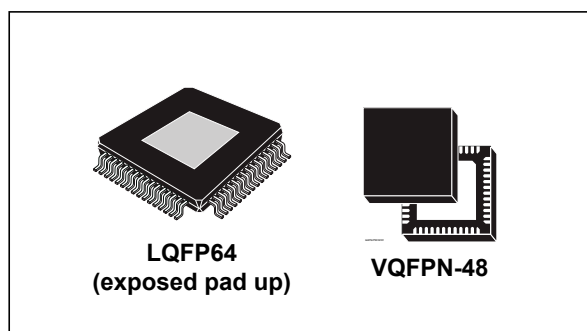


## Monolithic dual 3.5 A step-down switching regulator with LDO

Data brief



### Features

- Two step-down synchronous switching voltage regulators with internal power switches:
  - Wide operating input voltage range (from 3.3 V to 26 V)
  - Output voltage selectable by external divider (feedback voltage at 0.9 V)
  - 0.9 V minimum output, maximum output limited by maximum Duty Cycle
  - DC/DCs can work in Low Power Mode for reduced current consumption in low output Load
  - Internal high-side/ low-side NDMOS
  - 250 kHz and 2 MHz selectable free-run frequencies
  - 250 kHz < f < 2.3 MHz synchronization range at SYNCIN pin
  - Programmable current limits at 2 A and 4 A
  - Independent hardware high voltage enabling pins
  - Independent supply inputs
  - 180° phase shift, synch out is 90° out of phase with DC/DC1
  - Programmable switching frequency divider by 1, 2, 4, 8 between the two regulators
  - The two regulators can be paralleled
- Independent voltage supervisors/power-goods with selectable thresholds through external pin:
  - two available thresholds for UV/OV/PG signals: 90-120-95% or 80-110-85% (output voltage percentage)
- Soft-start, thermal protection
- One standby/linear regulator:
  - Output selectable with external resistor divider till 10 V
  - Soft start, hardware enable pin
  - 250 mA maximum current capability
  - Standby operative mode
  - Programmable power good thresholds (85% or 95% output voltage percentage)
  - Thermal protection
- Microcontroller reset with programmable duration, activated by output under voltage or watchdog fault
- External High Side Driver enable pin
- One integrated window watchdog (5 ms ≤ window ≤ 50 ms, with ± 20% tolerance)
- Short circuit protected outputs
- Low external components number
- Low EMI
- Automotive qualified - AECQ 100 (-40 to 105°C)
- Thermal shutdown junction temperature 150°C

**Table 1. Device summary**

Order code	Package	Packing
L5964Q-V0Y	VQFPN-48	Tray
L5964L-VYY	LQFP64 exp. pad up	Tray

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# 1 Description

L5964 is a dual step-down switching regulator with internal power switches and a low drop-out linear/standby regulator. All the regulators have independent supply voltages, enables, power goods and thermal protections.

The switching regulators have selectable voltage supervisors and power goods, and selectable current limits. The LDO has power good and fixed current limitation.

The two DC-DC converters can work in free-run condition, with frequency selectable between two values, 250 kHz or 2 MHz, or synchronize themselves to an external clock (SYNCIN pin). They are 180° out of phase, while the synchronization output signal (SYNCOUT pin) is 90° out of phase with the first regulator. The phase shift simplifies the use of two ICs in the same application (4 DC/DCs regulators).

The high operating frequency allowed by the synchronization input helps to reduce AM and FM interferences and grants the use of small and low cost inductors and capacitors.

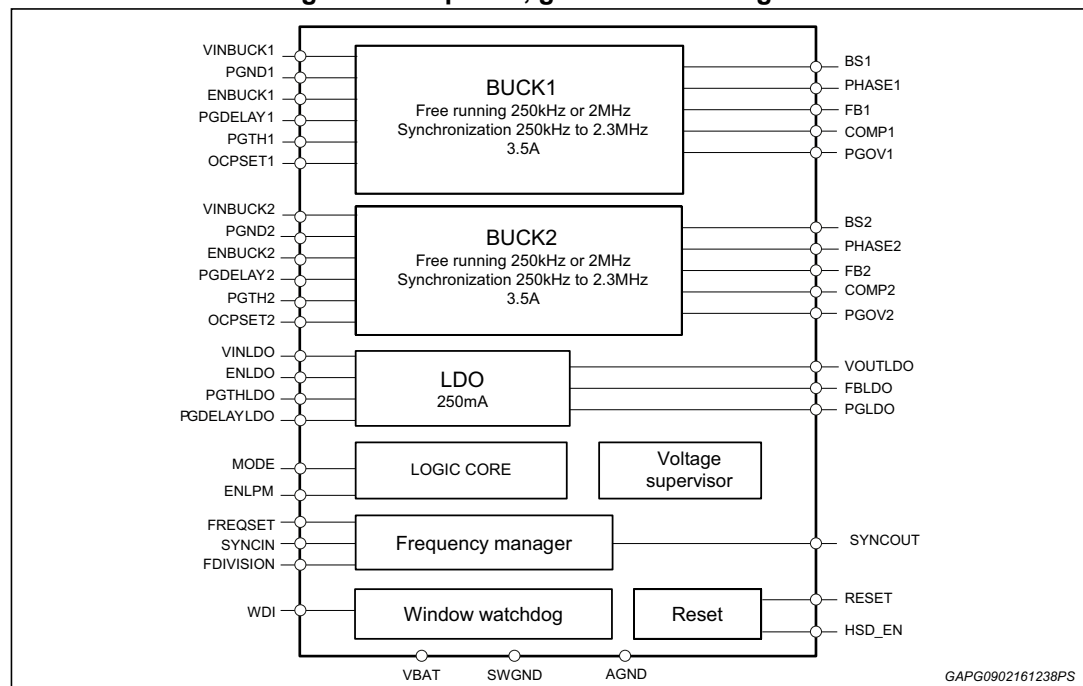
The two switching regulators can be used in parallel and increase the output current capability up to 7 A.

The L5964 can manage the microcontroller supply. A configurable reset output and a configurable watchdog input are available.

This IC finds application in the automotive segment, where load dump protection and wide input voltage range are mandatory. The total quiescent current, when both DC/DCs and LDO are disabled, is less than 10 µA.

The product is available in two different packages. A slug down package, QFN48, able to dissipate on the PCB. An exposed pad up package, LQFP64, when the power requirement is higher and an external heatsink is needed.

**Figure 1. Simplified, general block diagram**



## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

### 2.1 LQFP64 (10x10x1.4 mm exp. pad up) package information

Figure 2. LQFP64 (10x10x1.4 mm exp. pad up) package outline

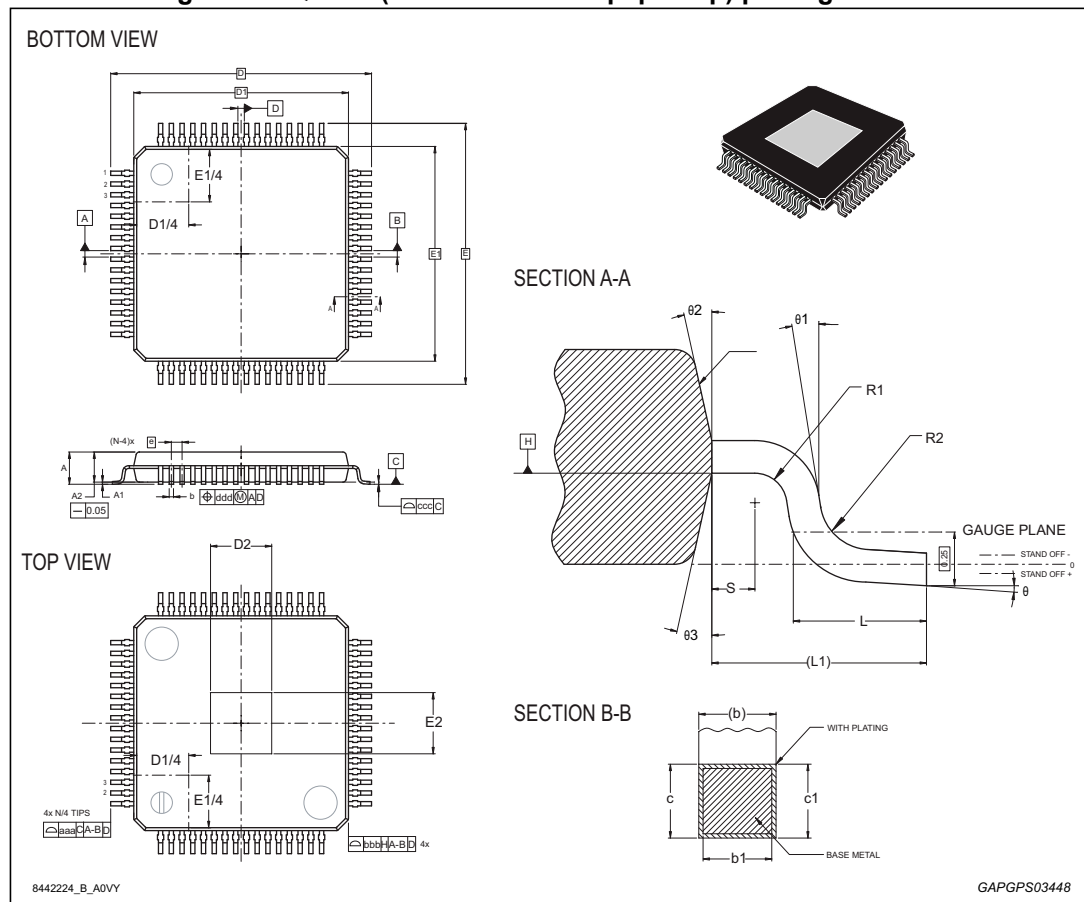


Table 2. LQFP64 (10x10x1.4 mm exp. pad up) package mechanical data

Ref	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
Θ	0°	3.5°	6°	0°	3.5°	6°
Θ1	0°	9°	12°	0°	9°	12°
Θ2	11°	12°	13°	11°	12°	13°
Θ3	11°	12°	13°	11°	12°	13°
A	-	-	1.60	-	-	0.0630
A1	-0.04	-	0.04	-0.0016	-	0.0016
A2	1.35	1.4	1.45	0.0531	0.0551	0.0571
b	-	-	0.255	-	-	0.0100
b1	0.17	0.20	0.23	0.0067	0.0079	0.0091
c	0.09	-	0.20	0.0035	-	0.0079
c1	0.09	-	0.16	0.0035	-	0.0063
D	-	12.00	-	-	0.4724	-
D1 <sup>(2)</sup>	-	10.00	-	-	0.3937	-
D2	-	6.00	-	-	0.2362	-
e	-	0.50	-	-	0.0197	-
E	-	12.00	-	-	0.4724	-
E1 <sup>(*)</sup>	-	10.00	-	-	0.3937	-
E2	-	6.00	-	-	0.2362	-
L	0.45	0.60	0.75	0.0177	0.0236	0.0295
L1	-	1.00	-	-	0.0394	-
N	-	64.00	-	-	2.5197	-
R1	0.08	-	-	0.0031	-	-
R2	0.08	-	0.20	0.0031	-	0.0079
S	0.20	-	-	0.0079	-	-
aaa	-	0.20	-	-	0.0079	-
bbb	-	0.20	-	-	0.0079	-
ccc	-	0.08	-	-	0.0031	-
ddd	-	0.08	-	-	0.0031	-

1. Values in inches are converted from mm and rounded to 4 decimal digits.

2. Dimensions D1 and E1 do not include mold flash or protrusions.  
Allowable mold flash or protrusions is "0.25 mm" per side.

## 2.2 VFQFPN-48 (7x7x1.0 mm - opt. D) package information

Figure 3. VFQFPN-48 (7x7x1.0 mm - opt. D) package outline

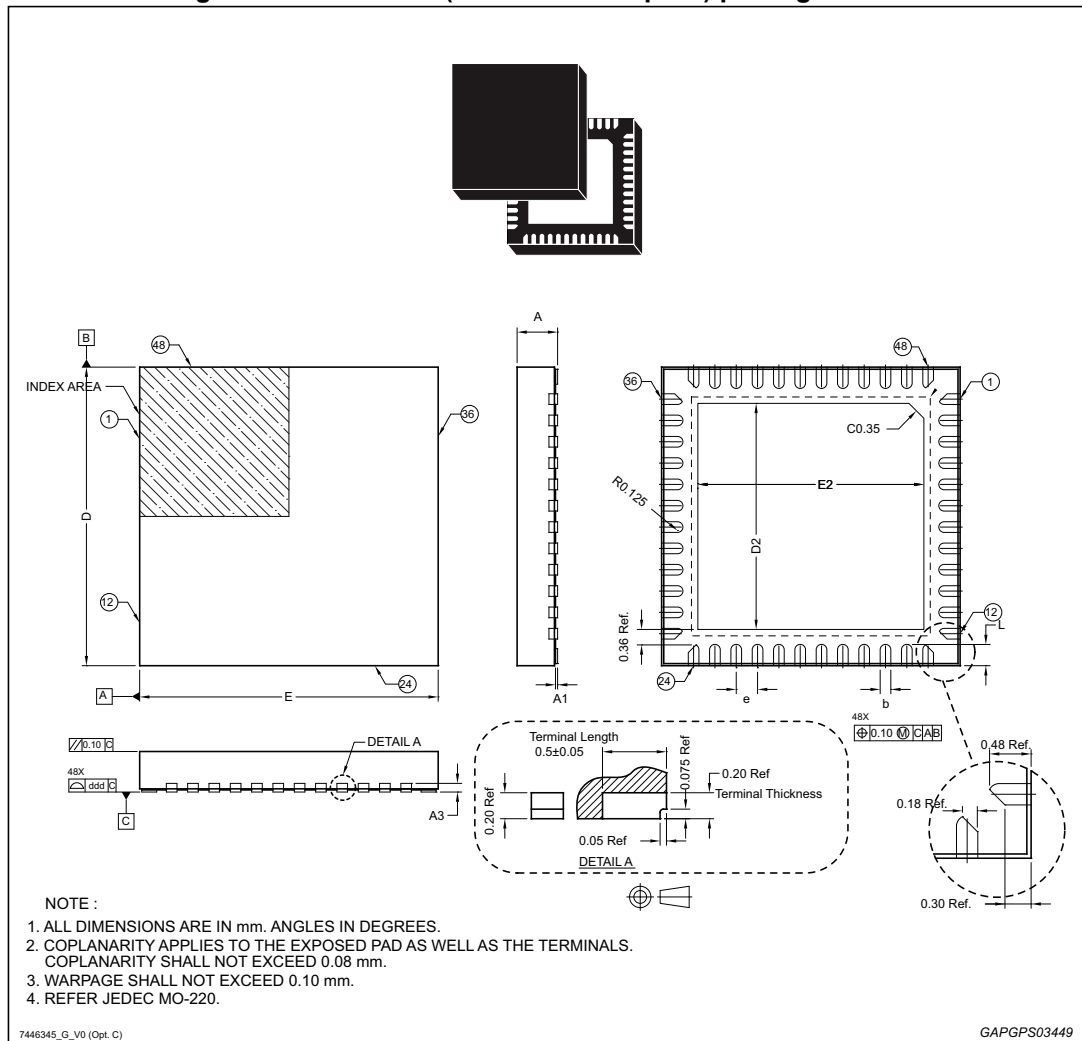


Table 3. VFQFPN-48 (7x7x1.0 mm - opt. D) package mechanical data

Ref	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.85	0.95	1.05	0.0335	0.0374	0.0413
A1	-	-	0.05	-	-	0.0020
A2	-	0.75	-	-	0.0295	-
A3	-	0.200	-	-	0.0079	-
b	0.15	0.25	0.35	0.0059	0.0098	0.0138
D	6.80	7.00	7.15	0.2697	0.2756	0.2815

Table 3. VFQFPN-48 (7x7x1.0 mm - opt. D) package mechanical data (continued)

Ref	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
D2	5.15	5.30	5.45	0.2028	0.2087	0.2146
E	6.85	7.00	7.15	0.2697	0.2756	0.2815
E2	5.15	5.30	5.45	0.2028	0.2087	0.2146
e	0.45	0.50	0.55	0.0177	0.0197	0.0217
L	0.45	0.50	0.55	0.0177	0.0197	0.0217
ddd	-	-	0.08	-	-	0.0031

1. Values in inches are converted from mm and rounded to 4 decimal digits.

### 3 Revision history

Table 4. Document revision history

Date	Revision	Changes
10-Feb-2016	1	Initial release.

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