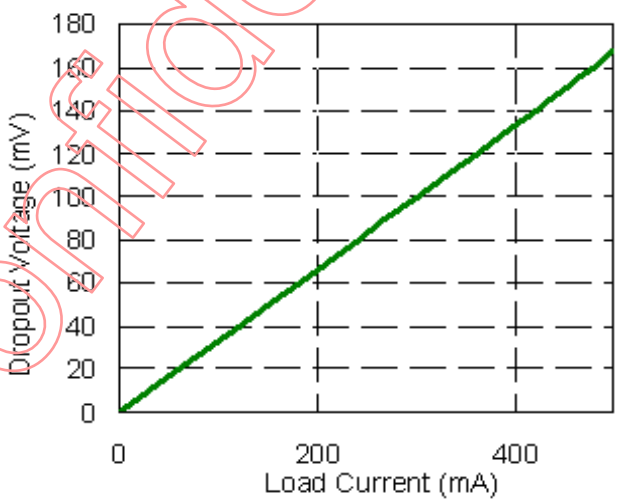
Ground Current vs. Input Voltage



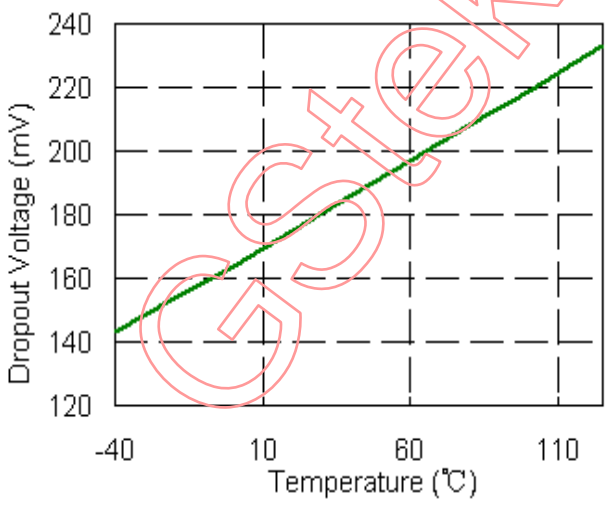
Enable Threshold vs. Input Voltage



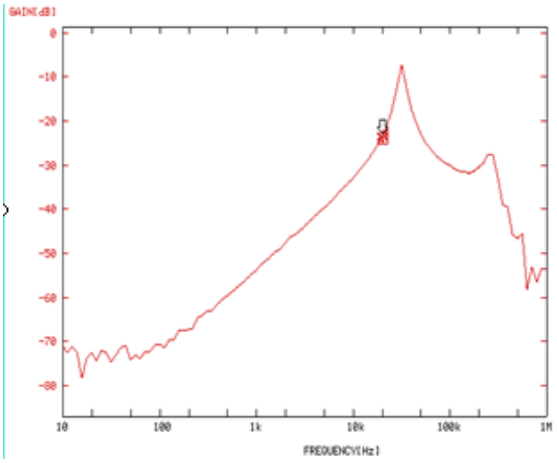
Dropout vs. Load Current



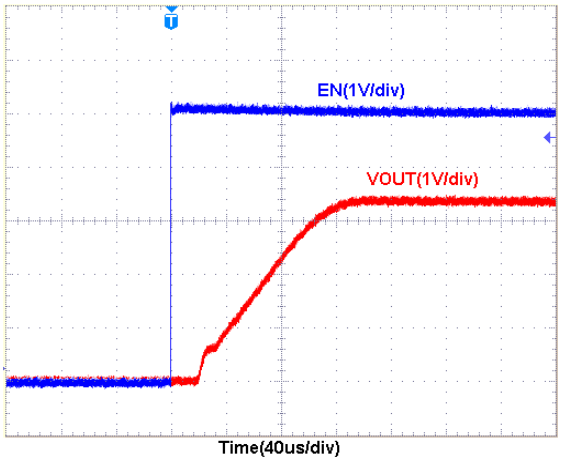
Dropout vs. Temperature (500mA Load)



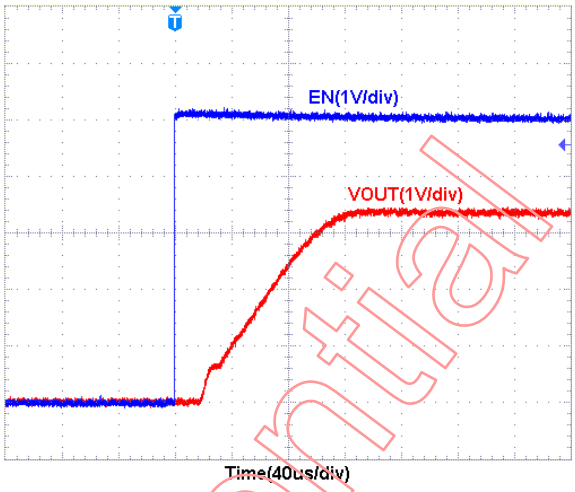
PSRR vs. Frequency



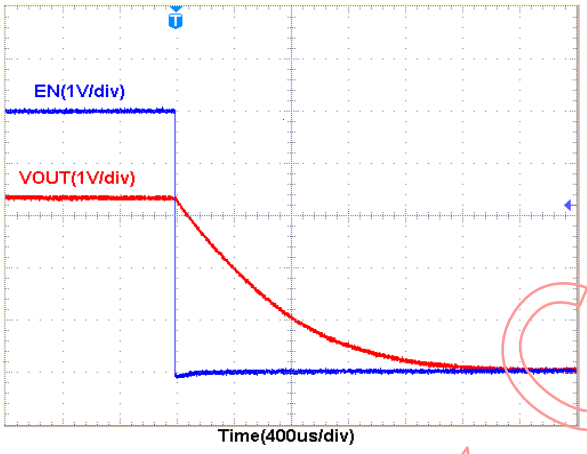
Enable Turn-On (0.1mA)



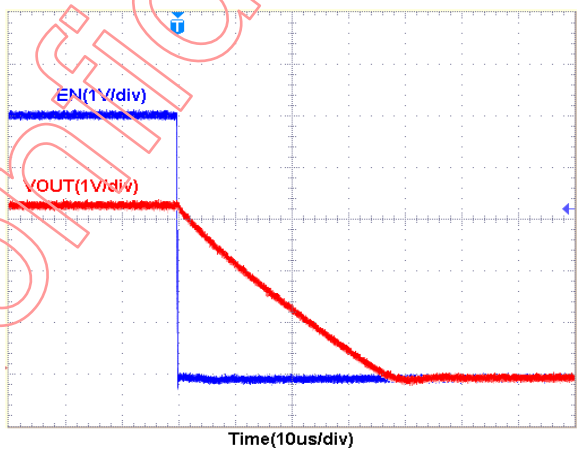
Enable Turn-On (500mA)



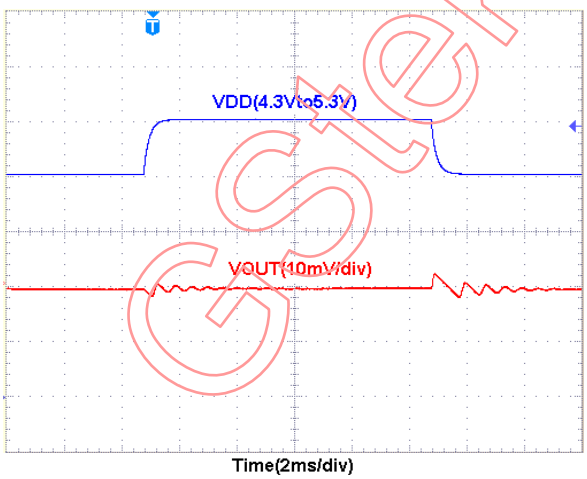
Enable Turn-Off (0.1mA)



Enable Turn-Off (500mA)

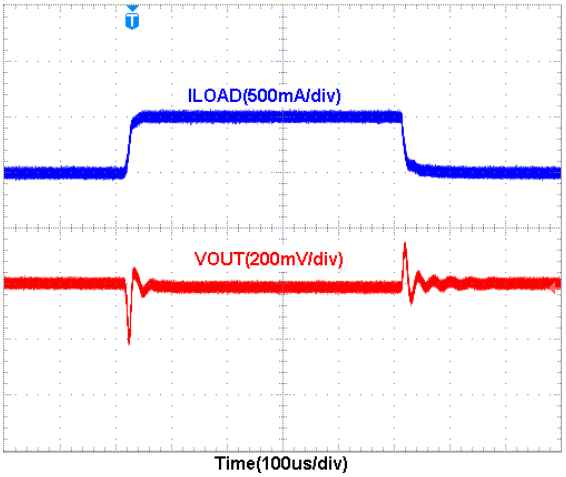


Line Transient Response



I_{OUT}=0.1mA

Load Transient Response



VDD=4.3V

Application Information

Power-on-Reset

The GS7116 features a power-on-reset control through monitor the supply voltage to prevent wrong operation. Only after the supply voltage exceed its rising POR threshold voltage, the regulator is to be initiated and starts up.

Current Limit

The GS7116 contains a foldback over current protection function. It allows the output current to reach the maximum value of 700mA. Then further decreases in the load resistance reduce both the load current and the load voltage. The main advantage of foldback limiting is less power dissipation in the pass transistor under shorted-load conditions. During startup, the current limit value is set to high, thus GS7116 can operate in full load condition. After startup, the current limit value is set to normal value, so the pass transistor is protected well.

Thermal-Shutdown Protection

Thermal Shutdown protects GS7116 from excessive power dissipation. If the die temperature exceeds 160°C, the pass transistor is shut off. 30°C of hysteresis prevents the regulator from turning on until the die temperature drops to 130°C.

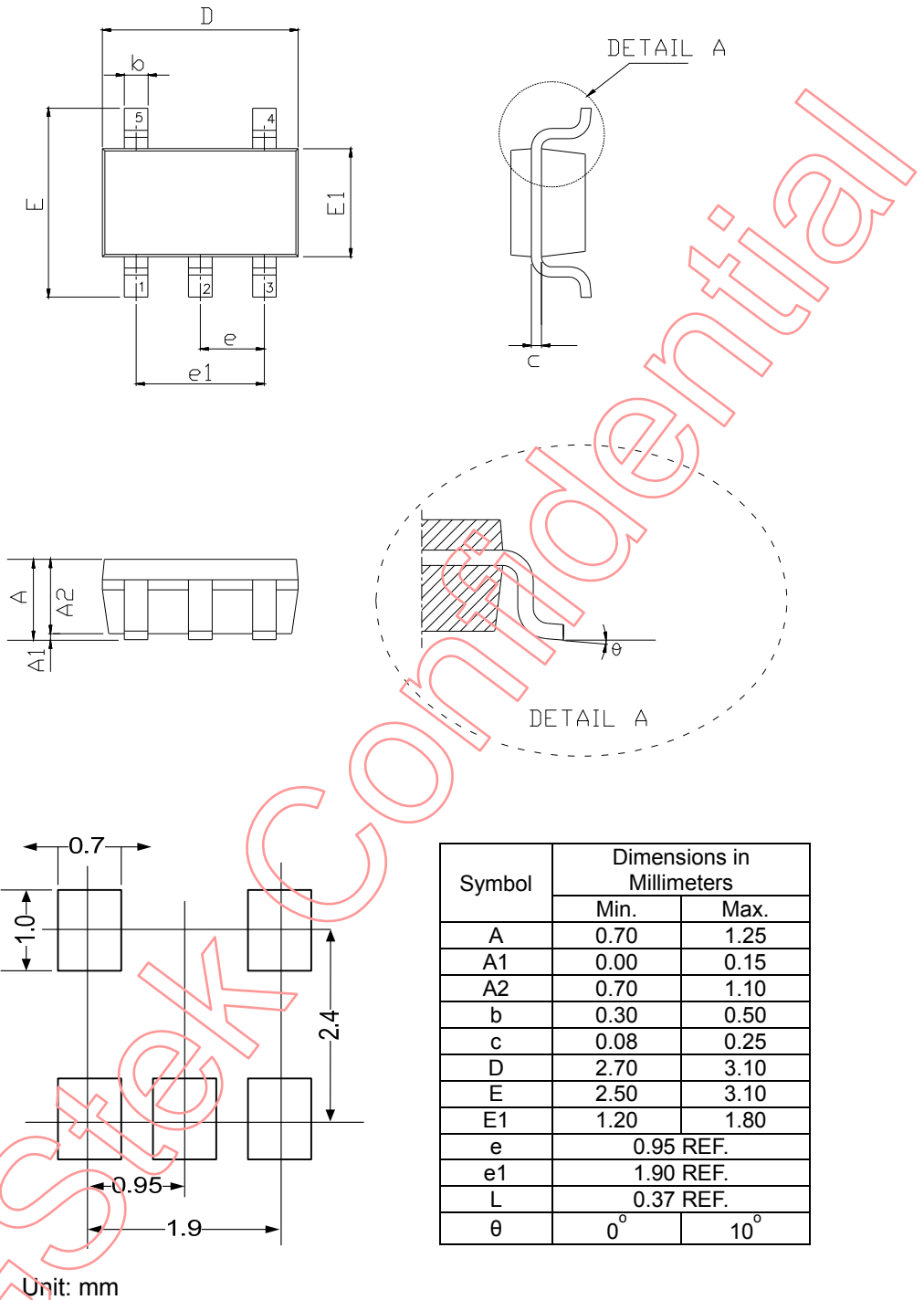
Output Capacitor selection

The GS7116 is specifically designed to employ ceramic output capacitor as low as 4.7uF. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Input Capacitor selection

Bypass VDD to ground with a 4.7uF or greater capacitor. Ceramic, tantalum or aluminum electrolytic capacitors may be selected for input capacitor. However ceramic capacitors are recommended due to their significant cost and space savings. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Package Dimensions, TSOT-23-5



Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.70	1.25
A1	0.00	0.15
A2	0.70	1.10
b	0.30	0.50
c	0.08	0.25
D	2.70	3.10
E	2.50	3.10
E1	1.20	1.80
e	0.95 REF.	
e1	1.90 REF.	
L	0.37 REF.	
θ	0°	10°

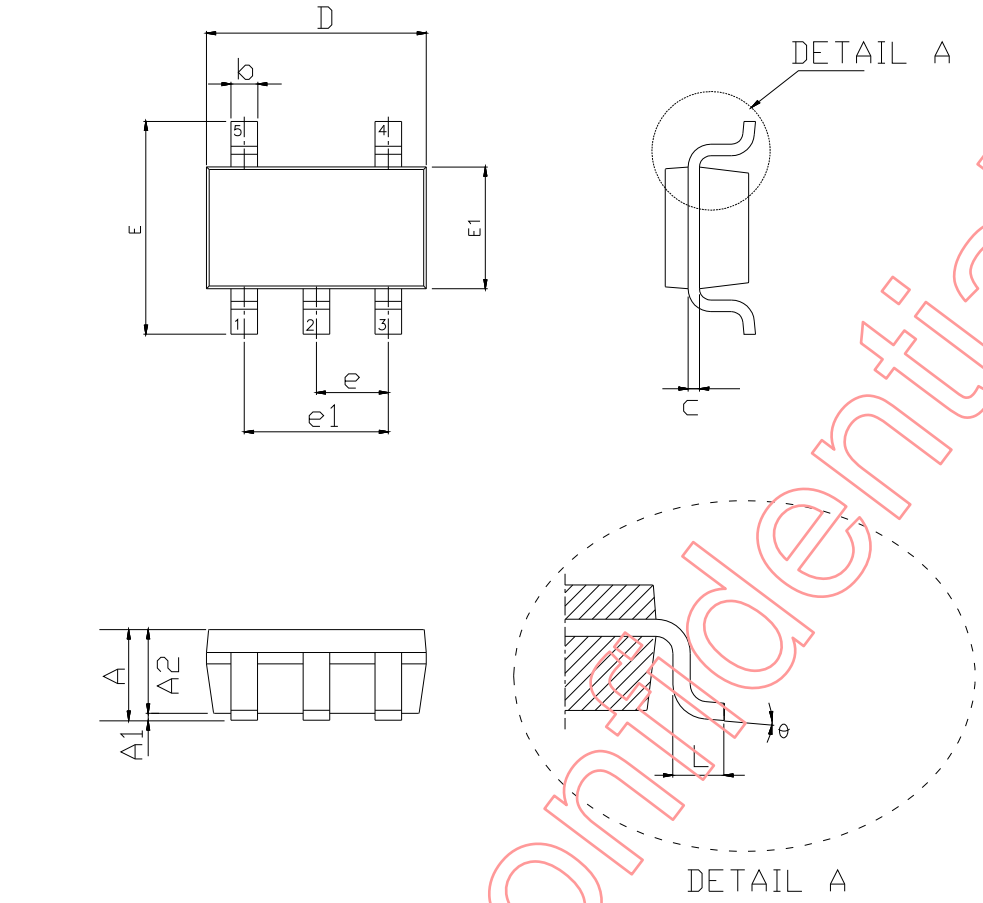
Note

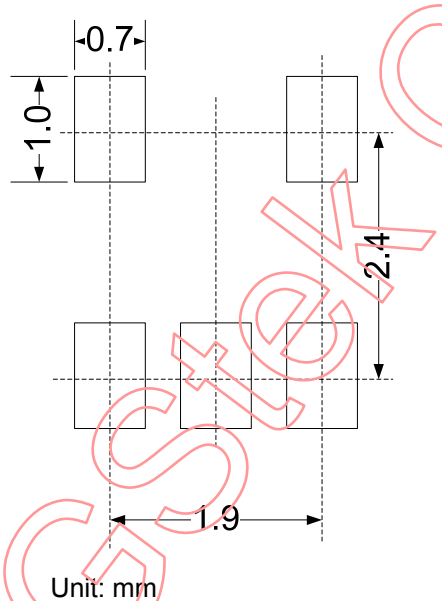
1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, SOT-23-5





Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.90	1.45
A1	0.00	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.25
D	2.70	3.10
E	2.60	3.00
E1	1.20	1.80
e	0.95 REF.	
e1	1.90 REF.	
L	0.37 REF.	
θ	0°	10°

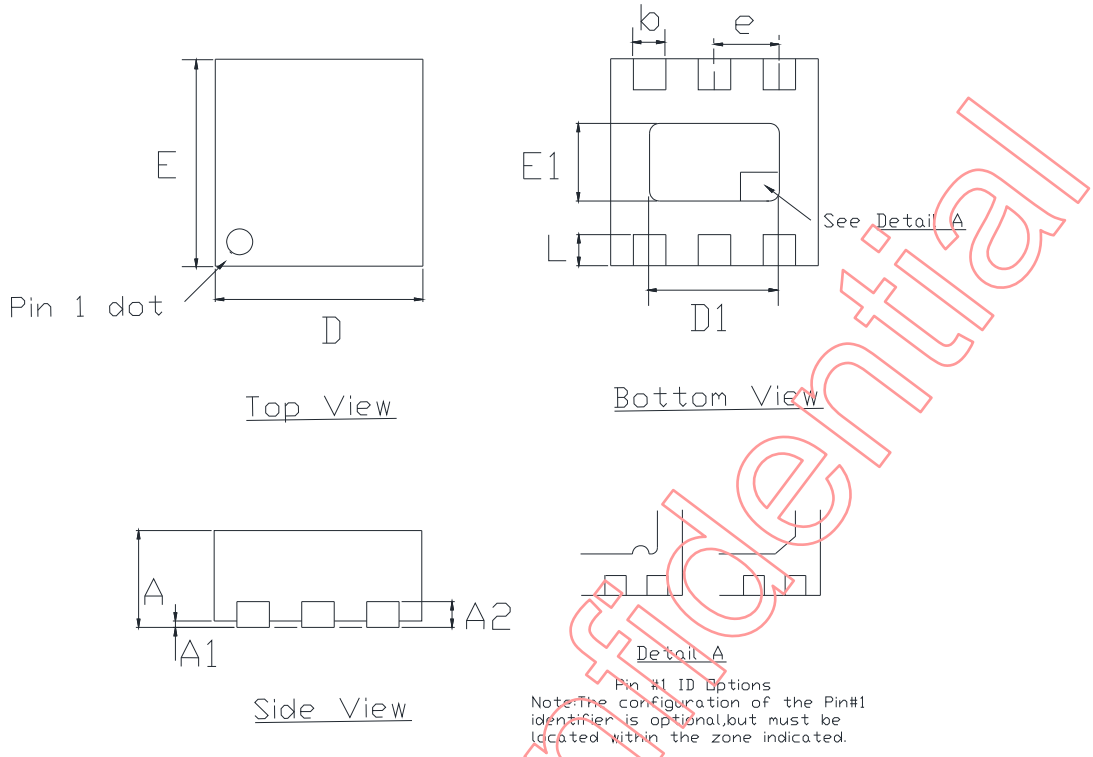
Note

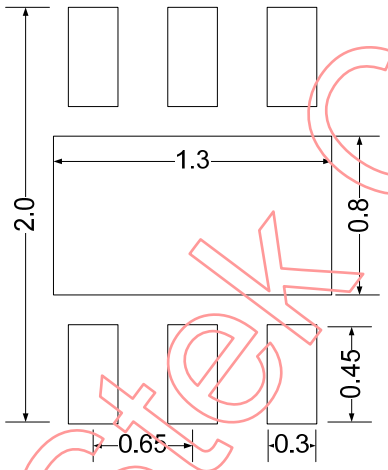
1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, TDFN6-2x2





Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.70	0.80
A1	0.00	0.05
A2	0.203 REF.	
D	1.90	2.10
D1	1.10	1.30
E	1.90	2.10
E1	0.60	0.80
e	0.65 REF.	
L	0.25	0.45

Note

1. Min.: Minimum dimension specified.
2. Max.: Maximum dimension specified.
3. REF.: Reference. Normal/Regular dimension specified for reference.

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