Features

- Optimized for fast transient response
- Low Shutdown Current~0.2uA (Typ.)
- Output Current~300mA
- 2.7~5.5V Operation
- ±1.5% Initial Voltage Accuracy
- Short Circuit Current Fold-back
- Programmable Soft-Start
- Low Temperature Drift Coefficient ~50ppm
- Line Regulation ~0.06%/V(Typ.)
- Low ESR Capacitor ~2.2uF ceramic capacitor
- TDFN6-2x2、SOT-23-5、SOT-353、TQFN9-1.5x1.5 and package
- Green Product (RoHS, Lead-Free, Halogen-Free Compliant)

General Description

The GS7137 is a CMOS linear regulator optimized for fast transient response. It guarantees delivery of 300mA output current. The device is available in fixed output voltage from 1.2V to 4.0V.

Based on its low quiescent current consumption and its less than 1uA shutdown mode, the GS7137 is ideal for battery- powered applications. The line transient response and load transient response of the GS7137 are excellent, thus the device is suitable for the power supply for handheld communication equipment. The regulator is stable with small ceramic capacitive loads (2.2uF typical).

Applications

- Portable communication equipment
- Notebook Computer
- Battery Powered Systems

Typical Application

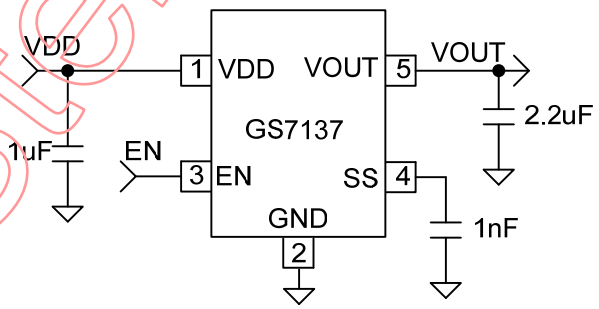


Figure 1 Typical Application of GS7137

Function Block Diagram

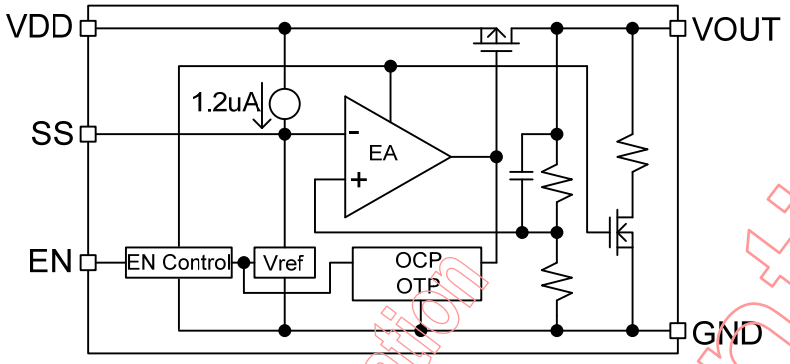


Figure 2(a) Functional diagram with discharge function

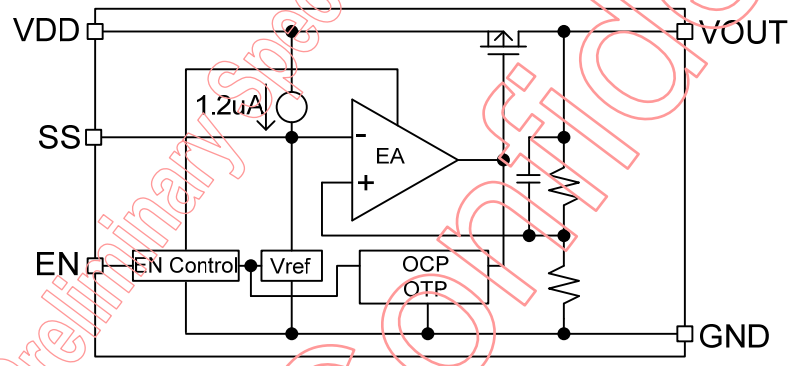


Figure 2(b) Functional diagram without discharge function

Figure 2 Function Block Diagram

Pin Configuration

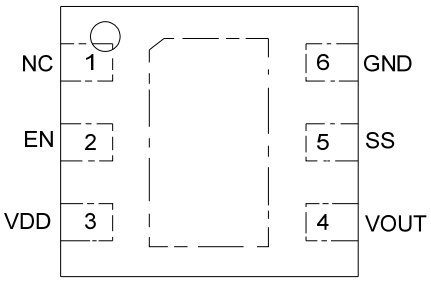


Figure 3a TDFN6-2x2 Package

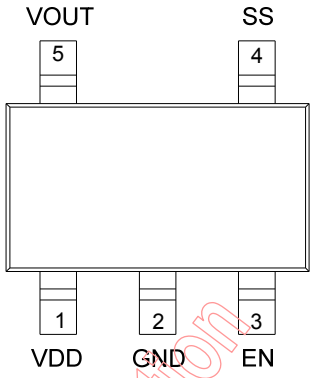


Figure 3b SOT-23-5/SOT-353Package

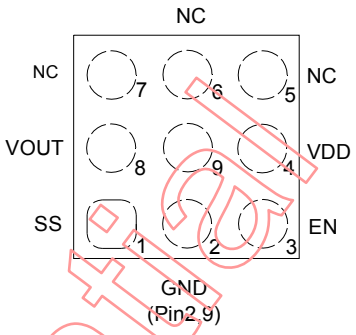


Figure 3c TQFN9-1.5x1.5 package

Pin Descriptions

Pin No.				Name	I/O type	Description
TDFN6-2x2	SOT-23-5	SOT-353	TQFN9-1.5x1.5			
3	1	1	4	VDD	I	Input Voltage Pin
6	2	2	2,9	GND	I/O	Ground pin
2	3	3	3	EN	I	Enable Pin
5	4	4	1	SS	O	Soft-start Pin
4	5	5	8	VOUT	O	Output Voltage Pin
1			5,6,7	NC		No connect

Ordering Information

GS7137PP-XXX- R

1. Package
2. Output Voltage
3. Shipping

No	Item	Contents
1	Package	D6: TDFN6-2x2 S5: SOT-23-5 C5: SOT-353 Q9: TQFN9-1.5x1.5
2	Output Voltage	1P2: 1.2V, 1P3: 1.3V, 1P5: 1.5V, 1P7:1.7V, 1P8: 1.8V, 1P85: 1.85V, 1P9: 1.9V, 2P0: 2.0V, 2P3: 2.3V, 2P5: 2.5V, 2P6: 2.6V, 2P7: 2.7V, 2P8: 2.8V, 285: 2.85V, 2P9: 2.9V, 3P0: 3.0V, 3P1: 3.1V, 3P3: 3.3V
3	Shipping	R: Tape & Reel

Example: GS7137 SOT-23-5 3.1V Tape & Reel ordering information is “GS7137S5-3P1-R”

Absolute Maximum Rating (Note 1)

Parameter	Symbol	Limits	Units
VDD to GND	V_{DD}	-0.3 < V_{DD} < 6.0	V
VEN to GND	V_{EN}	-0.3 < V_{EN}< 6.0	V
SS to GND	V_{SS}	-0.3 < V_{SS}< 6.0	V
Output Voltage to GND	V_{OUT}	-0.3 < V_{OUT}< V_{DD} +0.3	V
Output Current	I_{OUT}	300	mA
Package Power Dissipation at T_A≦25°C	$P_{D\_TDFN6-2x2}$	1087	mW
Package Power Dissipation at T_A≦25°C	$P_{D\_SOT-23-5}$	420	mW
Package Power Dissipation at T_A≦25°C	$P_{D\_SOT-353}$	300	mW
Package Power Dissipation at T_A≦25°C	$P_{D\_TQFN9-1.5x1.5}$	250	mW
Junction Temperature	T_J	- 45 ~ 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	$\theta_{JA\_TDFN6-2x2}$	92	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_SOT-23-5}$	238	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_SOT-353}$	333	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_TQFN9-1.5x1.5}$	400	°C/W

Recommend Operating Condition (Note 4)

Parameter	Symbol	Limits	Units
VDD to GND	V_{DD}	2.7 to 5.5	V
Junction Temperature	T_J	-40 ~ 125	°C
Ambient Temperature	T_A	-40 ~ 85	°C

Electrical Characteristics

(V_{DD} = Max{(V_{OUT} + 1)V, 2.7V}, T_A =T_J=25°C, C_{VDD}=1uF, C_{VOUT}=2.2uF, I_{OUT}=1mA, unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Supply Voltage	V_{DD}			2.7		5.5	V
Quiescent Current	I_{VDD}	V_{DD}=3.5V, V_{OUT} =2.5V ,Unload			60	90	uA
Standby Current	I_{STBY}	V_{EN}=0			0.2	1.0	uA
EN Input Current	I_{EN}	V_{EN}= 5V			0.3		uA
Output Current	I_{OUT}			300			mA
Output Voltage	V_{OUT}	I_{OUT}=1mA, V_{OUT} =1.2V~ 4.0V		-1.5		+1.5	%
Dropout Voltage (Note 5)	V_{DROP}	I_{OUT}=300mA	V_{OUT}=3.0V		260	360	mV
			V_{OUT}=3.1V		250	360	
			V_{OUT}=3.2V		240	360	
Line Regulation	$\triangle V_{LNR}$	V_{DD}= Max{(V_{OUT} + 1)V, 2.7V} to 5.5V, I_{OUT}=1mA		-0.25	0.06	0.25	%/V
Load Regulation	$\triangle V_{LDR}$	V_{DD}= Max{(V_{OUT} + 1)V, 2.7V}, I_{OUT}=1mA to 300mA		-1	0.3	1	%
Ripple Rejection Rate	PSRR	V_{DD}=MAX{(V_{OUT}+1.0)V, 3V}, Ripple 0.2Vp-p, I_{OUT}=1mA, f=1KHz			61		dB
Limit Current	I_{LIM}	V_{DD}=4.1V, V_{OUT} =3.1V		300	450	650	mA
Short Current	I_{SHORT}	V_{OUT}=0V, V_{DD}=4.1V			85	150	mA
EN Input Voltage High	V_{ENH}			1.2			V
EN Input Voltage Low	V_{ENL}					0.3	V
CL Auto-Discharge Resistance	R_{DISCHG}	V_{DD}=5.0V, V_{EN}=0V			70		Ω
Temperature Drift	$\triangle V_{OUT}/\triangle T_A$	I_{OUT}=1mA, T_A = -40°C to +85°C			40		ppm/°C
Thermal Shutdown temperature	T_{SHDN}				160		°C
Thermal Shutdown Hysteresis	$\triangle T_{SHDN}$				25		°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.

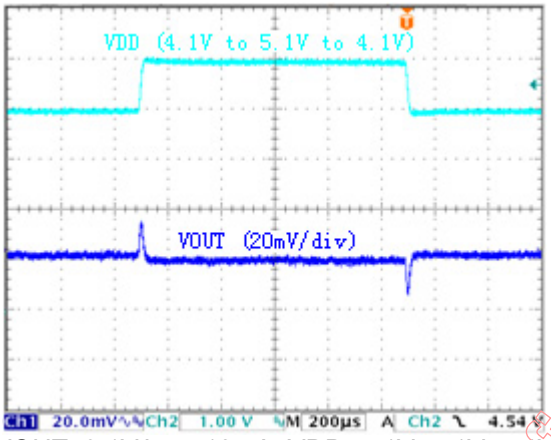
Note 3.θ_{JA} is measured in the natural convection at T_A=25°C on a high effective thermal conductivity test board (4 Layers, 2S2P) of JEDEC 51-7 thermal measurement standard.

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

Note 5. The dropout voltage is defined as V_{DD}- V_{OUT}, which is measured when V_{OUT} is V_{OUT}*0.98

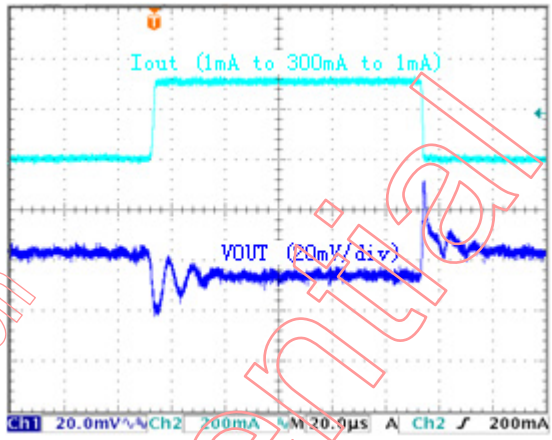
Typical Characteristics

Line transient



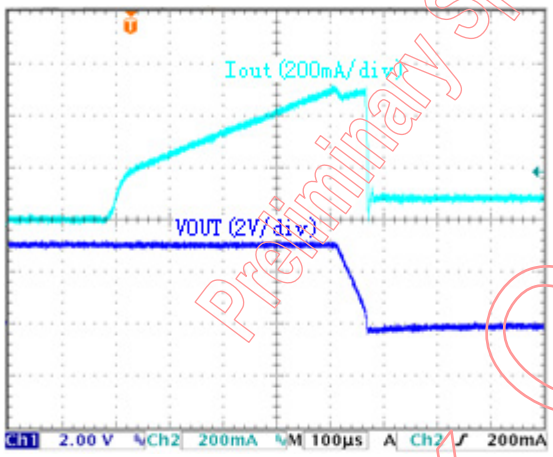
VOUT=3.1V,Iout=10mA, VDD=4.1V~5.1V~4.1V, tr=tf=10us

Load transient



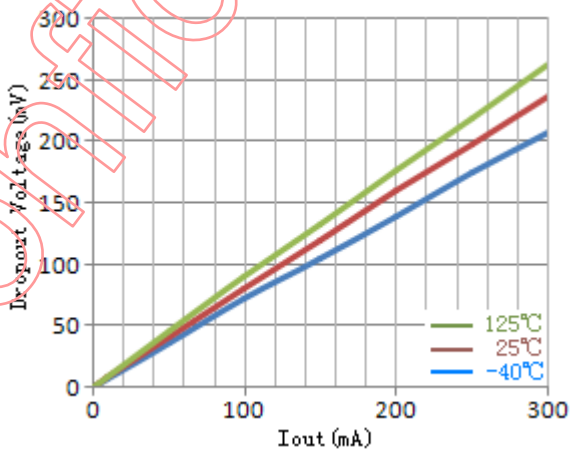
VOUT=3.1V,VDD=4.1V,Iout=1mA~300mA~1mA, tr=tf=1us

Over current protection characteristics



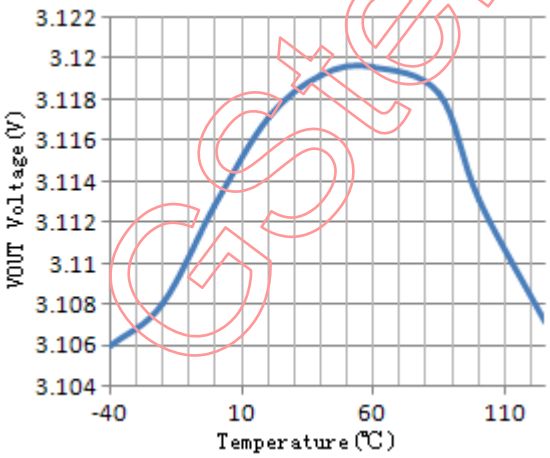
VOUT=3.1V, VDD=4.1V

Dropout voltage vs. ILOAD



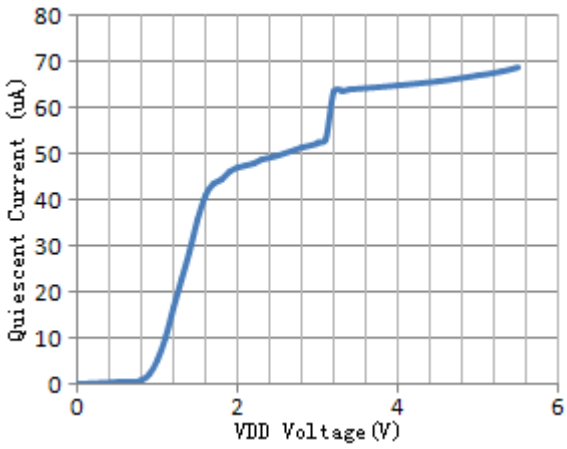
VOUT=3.1V

Output voltage vs. temperature



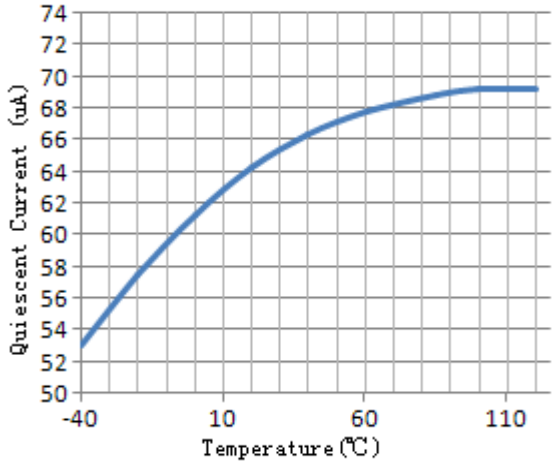
VOUT=3.1V, VDD=4.1V, Iout=1mA

Quiescent Current vs. VDD



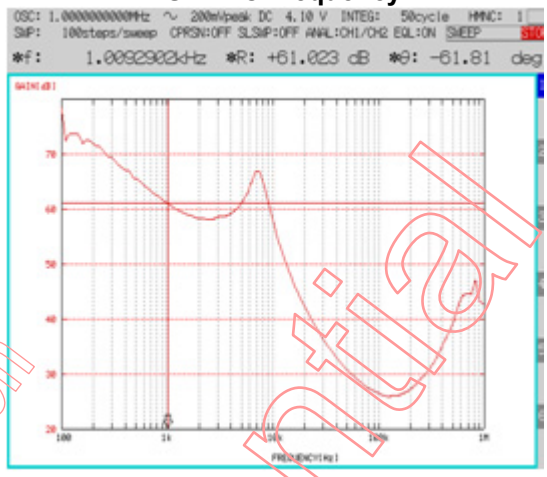
VOUT=3.1V, VDD=4.1V, Iout=1mA

Current Consumption vs. temperature



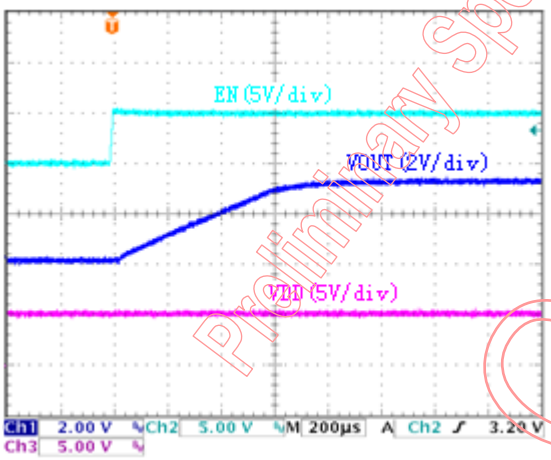
VOUT=3.1V, VDD=4.1V, Iout=1mA

PSRR vs. frequency



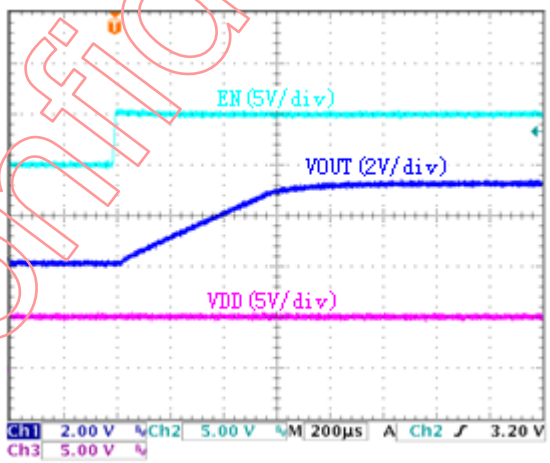
VOUT=3.1V, VDD=4.1V, Iout=1mA, SS=1nF, Vpp=0.2V

Turn On Speed with EN pin(No Load)



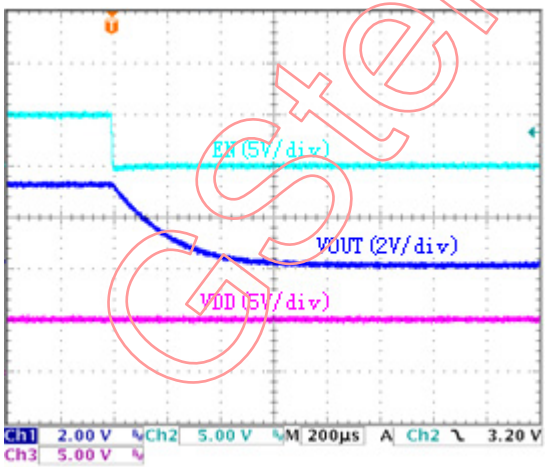
VOUT=3.1V, VDD=4.1V,SS=1nF, no load

Turn On Speed with EN pin(300mA Load)



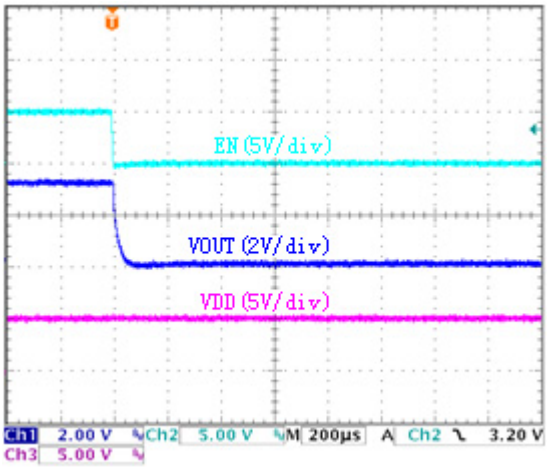
VOUT=3.1V, VDD=4.1V, SS=1nF, Iout=300mA

Turn Off Speed with EN pin(No Load)



VOUT=3.1V, VDD=4.1,SS=1nF, no load

Turn Off Speed with EN pin(300mA Load)



VOUT=3.1V, VDD=4.1V, SS=1nF, Iout=300mA

Application Information

Enable

The GS7137 has a dedicated enable pin(EN). When the EN pin is in the logic low (VEN<0.3V), the regulator will be turned off, reducing the supply current to less than 1uA.

When the EN pin is in the logic high (VEN>1.2V), the regulator will be turned on. Left open, the regulator will be turned off.

Current Limit

The GS7137 contains a foldback over current protection function. It allows the output current to reach the maximum value of 0.3A. 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.

Output Capacitor

The GS7137 is specifically designed to employ ceramic output capacitors as low as 2.2uF (X7R). 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.

Ceramic capacitors have different temperature characteristics and bias characteristics which depend on their dimensions and manufacturers. If the setting voltage is 2.5V or more and the capacitor's dimensions for V_{OUT} is too small, the capacitance value might be extremely low. As a result, the capacitance might be much less than expected value. In such cases, the operation might be unstable at low temperature (-25°C or less). So, use a larger capacity, or a large dimensions' capacitor.

Input Capacitor

Good bypassing is recommended from input to ground to help improve AC performance. A 1uF (X7R) input capacitor or greater located as close as possible to the IC is recommended. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Power Dissipation and Layout Considerations

Excessive power dissipation may cause thermal overload, and hence the increase of the IC junction temperature beyond a safe operating level. For continuous operation, it is highly recommended to keep the junction temperature below the maximum operation junction temperature 125°C for maximum reliability.

The relationship between θ_{JA} and $T_{J(MAX)}$ can be calculated as:

$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$

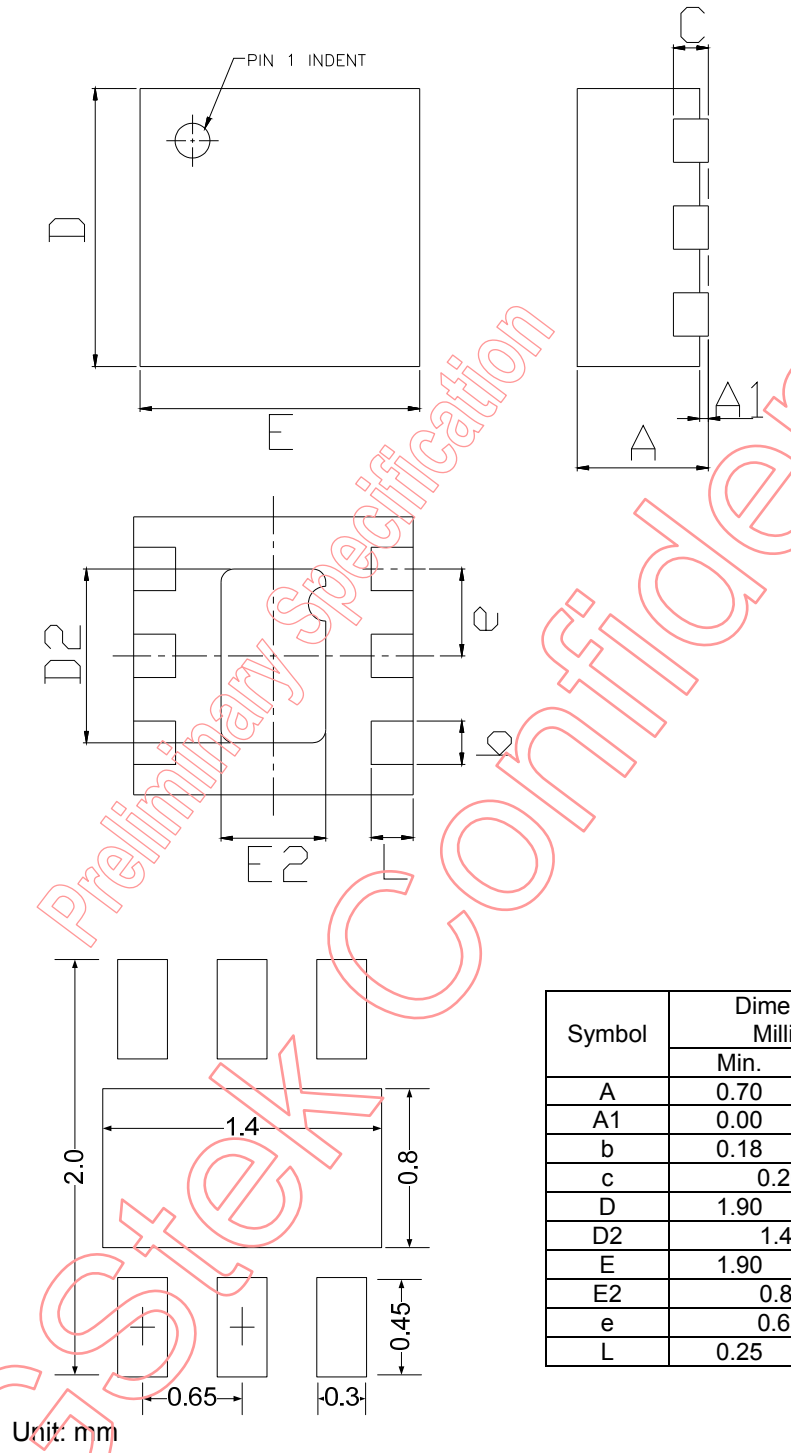
Where $T_{J(MAX)}$ is the maximum operation junction temperature 125°C, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

The power dissipation definition in device is:

$P_D = (V_{DD} - V_{OUT}) \times I_{OUT} + V_{DD} \times I_Q$

As the above equations indicate, it is desirable to work ICs whose θ_{JA} values are small such that $T_{J(MAX)}$ does not increase strongly with P_D. To avoid thermally overloading the GS7137, refrain from exceeding the absolute maximum junction temperature rating of 150°C under continuous operating condition. Overstressing the regulator with high loading currents and elevated input-to-output differential voltages can increase the IC die temperature significantly.

Package Dimensions, TDFN6-2x2

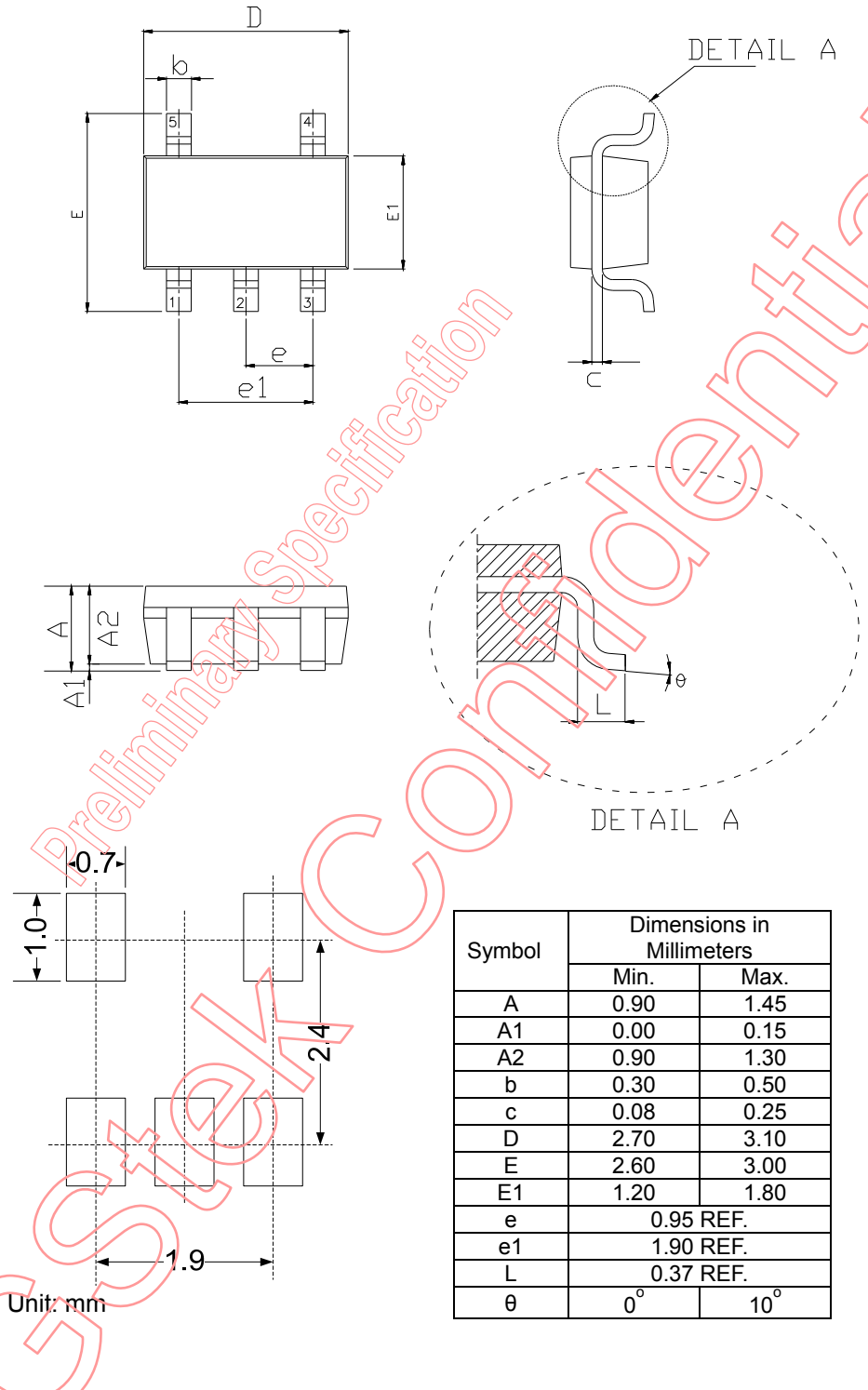


Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.70	0.90
A1	0.00	0.05
b	0.18	0.30
c	0.20 REF.	
D	1.90	2.10
D2	1.40 REF	
E	1.90	2.10
E2	0.80 REF	
e	0.65 REF.	
L	0.25	0.45

Note

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

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°

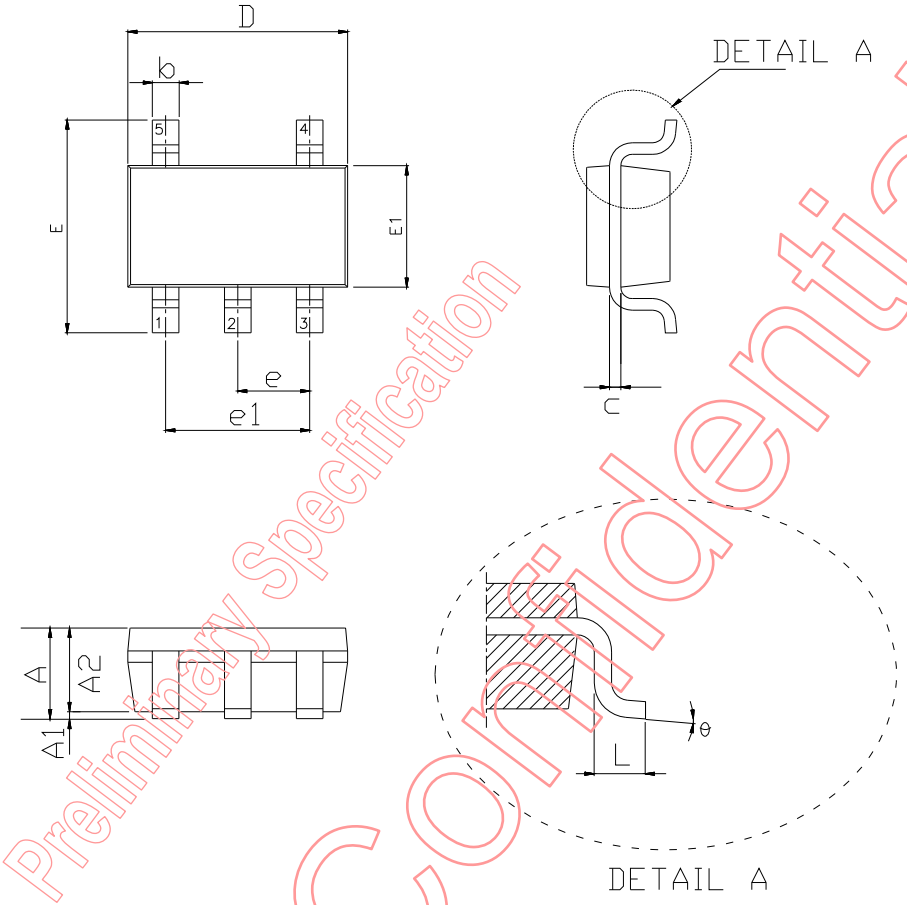
Note

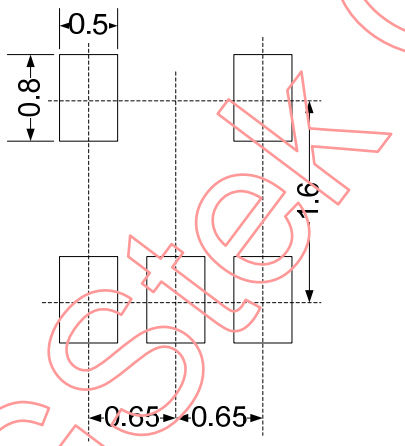
1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

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

Package Dimensions, SOT-353





Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.80	1.10
A1	-	0.10
A2	0.70	1.00
b	0.15	0.35
c	0.08	0.22
D	1.80	2.20
E	1.80	2.45
E1	1.15	1.35
e	0.65 REF.	
e1	1.30 REF.	
L	0.36 REF.	
θ	0^{o}	8^{o}

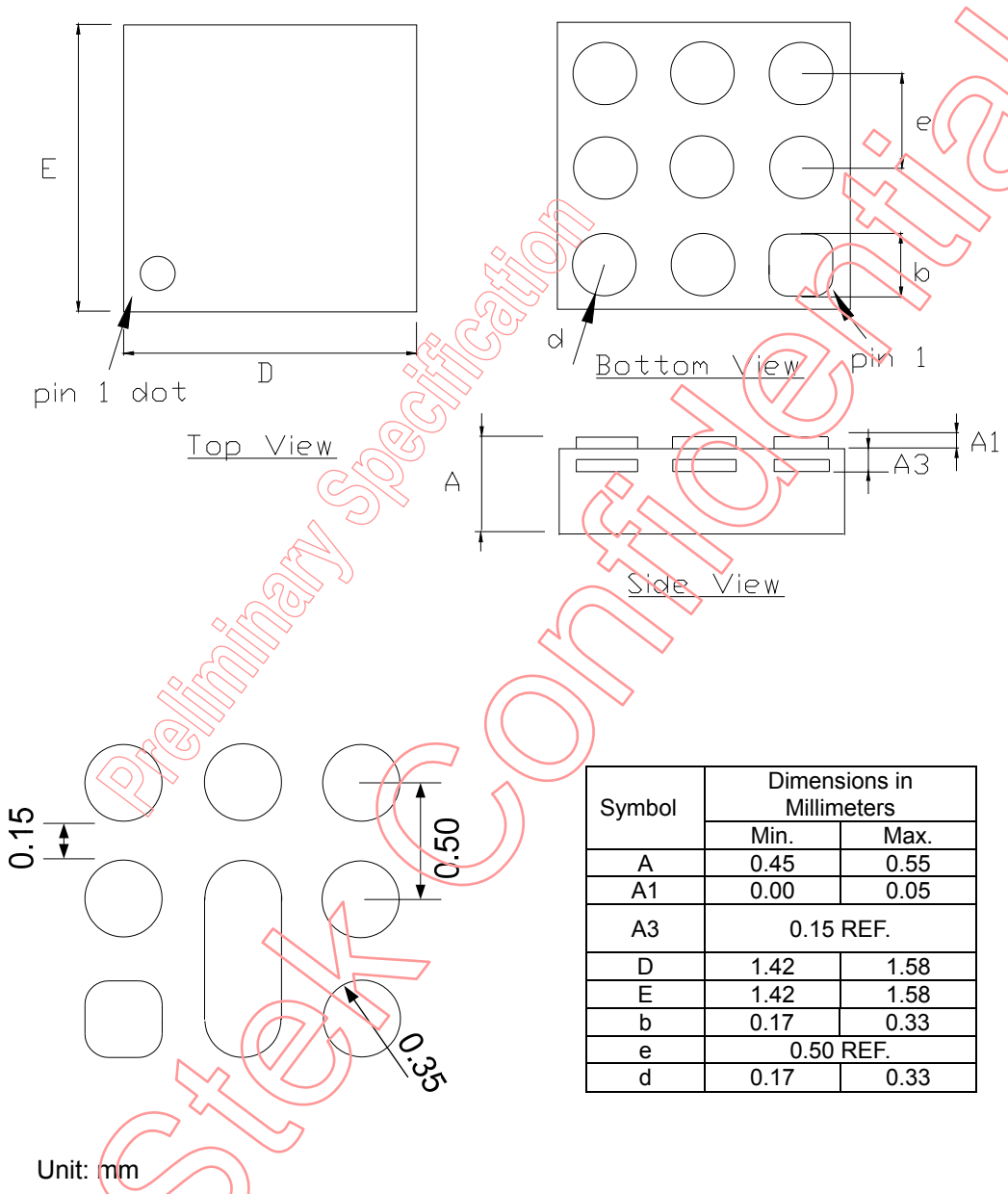
Note

1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

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

Package Dimensions, TQFN9-1.5x1.5



Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.45	0.55
A1	0.00	0.05
A3	0.15 REF.	
D	1.42	1.58
E	1.42	1.58
b	0.17	0.33
e	0.50 REF.	
d	0.17	0.33

Note

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

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