

# High Input Voltage, High PSRR, Low Quiescent Current LDO Regulator

## Features

- Low Current Consumption , Typically 3.5 $\mu$ A
- Output Voltage Accuracy  $\pm 2\%$
- Low Dropout Voltage of 500mV @  $I_o = 100$ mA
- Stable with Ceramic or Tantalum Capacitors
- Wide Operating range : 3.5V ~ 36V
- Low Shutdown Current , Typically Under 1 $\mu$ A
- Good Line Regulation and Load Regulation Specifications
- Thermal Shutdown and Current Limit Protection Embedded
- SOT23-3 & TDFN2X2-6 Package Available

## General Description

The G2921 is a highly accurate, low dropout regulator with 150mA output driving capacity and ultra-low ground current. The G2921 can work in a wide operation range from 3.5V up to 36V. The quiescent current is small even at high input voltage. The typical current consumption is about 3.5 $\mu$ A. It is stable with either ceramic or tantalum output capacitor, the minimum output capacitor is only 1 $\mu$ F required. It is very suitable for the battery-powered portable equipment, especially the keep-alive system. The G2921 can provide the higher performance and a longer battery service life.

## Applications

- USB Type-C Power Supply
- Keep-Alive Supply in Notebook and Portable Computers
- Logic Supply for High-Voltage Batteries
- Automotive Electronics
- Battery Powered Systems
- 3-4 Cell Li-Ion Battery Input Range

## Ordering Information

| ORDER NUMBER | MARKING | VOLTAGE | TEMP. RANGE   | PACKAGE (Green) |
|--------------|---------|---------|---------------|-----------------|
| G2921T71U    | 2921x   | 3.3V    | -40°C to 85°C | SOT23-3         |
| G2921AT71U   | 291Ax   | 5.0V    | -40°C to 85°C | SOT23-3         |
| G2921RB1D    | 2921    | 3.3V    | -40°C to 85°C | TDFN2X2-6       |
| G2921ARB1D   | 292A    | 5.0V    | -40°C to 85°C | TDFN2X2-6       |

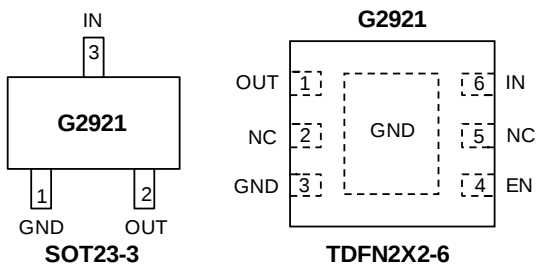
Note: T1: SOT23-3 RB: TDFN2X2-6

1: Bonding Code

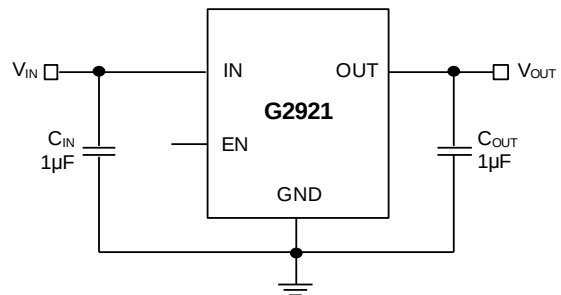
U & D: Tape & Reel

Green: Lead Free / Halogen Free

## Pin Configuration



## Typical Application Circuit



## Absolute Maximum Ratings <sup>(1)</sup>

Supply Voltage

$V_{IN}$  to GND. .... -0.3V to +40V

$V_{EN}$  to GND. .... -0.3V to +40V

$V_{OUT}$  to GND. .... -0.3V to +22V

Maximum Junction Temperature,  $T_J$  ..... 150°C

Storage Temperature Range,  $T_{STG}$ . . . -65°C to 150°C

Reflow Temperature (soldering, 10 sec) ..... 260°C

Electrostatic Discharge, VESD

Human body Model (HBM) <sup>(2)</sup> ..... 2000V

Charged-Device Model (CDM) ..... 1000V

## Operating Range

$T_A$  ..... -40°C to +85°C

$V_{IN}$  to GND. .... 3.5V to 36V

$V_{OUT}$  to GND ..... 3.3V/5.0V

## Thermal Information <sup>(3)</sup>

| THERMAL METRIC       |                                              | SOT23-3 | TDFN2X2-6 | UNIT |
|----------------------|----------------------------------------------|---------|-----------|------|
| $R_{\theta JA}$      | Junction to ambient thermal resistance       | 226.7   | 65.7      | °C/W |
| $R_{\theta JC\_top}$ | Junction to case top thermal resistance      | 127.4   | 108.4     | °C/W |
| $R_{\theta JB}$      | Junction to board thermal resistance         | 75.0    | 32.8      | °C/W |
| $\Psi_{JT}$          | Junction to top characterization parameter   | 29.7    | 2.6       | °C/W |
| $\Psi_{JB}$          | Junction to board characterization parameter | 74.7    | 32.7      | °C/W |
| $R_{\theta JC\_bot}$ | Junction to case bottom thermal resistance   | N/A     | 5.4       | °C/W |

## Electrical Characteristics

$V_{IN} = V_O + 3V$ ,  $T_A = 25^\circ C$ .

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            | CONDITIONS                                                          | MIN   | TYP  | MAX   | UNITS |
|------------------------------|-------------------|---------------------------------------------------------------------|-------|------|-------|-------|
| Input Voltage Range          | $V_{IN}$          |                                                                     | 3.5   | ---  | 36    | V     |
| Under Voltage Lockout        | $V_{UVLO}$        |                                                                     | ---   | 2.5  | ---   | V     |
| UVLO Hysteresis              | $V_{HYS}$         |                                                                     | ---   | 200  | ---   | mV    |
| Output Voltage Range         |                   | Fixed Mode                                                          | 3.234 | 3.3  | 3.366 | V     |
|                              |                   |                                                                     | 4.9   | 5.0  | 5.1   |       |
| Quiescent Current            | $I_Q$             | $I_{LOAD} = 0mA$                                                    | ---   | 3.5  | 5     | μA    |
| Shutdown Current             | $I_{SHDN}$        | $EN = 0$                                                            | ---   | 0.1  | 1     | μA    |
| EN Input Current             | $I_{EN}$          | $V_{EN} = 36V$                                                      | ---   | 0.1  | ---   | μA    |
| Line Regulation              | $\Delta V_{LINE}$ | $I_{LOAD} = 1mA$ , $V_{OUT+1} < V_{IN} < 36V$ , $V_{OUT} > 3.3V$    | ---   | 0.04 | 0.5   | %     |
|                              |                   | $I_{LOAD} = 1mA$ , $V_{OUT+1} < V_{IN} < 36V$ , $V_{OUT} \leq 3.3V$ | ---   | 0.04 | 0.6   | %     |
| Load Regulation              | $\Delta V_{LOAD}$ | $0mA < I_{LOAD} < 100mA$                                            | ---   | 1    | 3     | %     |
| Enable Input Voltage         | $V_{IH}$          |                                                                     | 0.9   | ---  | ---   | V     |
|                              | $V_{IL}$          |                                                                     | ---   | ---  | 0.4   | V     |
| Output Current Limit         | $I_{LIM}$         | $V_{OUT} = 0.5 \times V_{OUT(nom)}$                                 | 200   | 300  | ---   | mA    |
| Short Circuits Current       | $I_{SCKT}$        | $V_{OUT} = 0V$                                                      | ---   | 40   | ---   | mA    |
| Thermal Shutdown Temperature | $T_{SD}$          |                                                                     | ---   | 150  | ---   | °C    |
|                              | $T_{SD\_HYS}$     |                                                                     | ---   | 20   | ---   | °C    |

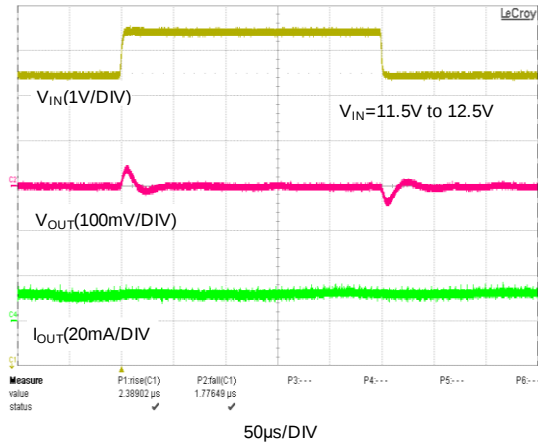
### Note

1. Absolute maximum rating indicates limits beyond which damage to the device may occurs
2. Human body model :  $C = 100pF$ ,  $R = 1500\Omega$ , 3 positive pulses plus 3 negative pulses
3. Package thermal metric is obtained using the method described in JEDEC specification JESD51-7, using a four-layer board.
4. The maximum power dissipation is  $P_{D(MAX)} = \frac{(T_{JMAX} - T_A)}{R_{\theta JA}}$ , Exceeding the maximum allowable power dissipation results in excessive die temperature, and the device will enter thermal shutdown.

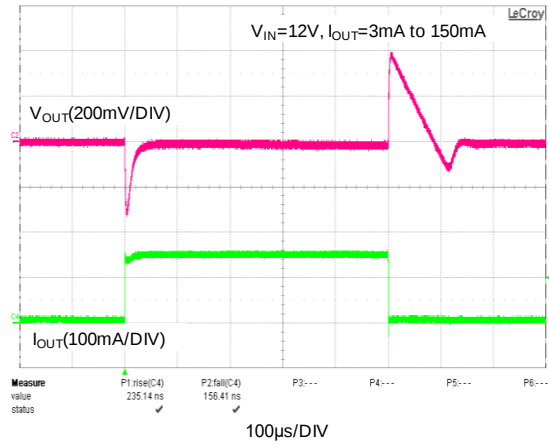
## Typical Performance Characteristics

Circuit of Fig. 1, component of table 1,  $V_{OUT}=3.3V$ ,  $V_{IN}>2.5V$   $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ ,  $T_A=25^\circ C$ , unless otherwise noted.

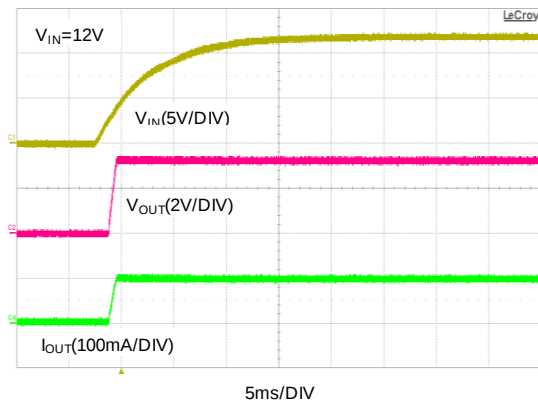
Line Transient Response



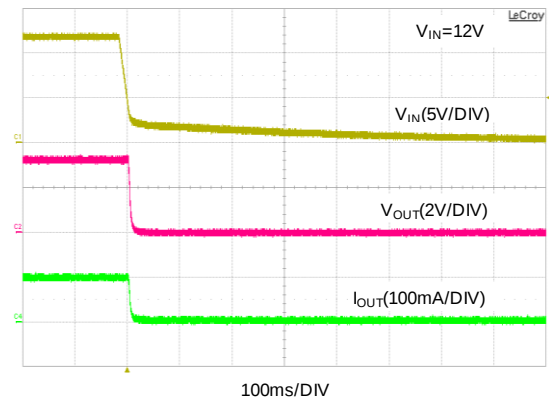
Load Transient Response



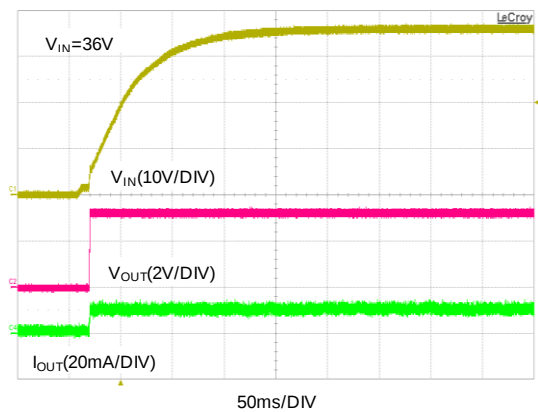
Power On from VIN



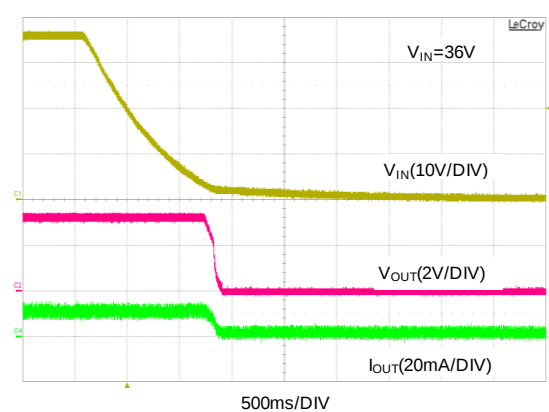
Power Off from VIN



Power On from VIN

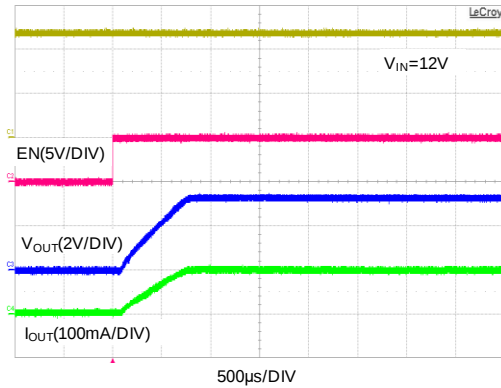


Power Off from VIN

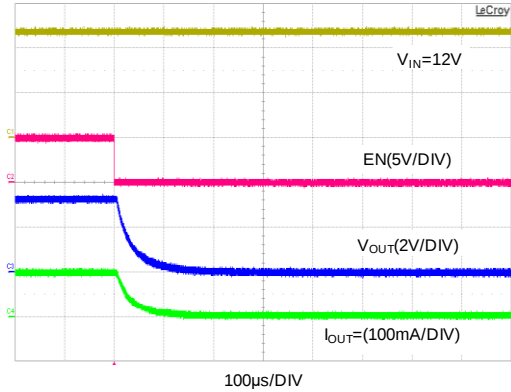


Typical Performance Characteristics (continued)

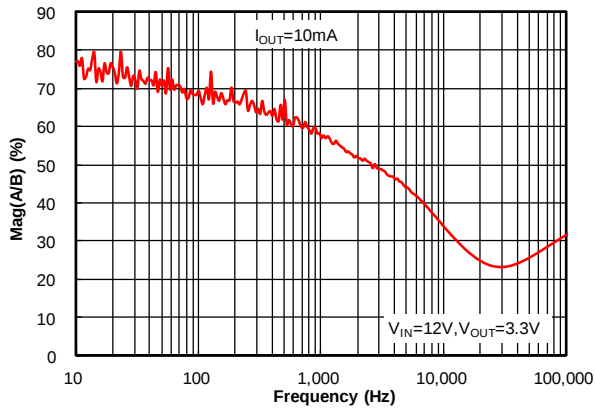
Power On from EN



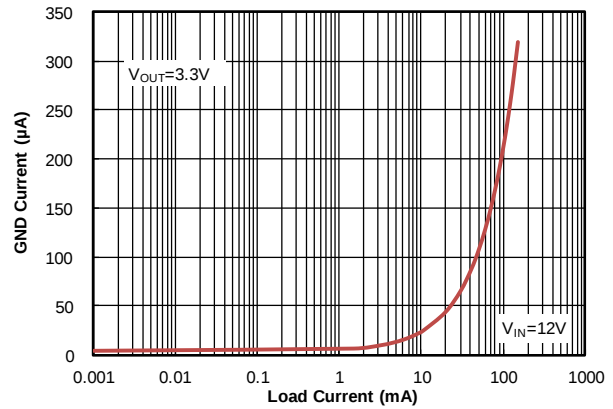
Power Off from EN



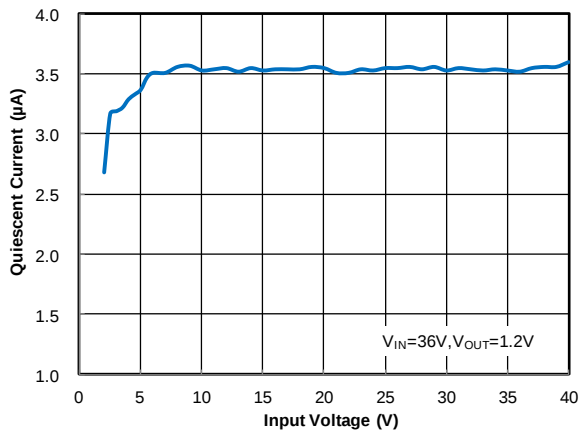
PSRR



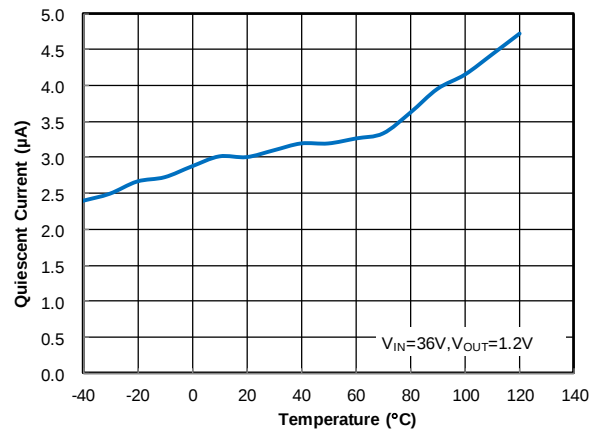
GND Current VS. Load Current



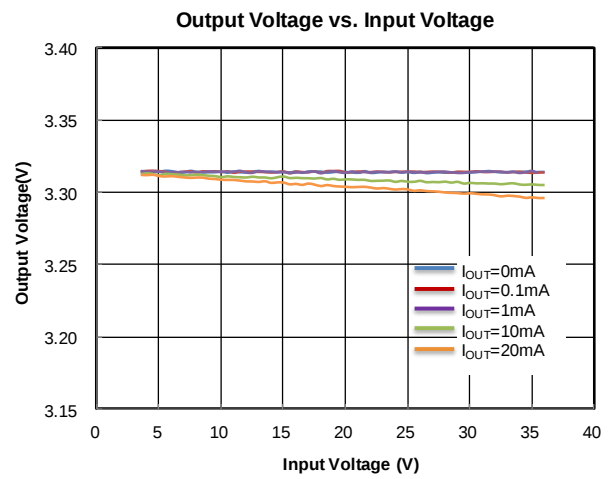
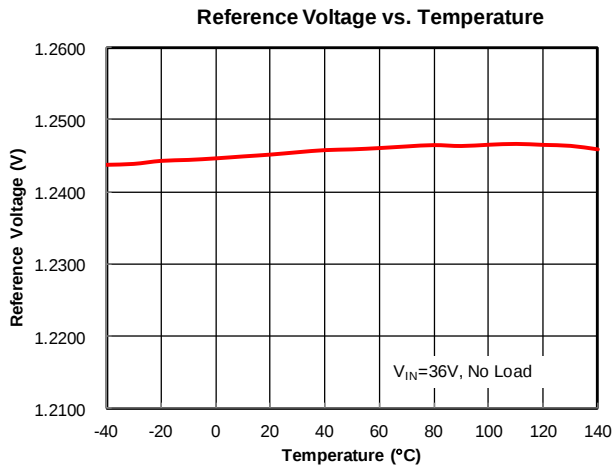
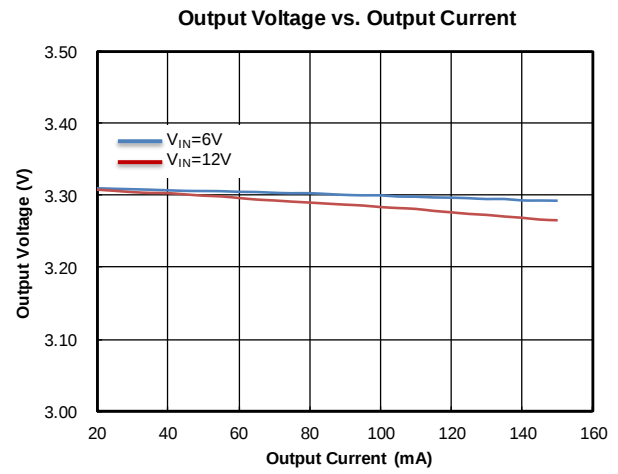
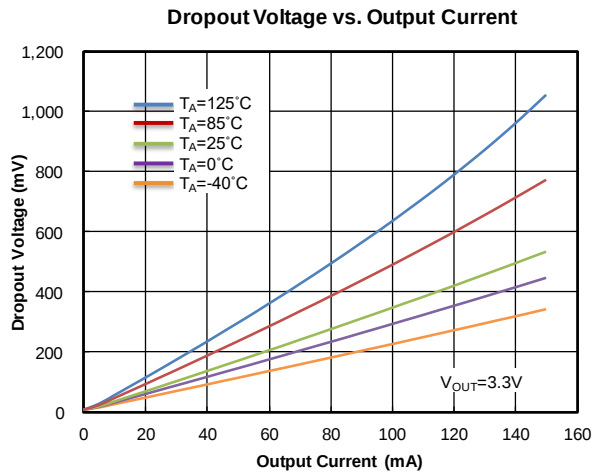
Quiescent Current vs. Input Voltage



Quiescent Current vs. Temperature

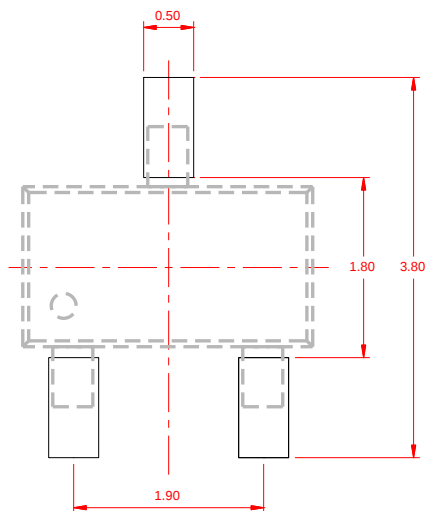


Typical Performance Characteristics (continued)

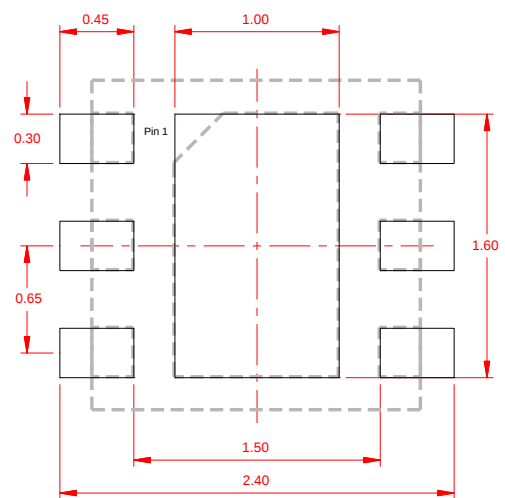


Minimum Footprint PCB Layout Section (mm)

**SOT23-3**



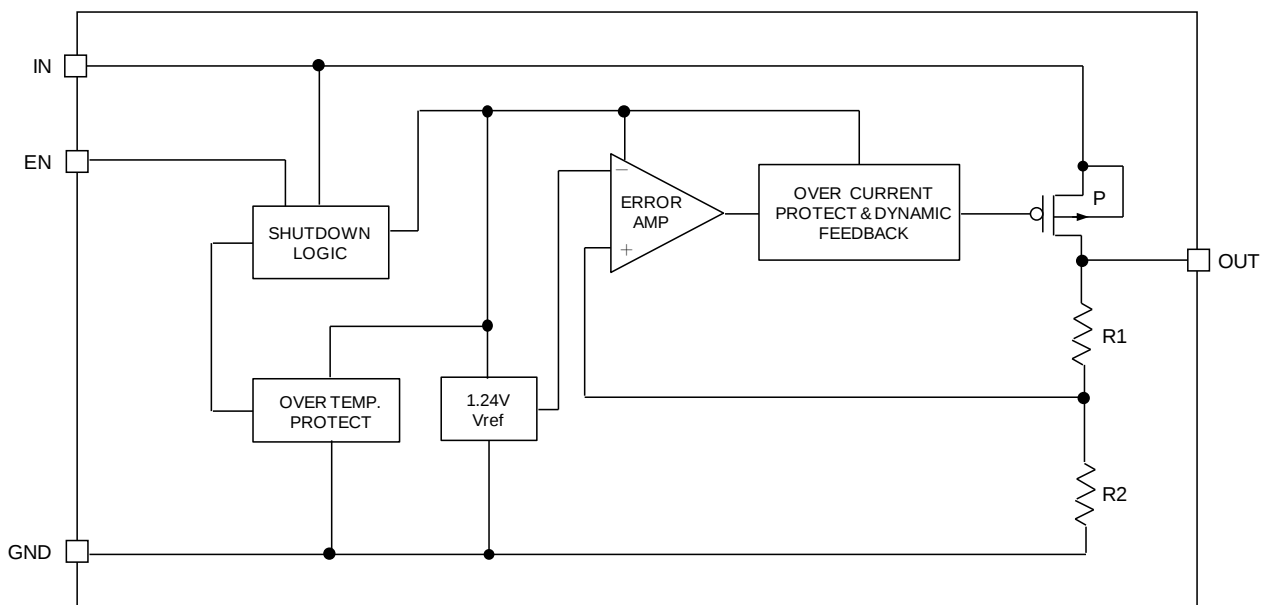
**TDFN2X2-6**



## Pin Description

| PIN     |           | NAME | FUNCTION                                          |
|---------|-----------|------|---------------------------------------------------|
| SOT23-3 | TDFN2X2-6 |      |                                                   |
| 1       | 3         | GND  | Ground                                            |
| 2       | 1         | OUT  | Regulator Output                                  |
| 3       | 6         | IN   | Supply Input                                      |
| ---     | 4         | EN   | Enable: logic low = shutdown; logic high = enable |
| ---     | 2,5       | N.C. | Not Connected                                     |

## Block Diagram



## Description

The G2921 is a highly accurate, low dropout regulator with 150mA output driving capacity and ultra-low ground current. The G2921 can work in a wide operation range from 3.5V up to 36V. The quiescent current is small even at high input voltage. The typical current consumption is about 3.5 $\mu$ A. The thermal shutdown and short circuits protection function is built-in to protect chip from damage. It is stable with either ceramic or tantalum output capacitor, the minimum output capacitor is only 1 $\mu$ F required. It is very suitable for the battery-powered portable equipment, especially the keep-alive system. The G2921 can provide the higher performance and a longer battery service life.

## Enable operation

The G2921 comes with an active-high enable pin that allows the regulator to be shutdown. The G2921 enters shutdown mode by driving the Enable input low, and turns on by pulling the Enable input high. The quiescent current is under 1 $\mu$ A in shutdown state.

## Input Capacitor

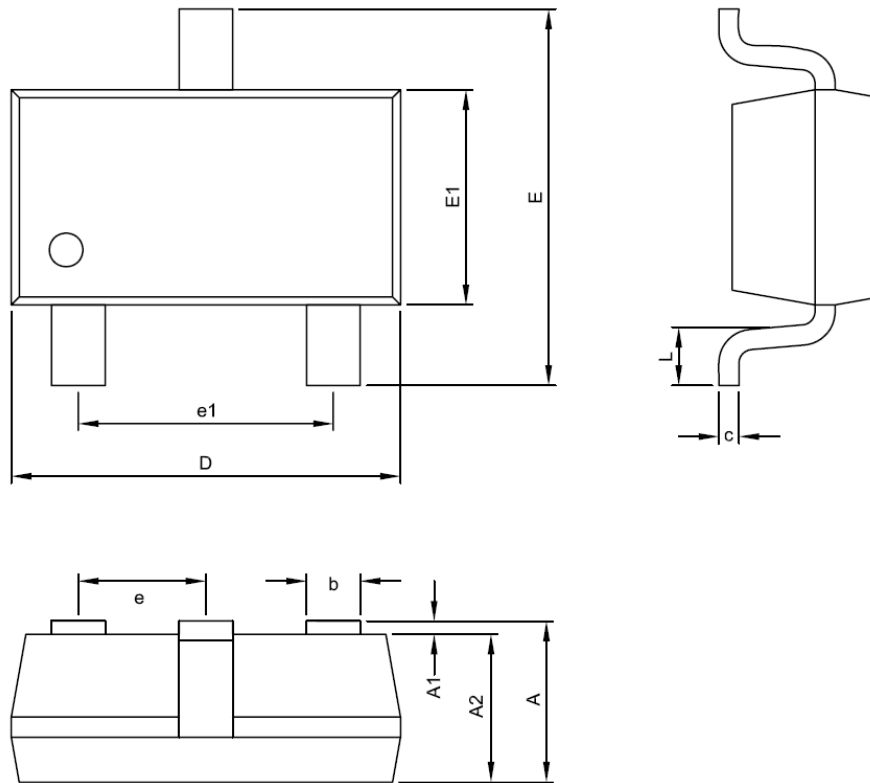
The input capacitor whose value is  $\geq 1\mu\text{F}$  is required. The value may be increased if the source supply has high ripple. Low ESR, small ceramic capacitors are recommended.

The G2921 can operate up to 36V. The input capacitor must have capability to sustain high voltage used on the input.

## Output Capacitor

The G2921 must require an output capacitor for stable operation. Larger valued and low ESR capacitors help to improve transient response. Ceramic capacitors have lower ESR and lower cost than Tantalum capacitors. X7R/X5R dielectric-type ceramic capacitors are recommended because of their temperature performance.

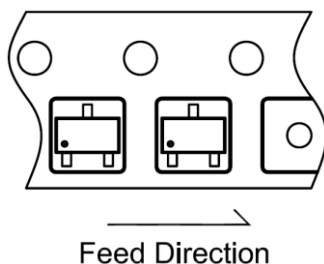
## Package Information



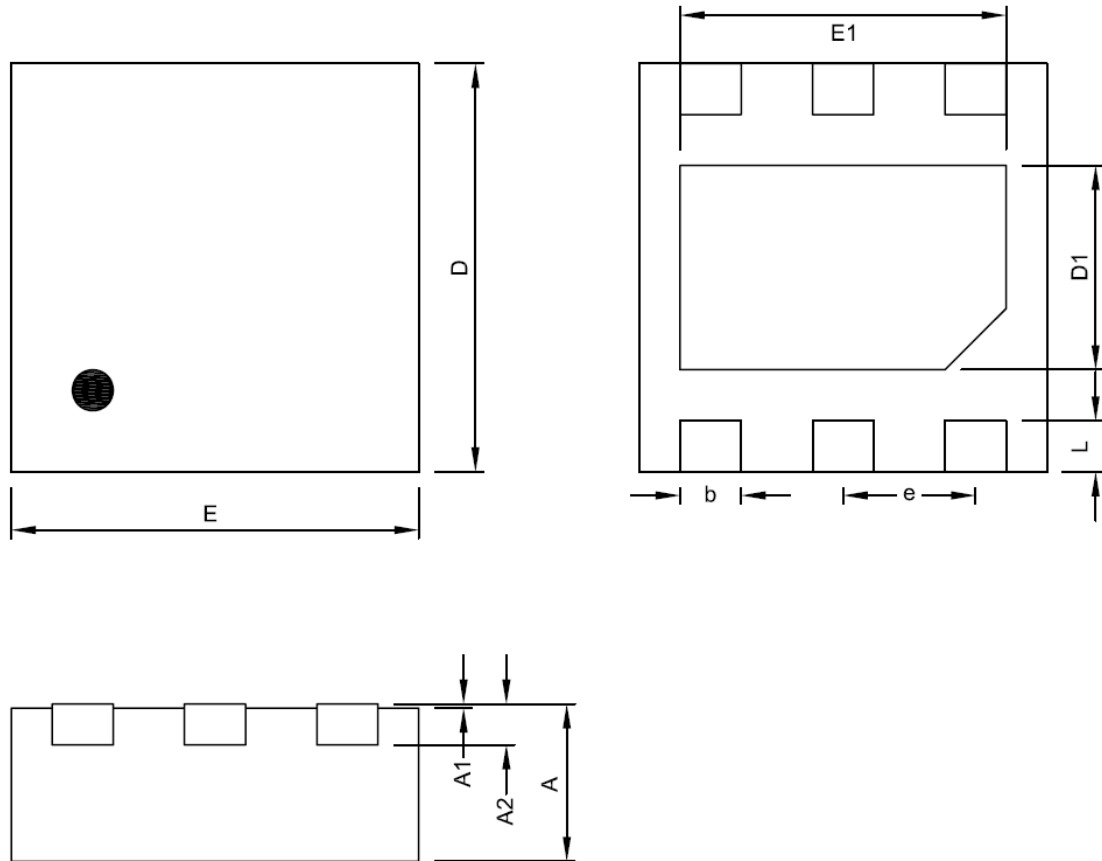
SOT23-3 Package

| Symbol | DIMENSION IN MM |      |      | DIMENSION IN INCH |       |       |
|--------|-----------------|------|------|-------------------|-------|-------|
|        | MIN.            | NOM. | MAX. | MIN.              | NOM.  | MAX.  |
| A      | 0.95            | 1.10 | 1.45 | 0.037             | 0.043 | 0.057 |
| A1     | 0.00            | ---  | 0.15 | 0.000             | ---   | 0.006 |
| A2     | 0.90            | 1.10 | 1.30 | 0.035             | 0.043 | 0.051 |
| D      | 2.70            | 2.90 | 3.10 | 0.106             | 0.114 | 0.122 |
| E      | 2.60            | 2.80 | 3.00 | 0.102             | 0.110 | 0.118 |
| E1     | 1.50            | 1.60 | 1.70 | 0.059             | 0.063 | 0.067 |
| c      | 0.08            | 0.15 | 0.25 | 0.003             | 0.006 | 0.010 |
| b      | 0.30            | 0.40 | 0.50 | 0.012             | 0.016 | 0.020 |
| e      | 0.95 BSC        |      |      | 0.037 BSC         |       |       |
| e1     | 1.90 BSC        |      |      | 0.075 BSC         |       |       |
| L      | 0.30            | 0.45 | 0.60 | 0.012             | 0.018 | 0.024 |

## Taping Specification



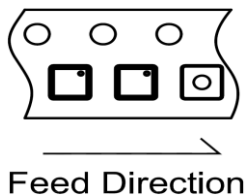
| PACKAGE | Q'TY/BY REEL |
|---------|--------------|
| SOT23-3 | 3,000 ea     |



TDFN2X2-6 Package

| Symbol | DIMENSION IN MM |      |      | DIMENSION IN INCH |        |        |
|--------|-----------------|------|------|-------------------|--------|--------|
|        | MIN.            | NOM. | MAX. | MIN.              | NOM.   | MAX.   |
| A      | 0.70            | 0.75 | 0.80 | 0.0276            | 0.0295 | 0.0315 |
| A1     | 0.00            | ---  | 0.05 | 0.0000            | ---    | 0.0020 |
| A2     | 0.20 REF        |      |      | 0.0079 REF        |        |        |
| D      | 1.95            | 2.00 | 2.05 | 0.0768            | 0.0787 | 0.0807 |
| E      | 1.95            | 2.00 | 2.05 | 0.0768            | 0.0787 | 0.0807 |
| D1     | 0.90            | 1.00 | 1.10 | 0.0354            | 0.0394 | 0.0433 |
| E1     | 1.50            | 1.60 | 1.65 | 0.0591            | 0.0630 | 0.0650 |
| b      | 0.25            | 0.30 | 0.35 | 0.0098            | 0.0118 | 0.0138 |
| e      | 0.65 BSC        |      |      | 0.0256 BSC        |        |        |
| L      | 0.20            | 0.25 | 0.30 | 0.0079            | 0.0098 | 0.0118 |

## Taping Specification



| PACKAGE   | Q'TY/BY REEL |
|-----------|--------------|
| TDFN2X2-6 | 3,000 ea     |