25mΩ R_{ON} 3A High Side One Channel Load Switch in 1mm X1mm WLCSP package

Features

- **25m ohm R_{ON}**
- **3A continuous operating current**
- **1mm X 1mm 4-pin, pin pitch 0.5mm WLCSP package**
- **Input voltage range 1.5V to 5.5V**
- **Internal level shift for CMOS/TTL control logic**
- **Ultra low quiescent current**
- **Micro-power shutdown current**
- **Soft-start.**
- **Load discharge circuit..**
- **Ultra fast turn off time**
- **With reverse voltage block function**.

Applications

- **Cellular phones**
- **Portable Navigation Devices(PND)**
- **Personal Media Players (PMP)**
- **Ultra Mobile PCs**
- **Portable instrumentation**
- **Other Portable applications**
- **PDAs**
- **Industrial and DataComm equirment**

General Description

The G5192C/D is a family of high-side load switches designed to operation from 1.5V to 5V input voltage. The load switch pass element is an internal 25 ohm R_{ON} P-channel MOSFET which enable the device to support up to 3A of continuous current. Additionally, the load switch supports 1.5V.

Logic level control and shutdown features in a tiny 1mm X 1mm 4 pin WLCSP package.

The G5192C/D provide a slew rate controlled soft-start turn on of 100μs. The soft-start feature is provided to prevent an in-rush current event from pulling down the input supply voltage.

The G5192D feature an active load discharge circuit which switches in a 200Ω load when the switch is disabled to automatically discharge a capacitive load.

An active pull-down on the enable input keeps the G5192C/D in a default OFF state until the enable pin is pulled above 1.2V. Internal level shift circuitry allows low voltage logic signal to switch higher supply voltages.
The enable voltage can be as high as 5.5V and is not limited by the input voltage.

The G5192C/D with reverse voltage block function, if the VIN disappears or VIN is less than VOUT; device will turn off without leakage current.

The G5192C/D operating voltage range makes them ideal for Lithium ion and NMH/NiCad/Alkaline battery powered systems as well as non-battery powered applications. The device provides low quiescent current and low shutdown current to maximize battery life.

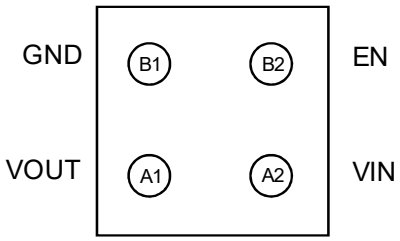
Ordering Information

ORDER NUMBER	MARKING	SPEC	PACKAGE (Green)
G5192CB11U	5x C	Soft start	WLCSP2X2-4
G5192CB12U	52 Cx	Soft start	WLCSP2X2-4 (BSC)
G5192DB11U	5x D	Soft start & Load discharge	WLCSP2X2-4
G5192DB12U	52 Dx	Soft start & Load discharge	WLCSP2X2-4 (BSC)
G5192DB13U	53 Dx	Soft start & Load discharge	WLCSP2X2-4 (BSC)

Note: B1: WLCSP2X2-4
1: Bonding Code
2 & 3: BSC (Back Side Coating)
U: Tape & Reel
Green : Lead Free / Halogen Free

Pin Configuration

4 Bump WLCSP



Bottom View

WLCSP2X2-4

Absolute Maximum Ratings

Input Voltage Range (V_{IN}). . . . . +6.0V
Input Voltage Range(V_{EN}). . . . . +6.0V
Continuous Drain Current for T_A=25°C[2] (I_{D1}) 3A
Continuous Drain Current for T_A=85°C[2] (I_{D2}) 2A
Pulsed Drain Current[3] (I_{DP}) . . . . . ±6A
Continues Diode Current[4] (I_S) . . . . . -50mA
Thermal Resistance Junction to Ambient, (θ_{JA})
WLCSP2X2-4[5] . . . . . 95°C/W
Storage Temperature Range. . . . . .-55 °C to 150°C
Maximum Lead Temperature (soldering,10sec)
. . . . . 300°C
Minimum ESD Rating (Human Body Model)[6] . . . 3KV

Recommended Operating Conditions

Input Voltage Range (V_{IN}). . . . . +1.5V to +5.5V
Junction Temperature (Tj) . . . . . -40°C to 125°C
Operating Temperature Range . . . . . -40°C to 85°C

1. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and 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.
2. With thermal contact to PCB.
3. Pulse width <300μs with <2% duty cycle.
4. Continuous body diode current conduction (reverse conduction, i.e V_{OUT} to V_{IN}) is not recommended.
5. Measured using the PCB with area 30mm X 44mm.
6. Devices are ESD sensitive. Handling precaution recommended. The Human Body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin.

Electrical Characteristics

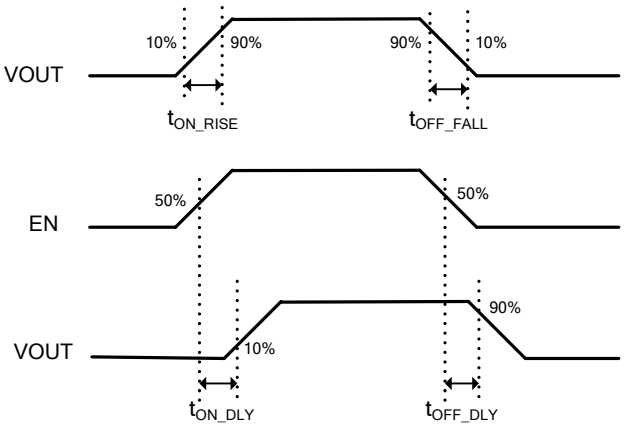
The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.

PARAMETER	SYMBOL	Condition	MIN	TYP	MAX	UNIT
Enable input voltage “H “	V_{EN_H}	V_{IN}=3.6V to 4.5V, I_D=-250μA	1.2	---	---	V
		V_{IN}=1.5V to 3.6V, I_D=-250μA	1	---	---	V
Enable input voltage “L “	V_{EN_L}	V_{IN}=1.5V to 4.5V, I_D=-250μA	---	---	0.4	V
Quiescent current	IQ	VIN=VEN=5V, ID=OPEN For G5192C/D	---	4.5	8	μA
Enable Input Current	IEN	VIN=VEN=5V, ID=OPEN	---	2	4	μA
Pull down resistance at EN pin	R_{EN_PO}	VIN=VEN=5V	---	2.3	---	MΩ
Quiescent current(shutdown)	ISHUT-Q1	VIN=5V, VEN=0V,ID=OPEN Measure on V_{IN} (T_A =25°C)	---	0.4	1	μA
P-Channel Drain to Source ON Resistance.	$R_{DS(ON)}$	VIN=5.0V, ID=100mA, VEN=1.5V	---	26	38	mΩ
		VIN=4.5V, ID=100mA, VEN=1.5V	---	27	40	mΩ
		VIN=3.6V, ID=100mA, VEN=1.5V	---	30	43	mΩ
		VIN=2.5V, ID=100mA, VEN=1.5V	---	38	55	mΩ
		VIN=1.8V, ID=100mA, VEN=1.5V	---	50	75	mΩ
		VIN=1.7V, ID=100mA, VEN=1.5V	---	55	85	mΩ
		VIN=1.5V, ID=100mA, VEN=1.5V	---	68	95	mΩ
Turn-off Resistance (G5192D)	RSHUTDOWN	VIN=3.6V, ITEST=1mA, VEN=0V	---	250	400	Ω

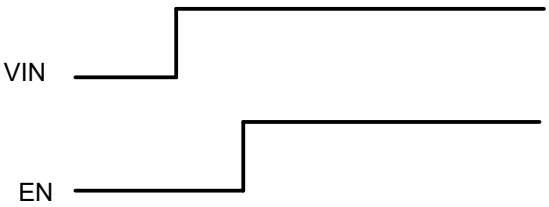
Electrical Characteristics (Dynamic)

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.

PARAMETER	SYMBOL	Condition	MIN	TYP	MAX	UNIT
Turn-On Delay Time	t_{ON_DLY}	V_{IN}=3.6V, I_D=100mA, V_{EN}=1.5V For G5192C/D	50	110	185	μs
Turn-On Rise Time	t_{ON_RISE}	V_{IN}=3.6V, I_D=100mA, V_{EN}=1.5V For G5192C/D	50	130	200	μs
Turn-Off Delay Time	t_{OFF_DLY}	V_{IN}=3.6V, I_D=100mA, V_{EN}=0V,CL=0μF	---	230	---	ns
Turn-Off Fall Time	t_{OFF_FALL}	V_{IN}=3.6V, I_D=100mA, V_{EN}=0V, CL=0μF	---	300	---	ns



Timing Diagram

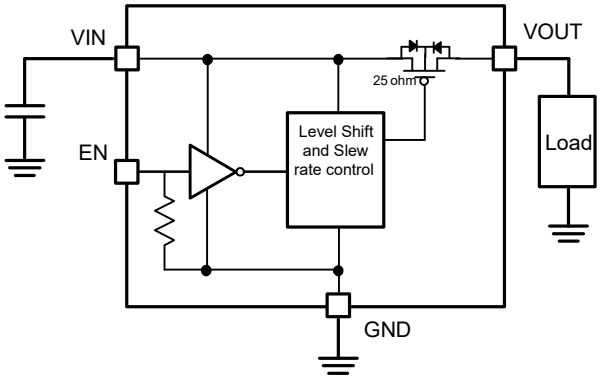


Turn on timing sequence for G5192C/D

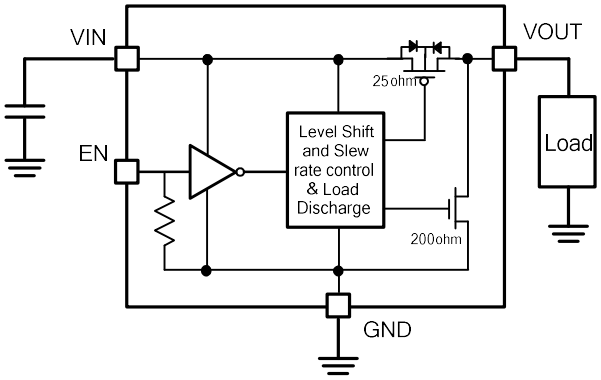
Pin Descriptions

Pin number	Pin name	Pin function
A1	VOUT	Drain of P-channel MOS
A2	VIN	Source of P-channel MOS
B1	GND	Ground (should be connected to electrical ground).
B2	EN	Enable (input): Active-high CMOS/TTL control input for switch internal – 2MΩ pull down resister. Output will be off if this pin is left floating.

Typical Application



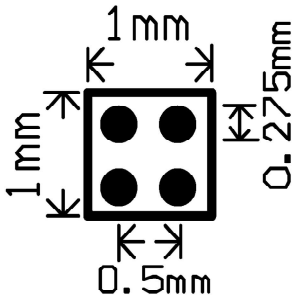
G5192C(Soft - start)



G5192D(soft- start with
auto- discharge)

Minimum Footprint PCB Layout Section

WLCSP2X2-4



Application Information

Power Dissipation Considerations

The simple thermal circuit can be considered as figure1:

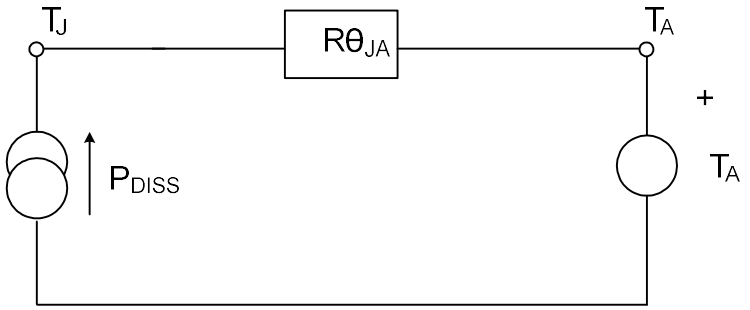


Figure 1. Simple Thermal Circuit

$Tj=P_{DISS}$ X $R\theta_{JA}$ $+T_A$
P_{DISS} is calculated as I_{SWITCH}^2 X $R_{SWmax.}$ $R\theta_{JA}$ is found in the operating ratings section of the datasheet

Example:
A switch is intended to drive a 2A load and is placed on a printed circuit board which has a ground plane area of at least 25mm by 25mm ($625mm^2$). The Voltage source is a Li-ion battery with a lower operating threshold of 3V and the ambient temperature of the assembly can be up to 50°C.

Summary of variables:

I_{SW}=2A
V_{IN}=3V to 4.2V
T_A=50°C
$R\theta_{JA}$ = 95°C/W from Datasheet.
P_{DISS} = I_{SW}^2 X R_{SWmaX}

The worst case switch resistance (R_{SWmaX}) at the lowest V_{IN} of 3V is not available in the datasheet, so the next lower value of V_{IN} is used.

R_{SWmaX} @ 2.5V=87mΩ

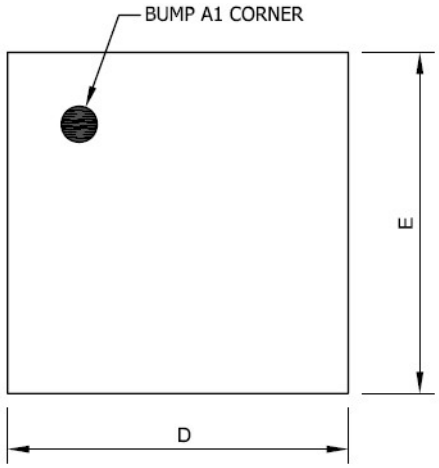
If this were a figure for worst case R_{SWmaX} for 25°C, an additional consideration is to allow for the maximum junction temperature of 125°C, the actual worst case resistance in this case can be 30% higher (See RDSON variance ns. Temperature graph). However, 87mΩ is the maximum over temperature.
Therefore:

$Tj=2^2$ x 0.087 x 95 + 50
Tj=83°C

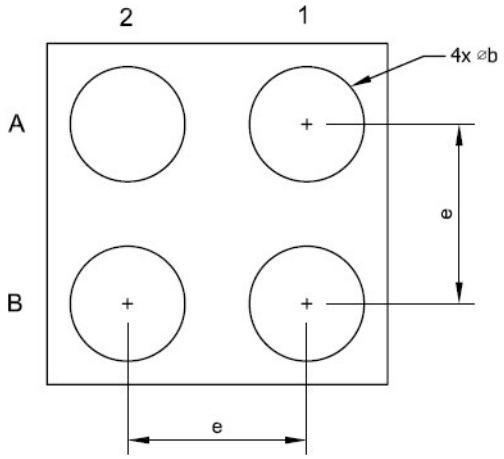
This is below the maximum 125°C.

Package Information

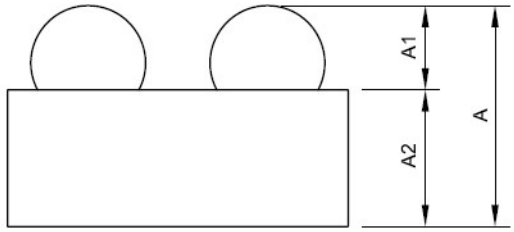
(G5192CB11U/ G5192DB11U)



Top View



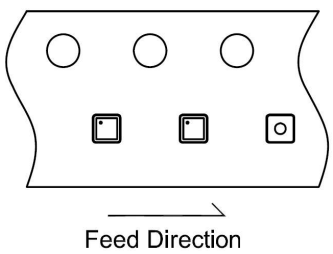
Bottom View



WLCSP2X2-4 (B1) Package

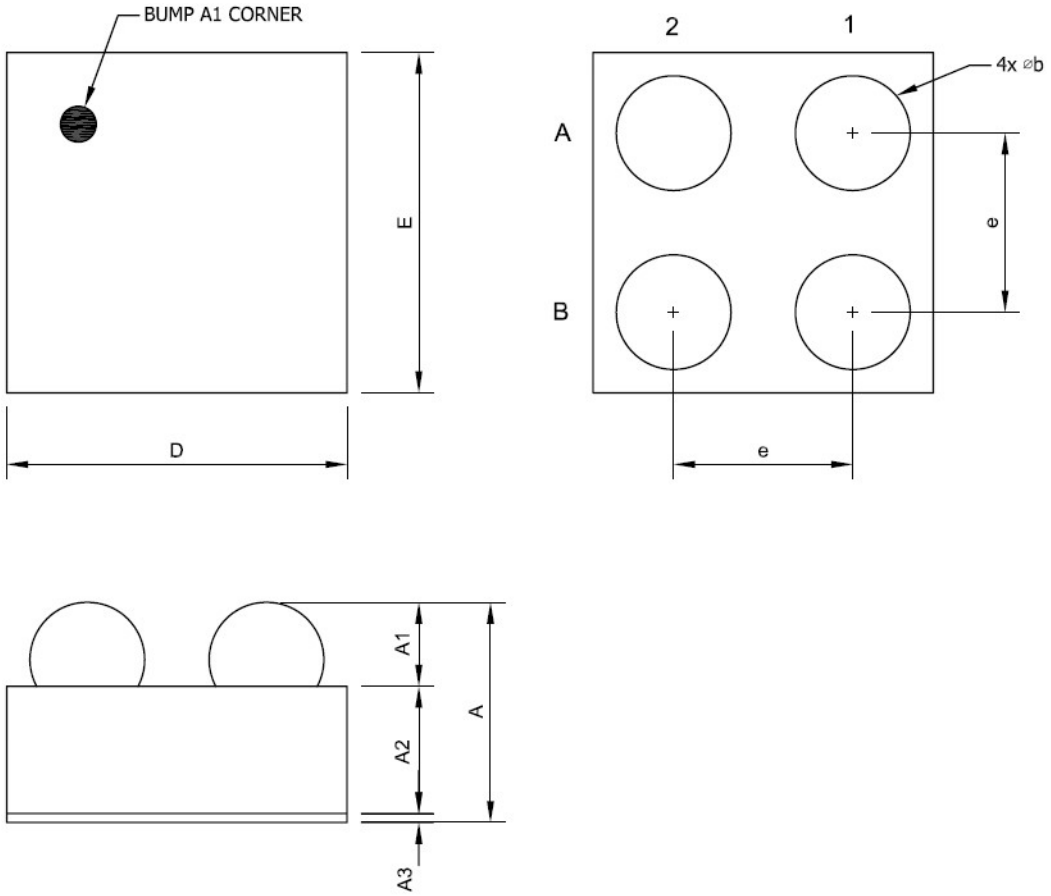
Symbol	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.540	0.600	0.660	0.0212	0.0236	0.0260
A1	0.210	0.235	0.260	0.0083	0.0093	0.0102
A2	0.330	0.365	0.400	0.0130	0.0144	0.0157
D	0.920	0.960	1.000	0.0362	0.0378	0.0394
E	0.920	0.960	1.000	0.0362	0.0378	0.0394
b	0.300	0.320	0.340	0.0118	0.0126	0.0134
e	0.50 BSC			0.0197 BSC		

Taping Specification



PACKAGE	Q'TY/REEL
WLCSP2X2-4	3,000 ea

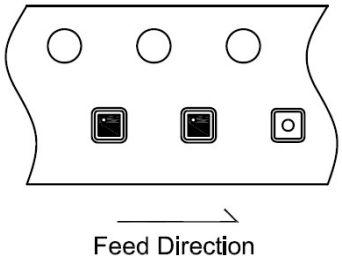
(G5192CB12U/ G5192DB12U/ G5192DB13U)



WLCSP2X2-4 (B1) Package

Symbol	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.540	0.600	0.660	0.0212	0.0236	0.0260
A1	0.210	0.235	0.260	0.0083	0.0093	0.0102
A2	0.310	0.340	0.370	0.0122	0.0134	0.0146
A3	0.020	0.025	0.030	0.0008	0.0010	0.0012
D	0.920	0.960	1.000	0.0362	0.0378	0.0394
E	0.920	0.960	1.000	0.0362	0.0378	0.0394
b	0.300	0.320	0.340	0.0118	0.0126	0.0134
e	0.50 BSC			0.0197 BSC		

Taping Specification



PACKAGE	Q'TY/REEL
WLCSP2X2-4	3,000 ea