GS1117A Series

1A Low Dropout Voltage Regulator

Product Description

The GS1117A is a low dropout three-terminal regulator with 1A output current capability. It has been optimized for low voltage applications where the transient response and minimum input voltage are critical.

The GS1117A provides current limit and thermal shutdown protection functions. On-chip thermal shutdown provides protection against a combination of high current and ambient temperature that would create excessive junction temperature.

The GS1117A is available in 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5.0V fixed output voltage versions and ADJ output voltage version. And it is available in three leads SOT-89, SOT-223 and TO-252(A2) surface mount packages.

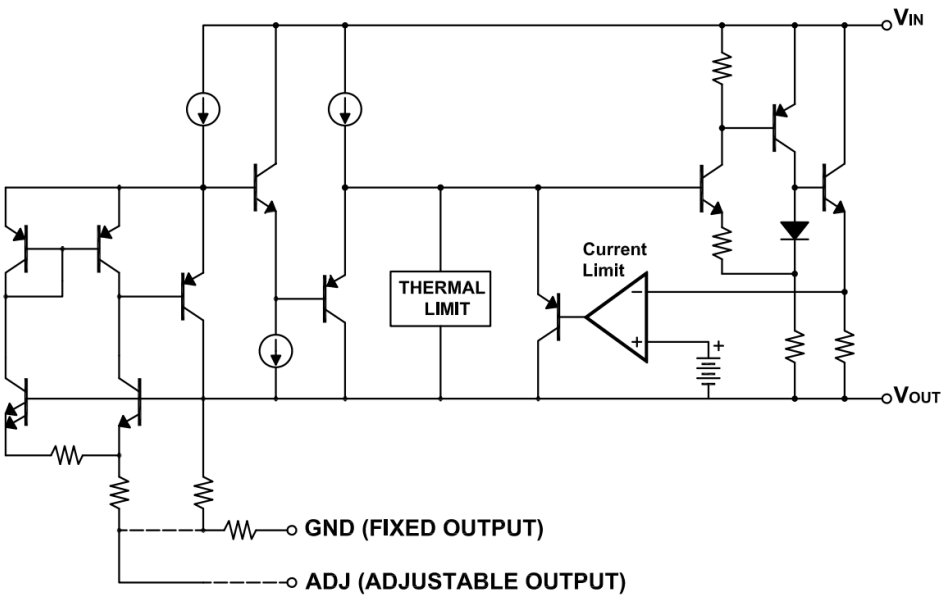
Features

- Adjustable or Fixed Output
- Output Current of 1A
- Output Voltage Accuracy within ±.2.0%
- RoHS Compliant & Halogen Free

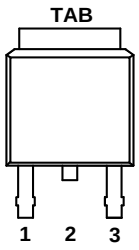
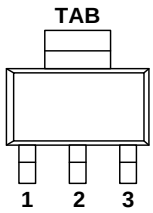
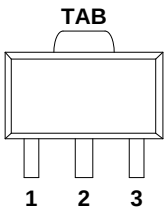
Applications

- Battery-Power Circuitry
- Post Regulator for Switching Power Supply
- Low Voltage Logic Suppliers
- ADSL Modem
- Power Management for Computer Mother Board and Graphic Card

Block Diagram



Packages & Pin Assignments

TO-252(A2)	SOT-223	SOT-89
		

Pin	GS1117AD	Pin	GS1117AX	Pin	GS1117AY
1	GND/ADJ	1	GND/ADJ	1	GND/ADJ
2	V_{OUT}	2	V_{OUT}	2	V_{OUT}
3	V_{IN}	3	V_{IN}	3	V_{IN}

Ordering and Marking Information

Ordering Information			
TO-252(A2)	**SOT-223**	**SOT-89**	**Output**
GS1117ADF	GS1117AXF	GS1117AYF	ADJ
GS1117AD12F	GS1117AX12F	GS1117AY12F	1.2V
GS1117AD15F	GS1117AX15F	GS1117AY15F	1.5V
GS1117AD18F	GS1117AX18F	GS1117AY18F	1.8V
GS1117AD25F	GS1117AX25F	GS1117AY25F	2.5V
GS1117AD33F	GS1117AX33F	GS1117AY33F	3.3V
GS1117AD50F	GS1117AX50F	GS1117AY50F	5.0V

GS1117A[1][2][2]F

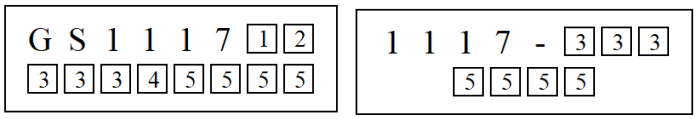
Product Name:
GS1117A

Package Code:
[1] is D, X or Y
- D for TO252(A2)
- X for SOT-223
- Y for SOT-89

Voltage Code:
[2][2] is Blank or 12, 15, 18…
- Blank for ADJ Version
- 12 for 1.2V, 33 for 3.3V and so on

F Suffix:
Stands for RoHS Compliant and Halogen Free

Marking Information



Product Code:
1 is Blank or A
- GS1117, GS1117A
- 1117 -

Package Code:
2 is D, X or Y
- D for TO252(A2)
- X for SOT-223
- Y for SOT-89

Voltage Code:
3 3 3 is Blank, ADJ or 12, 15, 18…
- Blank or ADJ for ADJ Version
- 12 for 1.2V, 33 for 3.3V and so on

Green Level:
4 is F for RoHS Compliant and Halogen Free

GS Code:
5 5 5 5 is GS Code

Absolute Maximum Ratings (T_a=+25 ºC, unless otherwise specified.)

Symbol	Parameter	Maximum		Unit
V_{IN}	Input Voltage	18		V
T_J	Junction Temperature	150		ºC
T_{STG}	Storage temperature Range	-65 to 150		ºC
T_{LEAD}	Lead Temperature (Soldering, 10 sec)	300		ºC
θ_{JA}	Thermal Resistance Junction to Ambient (Condition: No heat sink)	SOT-223	120	ºC/W
		SOT-89	250	
		TO-252(A2)	100	
P_D	Power Dissipation	SOT-223	0.9	W
		SOT-89	0.5	
		TO-252(A2)	1.2	

Stresses above those listed “Absolute Maximum Ratings” above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied.
Exposure to Absolute Maximum Ratings conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter Name	Min.	Max.	Unit
Input Voltage Range	-	15	V
Ambient Temperature	-40	125	°C

Electrical Characteristics (Ta=+25 ºC, unless otherwise specified.)

Parameter	Device	Conditions	Min.	Typ.	Max.	Unit
Reference Voltage	GS1117A-Adj	V_{IN} -V_{OUT}=2V, I_{OUT} =10mA	1.225	1.250	1.275	V
		1.4V≤ V_{IN}-V_{OUT} ≤12V, 10mA≤ I_{OUT} ≤1A	1.200	1.250	1.300	
Output Voltage	GS1117A-1.2	V_{IN} =3.2V, I_{OUT} =10mA	1.176	1.200	1.224	V
		3.0V≤ V_{IN} ≤12V, 0≤ I_{OUT} ≤1.0A	1.152	1.200	1.224	V
	GS1117A-1.5	V_{IN} =3.5V, I_{OUT} =10mA	1.470	1.500	1.530	V
		3.0V≤ V_{IN} ≤12V, 0≤ I_{OUT} ≤1.0A	1.440	1.500	1.560	V
	GS1117A-1.8	V_{IN} =3.8V, I_{OUT} =10mA	1.764	1.800	1.836	V
		3.2V≤ V_{IN} ≤12V, 0≤ I_{OUT} ≤1.0A	1.728	1.800	1.872	V
	GS1117A-2.5	V_{IN} =4.5V, I_{OUT} =10mA	2.450	2.500	2.550	V
		3.9V≤ V_{IN} ≤12V, 0≤ I_{OUT} ≤1.0A	2.400	2.500	2.600	V
	GS1117A-3.3	V_{IN} =5V, I_{OUT} =10mA	3.234	3.300	3.366	V
		4.75V≤ V_{IN} ≤12V, 0≤ I_{OUT} ≤1.0A	3.168	3.300	3.423	V
	GS1117A-5.0	V_{IN} =7.0V V, I_{OUT} =10mA	4.900	5.000	5.100	V
		6.5V≤ V_{IN} ≤12V, 0≤ I_{OUT} ≤1.0A	4.800	5.000	5.200	V
Line Regulation (Note 1)	GS1117A-Adj	1.4V ≤ V_{IN}-V_{OUT} ≤ 10.75V, I_{OUT} =10mA			1.2	%
	GS1117A-XX	(V_{OUT}+1.4V) ≤ V_{IN} ≤ 12V, I_{OUT} =10mA		5	15	mV
Load Regulation (Note 1 & 2)	GS1117A-Adj	V_{IN}-V_{OUT}=3V, 10mA ≤ I_{OUT} ≤ 1A			1.2	%
	GS1117A-XX	V_{IN}-V_{OUT} = 1.4V, 0≤ I_{OUT} ≤1.0A		6	15	mV
Dropout Voltage	All	△Vout, ΔVref =1%, I_{OUT} =100mA		1.0	1.2	V
		ΔVout, ΔVref=1%, I_{OUT} =500mA		1.05	1.25	V
		△Vout, ΔVref=1%, I_{OUT} =1.0A		1.1	1.3	V
Current Limit	All	V_{IN} - V_{OUT}=2.0V, T_J=25°C	1	1.4		A
Ground Pin Current	GS1117A-XX	V_{IN} = V_{OUT}+1.5V		4	8	mA
Minimum Load Current (Note 3)	GS1117A-Adj			5	10	mA
Adjust Pin Current	GS1117A-Adj			50	120	μA
Temperature Stability	All			0.5		%

Note 1: The Parameters of Line Regulation and Load Regulation in above are tested under the room temperature. The Curve of Load Regulation vs. Temperature is shown in the section of typical performance characteristics.

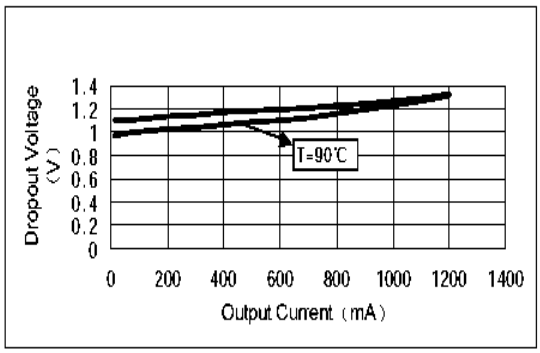
Note 2: The parameter can meet the specs when Iout varies from 0 to 1.0A, Vin-Vout varies from 1.4V to 12V at room temperature. It required the output current larger than 10mA to satisfy the criterion once the temperature varies between -40℃ and 125℃.

Note 3: Minimum Load Current is specified for adjustment version and it is the required minimum load current for regulating output voltage within the spec.

Typical Performance Characteristics

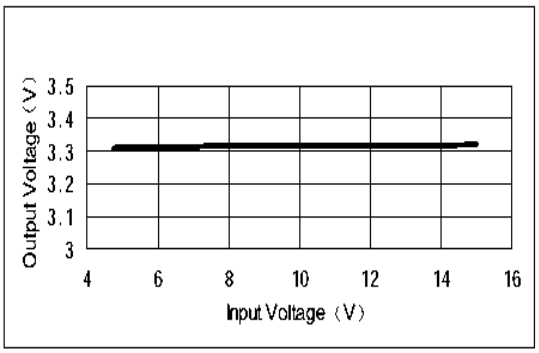
Dropout Voltage (V_{IN}-V_{OUT})

T_A=25℃ and 90℃



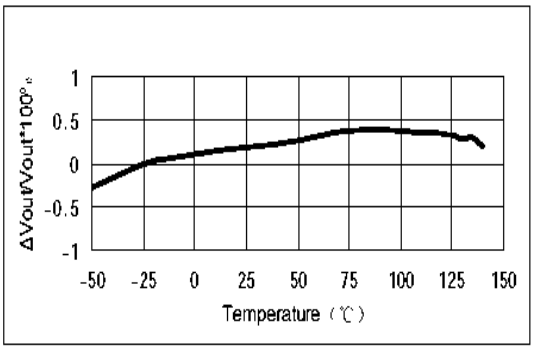
Line Regulation

V_{OUT}=3.3V, I_{OUT}=10mA



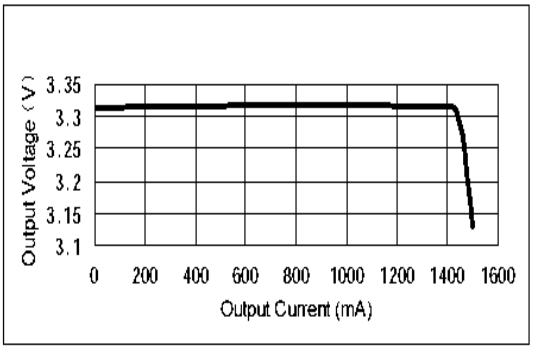
Load Regulation V.S Temperature

I_{OUT} from 10mA to 1A



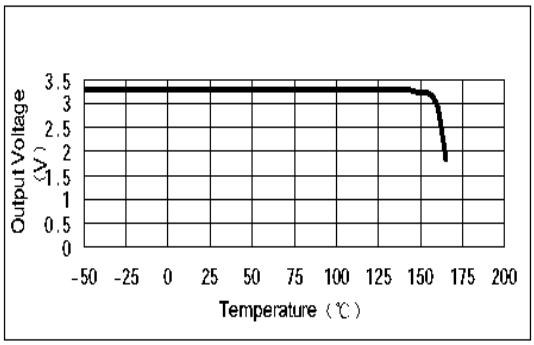
Load Regulation

V_{OUT}=3.3V, I_{OUT}=10mA

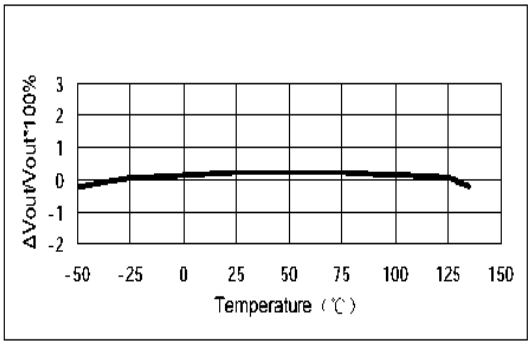


Output Voltage V.S Temperature

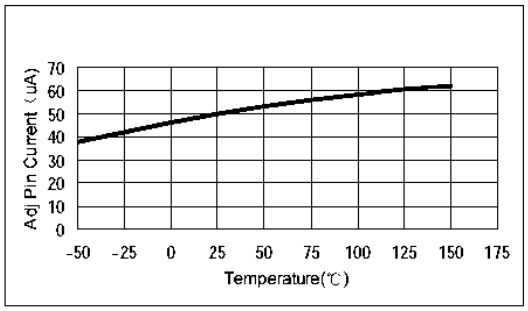
V_{OUT}=3.3V



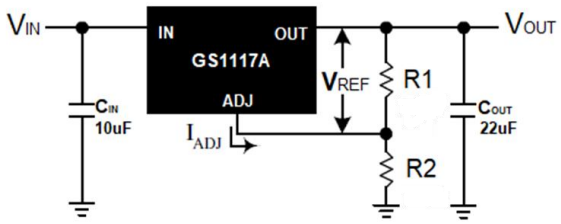
Temperature Stability



Adjust Pin Current



Typical Applications



$V_{OUT}=V_{REF}(1+R2/R1)+I_{ADJ}R2$

Figure 1. Adjustable Voltage Regulator

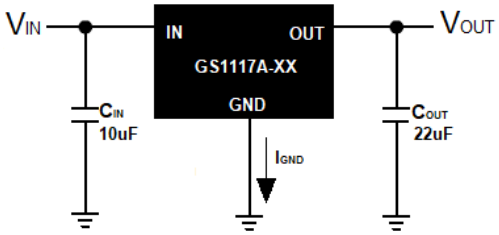


Figure 2. Fixed Voltage Regulator

GS1117A is a series of low dropout voltage three terminal regulators. Its application circuit is very simple, the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, current limit, power transistors and its driver circuit and so on.

The thermal shut down and current limit modules can assure chip and its application system working safety when the junction temperature is larger than 125℃ or output current is larger than 1.4A typically.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The accuracy of output voltage is guaranteed by trimming technique.

Application Hints

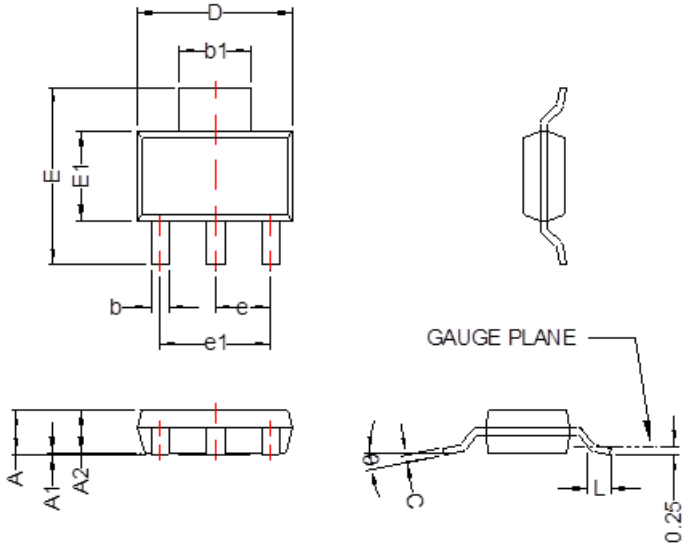
1. Recommend using 10μF tantalum capacitor for input capacitor C_{IN} for all of application circuits.
2. Recommend using 22μF tantalum capacitor for output capacitor C_{OUT} to assure circuit stability.
3. The adjust pin can be bypassed to ground with a bypass capacitor (C_{ADJ}) to improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. At any ripple frequency, the impedance of the C_{ADJ} must be less than R1 to prevent the ripple from being amplified:

   $1 / (2\pi \times f_{RIPPLE} \times C_{ADJ}) < R1$

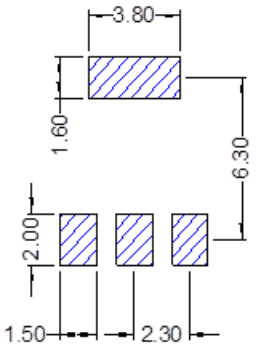
   The R1 is the resistor between the output and the adjust pin. The value is normally in the range of 100 Ω to 200 Ω. For example, with R1 = 124 Ω and f_{RIPPLE} = 120 Hz, the C_{ADJ} must be > 11μF.

SOT-223

Package Dimension



Recommended Land Pattern



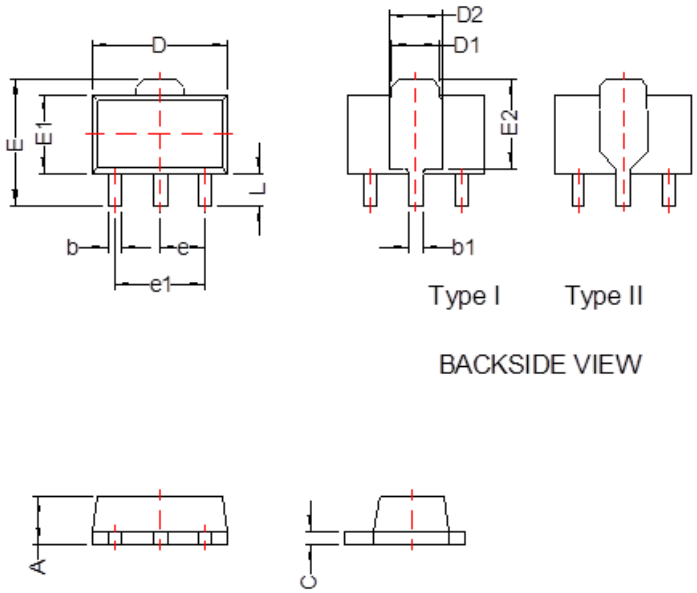
Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.50	1.80	0.059	0.071
A1	0.02	0.12	0.001	0.005
A2	1.45	1.75	0.057	0.069
b	0.60	0.84	0.024	0.033
b1	2.90	3.10	0.114	0.122
c	0.23	0.35	0.009	0.014
D	6.20	6.70	0.244	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	0.146
e	2.30 BSC		0.091 BSC	
e1	4.60 BSC		0.181 BSC	
L	0.75	-	0.030	-
θ	0°	10°	0°	10°

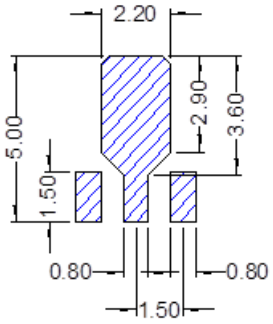
1. DIMENSION D AND E1 DO NOT INCLUDE MOLD FLASH,TIE BAR BURRS，GATE BURRS，AND INTERLEAD FLASH,NOT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
2. DIMENSION b AND b1 DO NOT INCLUDE DAMBAR PROTRUSION，ALLOWABLE DAMBAR PROTRUSION SHALL BE IN EXCESS OF THE b AND b1 DIMENSIONS AT MAXIMUM MATERIAL CONDITION.

SOT-89

Package Dimension



Recommended Land Pattern

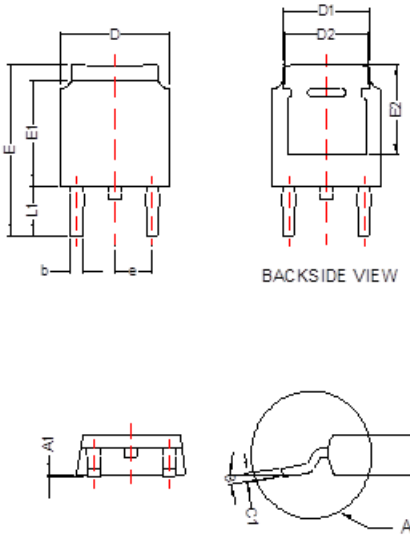


Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.40	1.60	0.055	0.063
b	0.30	0.55	0.012	0.022
b1	0.40	0.60	0.016	0.024
c	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.40	1.83	0.055	0.072
D2	1.75 REF		0.069 REF	
E	3.94	4.25	0.155	0.167
E1	2.30	2.60	0.091	0.102
E2	2.84 REF		0.112 REF	
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
L	0.89	1.20	0.035	0.047

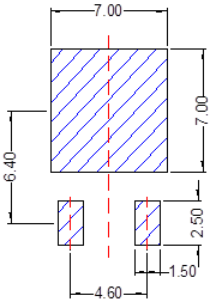
1. DIMENSION D AND E1 DO NOT INCLUDE MOLD FLASH,TIE BAR BURRS，GATE BURRS，AND INTERLEAD FLASH,NOT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
2. DIMENSION b AND b1 DO NOT INCLUDE DAMBAR PROTRUSION，ALLOWABLE DAMBAR PROTRUSION SHALL BE IN EXCESS OF THE b AND b1 DIMENSIONS AT MAXIMUM MATERIAL CONDITION.

TO-252(A2)

Package Dimension



Recommended Land Pattern



Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	2.18	2.40	0.086	0.094
A1	0.00	0.15	0.000	0.006
b	0.64	0.90	0.025	0.035
b1	0.76	1.14	0.030	0.045
c	0.40	0.89	0.016	0.035
c1	0.40	0.61	0.016	0.024
D	6.35	6.73	0.250	0.265
D1	4.95	5.46	0.195	0.215
D2	4.32	-	0.170	-
E	9.40	10.41	0.370	0.410
E1	5.97	6.22	0.235	0.245
E2	4.95	-	0.195	-
e	2.286 BSC		0.090 BSC	
L	1.40	1.77	0.055	0.070
L1	2.67	3.07	0.105	0.121
L2	-	1.20	-	0.047
θ	0°	8°	0°	8°

1. DIMENSION D DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15mm PER DNE.
2. DIMENSION E1 DOES NOT INCLUDE MOLD FLASH, PROTRUSION. OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL EXCEED 0.15mm INCHES PER DNE.

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CONTACT US

GS Headquarter	
	4F.,No.43-1,Lane11,Sec.6,Minquan E.Rd Neihu District Taipei City 114, Taiwan (R.O.C)
	886-2-2657-9980
	886-2-2657-3630
	sales_twn@gs-power.com

RD Division	
	824 Bolton Drive Milpitas. CA. 95035
	1-408-457-0587