THE DATASHEET OF

L9963

L9963

Data brief

Automotive chip for battery management applications

Features

- AEC-Q100 qualified
- Measures 4 to 14 cells in series, with 0 us desynchronization delay between samples. Supports also busbar connection without altering cell results
- Coulomb counter supporting pack overcurrent detection in both ignition on and off states. Fully synchronized current and voltage samples
- 16-bit voltage measurement with maximum error of ±2 mV in the [1.7 – 4.7] V range, in whole operating temp range
- 2.66 Mbps isolated serial communication with regenerative buffer, supporting dual access ring. Less than 2 µs latency between start of conversion of the 1st and the 15th device in a chain. Less than 4 ms to convert and read 96 cells in a system using 8 L9963. Supports both transformer and capacitive based isolation
- 200 mA passive internal balancing current for each cell in both normal and silent-balancing mode. Possibility of executing cyclic wake-up measurements. Manual/Timed balancing, on multiple channels simultaneously; Internal/external balancing
- Fully redundant cell measurement path, with ADC Swap, for enhanced safety and limp home functionality
- Intelligent diagnostic routine providing automatic failure validation. Redundant fault notification through both SPI Global Status Word (GSW) and dedicated FAULT line
- Two 5 V regulators supporting external load connection with 25 mA (VCOM) and 50 mA (VTREF) current capability
- 9 GPIOs, with up to 7 analog inputs for NTC sensing
- Robust hot-plug performance. No Zeners needed in parallel to each cell
- Full ISO26262 compliant, ASIL-D systems ready
- TQFP64EP package

Product status link
L9963

Product label
SUSTAINABLE TECHNOLOGY

Product summary		
Order code	**Package**	**Packing**
L9963	TQFP64EP (exposed pad down)	Tray

Application

- 48 V and high-voltage battery packs
- Backup energy storage systems and UPS
- E-bikes, e-scooters
- Portable and semi-portable equipment

Description

The L9963 is a Li-ion battery monitoring and protection chip for high-reliability automotive applications and energy storage systems. Up to 14 stacked battery cells can be monitored to meet the requirements of 48 V and higher voltage systems.

Each cell voltage is measured with high accuracy, as well as the current for the on-chip coulomb counting. The device can monitor up to 7 NTCs. The information is transmitted through SPI communication or isolated interface.

Multiple L9963 can be connected in a daisy chain and communicate with one host processor via the transformer isolated interfaces, featuring high-speed, low EMI, long distance, and reliable data transmission.

Passive balancing with programmable channel selection is offered in both normal and low power mode (silent balance). The balancing can be terminated automatically based on internal timer interrupt. Nine GPIOs are integrated for external monitoring and controlling. The L9963 features a comprehensive set of fault detection and notification functions to meet the safety standard requirements.

1 Block and typical application diagrams

Figure 1. **Block diagram**

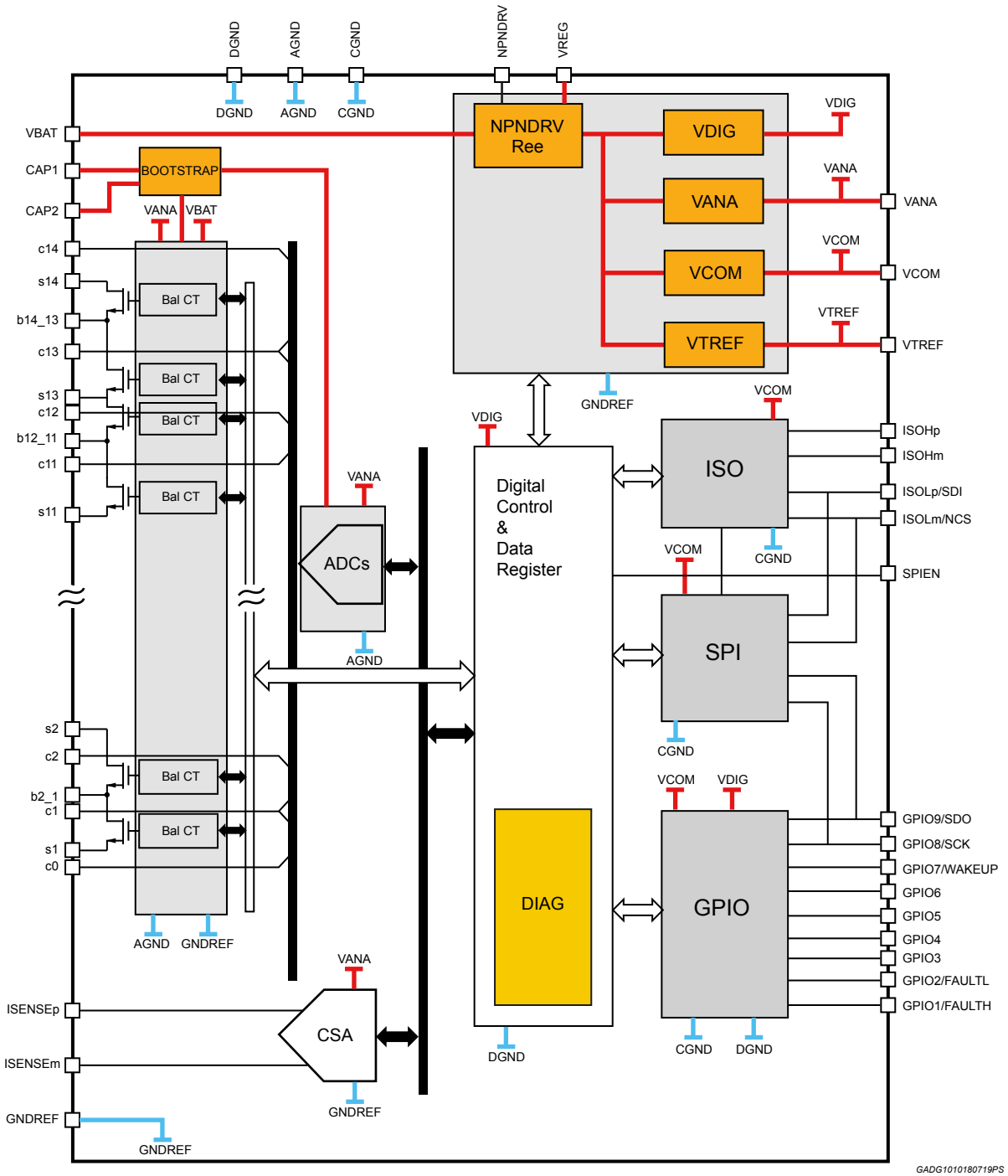
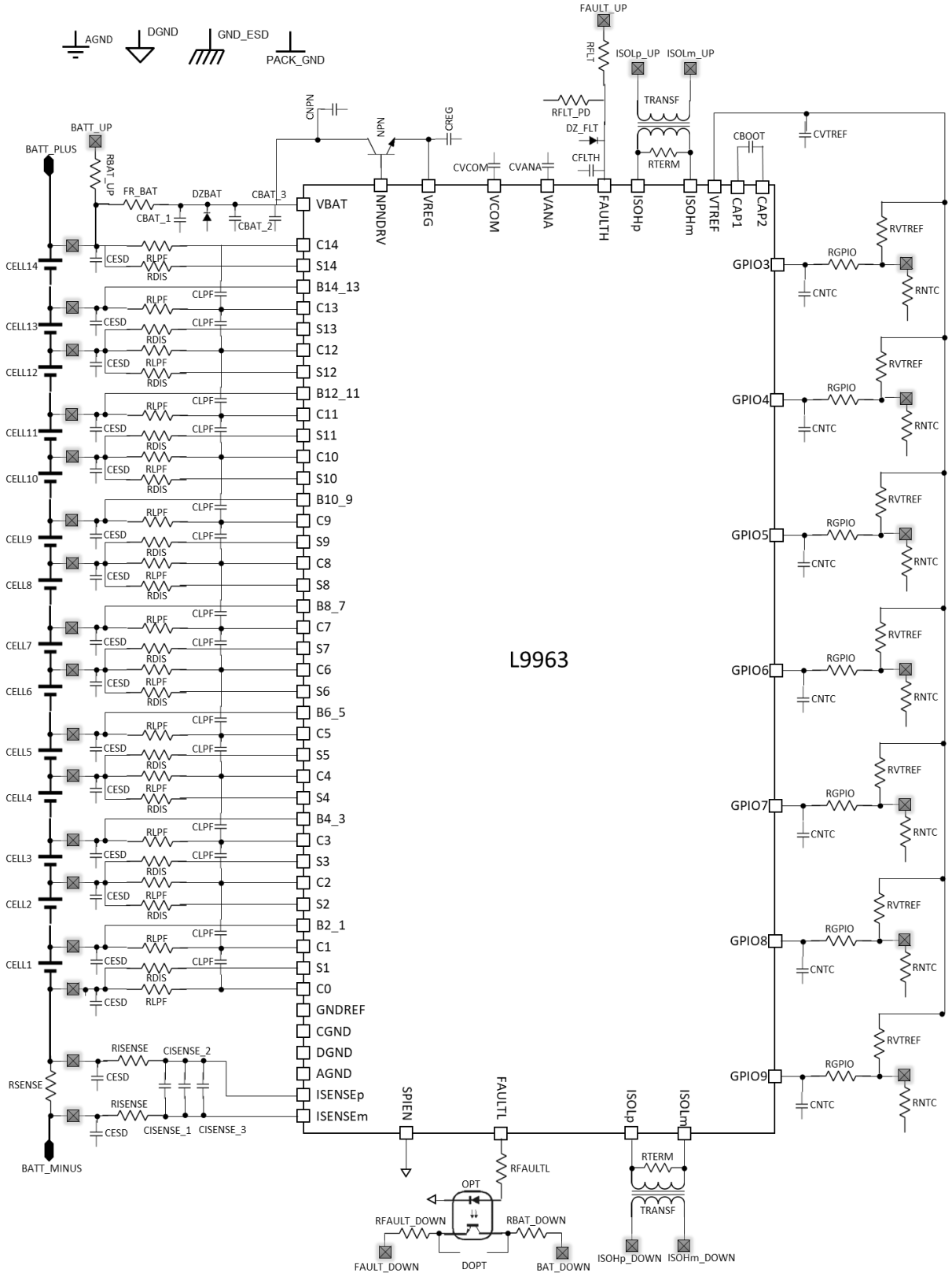


Figure 2. 14 cells with internal balancing, isolated linking with high-side and low-side devices typical application diagram



2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

2.1 TQFP64EP (10x10x1 mm exp. pad down) package information

Figure 3. TQFP64EP (10x10x1 mm exp. pad down) package outline

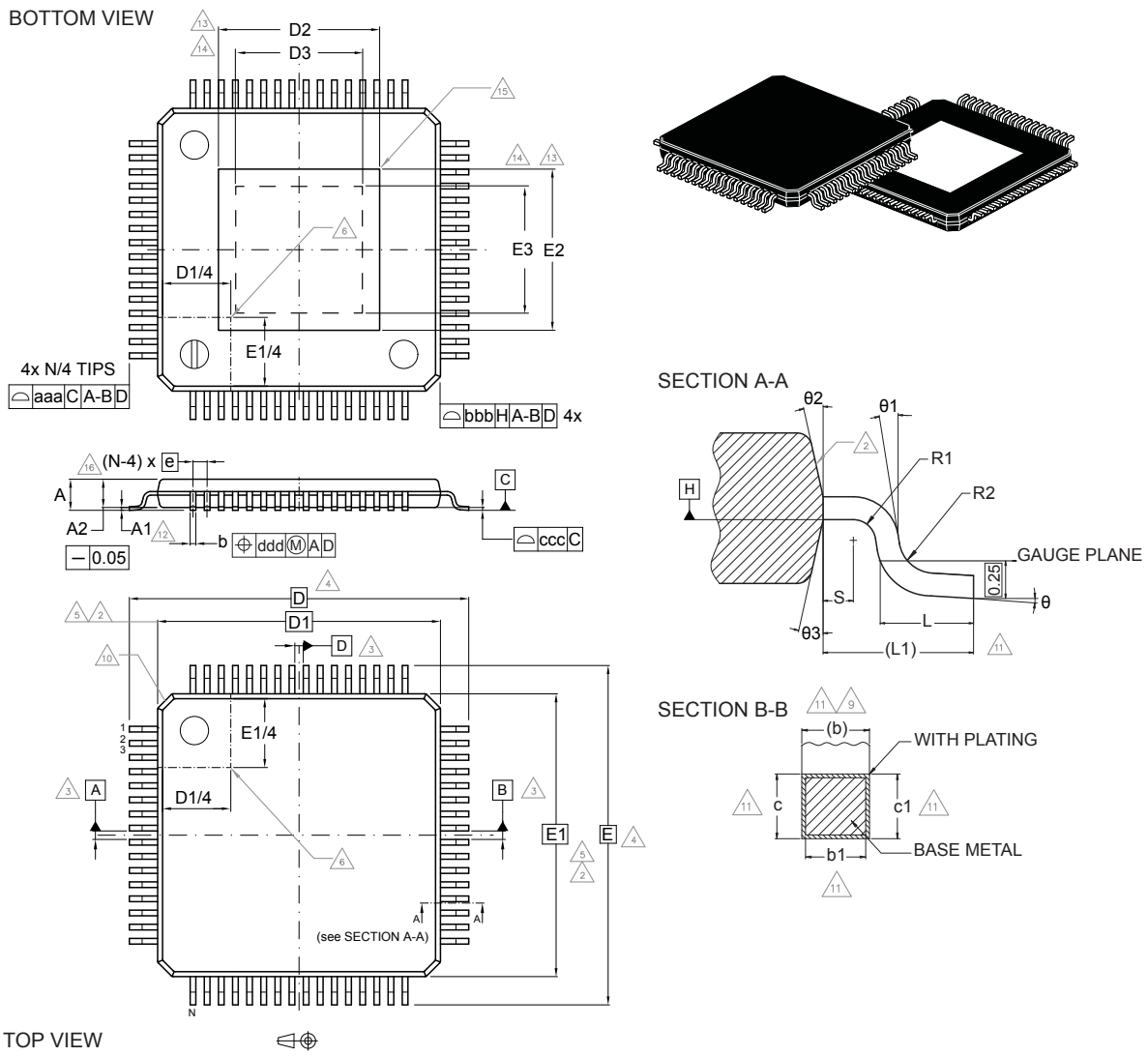


Table 1. TQFP64EP (10x10x1 mm exp. pad down) package mechanical data

Ref	Min.	Typ.	Max.	Note (see # in Notes below)
ϴ	0°	3.5°	7°	-
ϴ1	0°	-	-	-

Ref	Min.	Typ.	Max.	Note (see # in Notes below)
Θ2	11°	12°	13°	-
Θ3	11°	12°	13°	-
A	-	-	1.2	15
A1	0.05	-	0.15	12
A2	0.95	1	1.05	15
b	0.17	0.22	0.27	9, 11
b1	0.17	0.2	0.23	11
c	0.09	-	0.2	11
c1	0.09	-	0.16	11
D	-	12.00 BSC	-	4
D1	-	10.00 BSC	-	5, 2
D2	See VARIATIONS			13
D3	See VARIATIONS			14
e	-	0.50 BSC	-	-
E	-	12.00 BSC	-	4
E1(*)	-	10.00 BSC	-	5, 2
E2	See VARIATIONS			13
E3	See VARIATIONS			14
L	0.45	0.6	0.75	-
L1	-	1.00 REF	-	-
N	-	64	-	16
R1	0.08	-	-	-
R2	0.08	-	0.2	-
S	0.2	-	-	-
Tolerance of form and position				
aaa	-	0.2	-	1, 7
bbb	-	0.2	-	
ccc	-	0.08	-	
ddd	-	0.08	-	
VARIATIONS				
Pad option 4.3 x 4.3 (T3)				
D2	-	-	4.65	13, 14
E2	-	-	4.65	
D3	2.90	-	-	
E3	2.90	-	-	
Pad option 4.5 x 4.5 (T1-T3)				

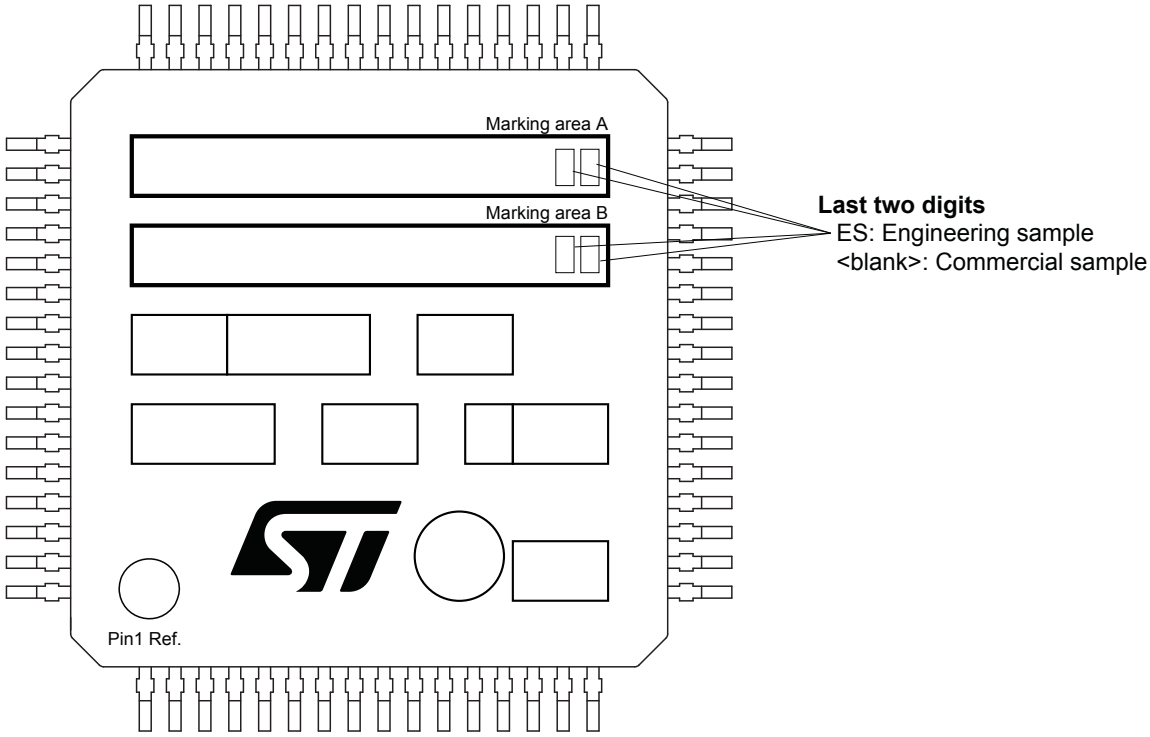
Ref	Min.	Typ.	Max.	Note (see # in Notes below)
D2	-	-	4.98	13, 14
E2	-	-	4.98	
D3	3.29	-	-	
E3	3.29	-	-	
Pad option 6.0 x 6.0 (T3)				
D2	-	-	6.40	13, 14
E2	-	-	6.40	
D3	4.80	-	-	
E3	4.80	-	-	
Pad option 7.5 x 7.5 (T1)				
D2	-	-	7.60	13, 14
E2	-	-	7.60	
D3	7.30	-	-	
E3	7.30	-	-	

Notes

1. Dimensioning and tolerancing schemes conform to ASME Y14.5M-1994.
2. The Top package body size may be smaller than the bottom package size up to 0.15 mm.
3. Datum A-B and D to be determined at datum plane H.
4. To be determined at seating datum plane C.
5. Dimensions D1 and E1 do not include mold flash or protrusions. Allowable mold flash or protrusions is “0.25 mm” per side. D1 and E1 are Maximum plastic body size dimensions including mold mismatch.
6. Details of pin 1 identifier are optional but must be located within the zone indicated.
7. All Dimensions are in millimeters.
8. No intrusion allowed inwards the leads.
9. Dimension “b” does not include dambar protrusion. Allowable dambar protrusion shall not cause the lead width to exceed the maximum “b” dimension by more than 0.08 mm. Dambar cannot be located on the lower radius or the foot. Minimum space between protrusion and an adjacent lead is 0.07 mm for 0.4 mm and 0.5 mm pitch packages.
10. Exact shape of each corner is optional.
11. These dimensions apply to the flat section of the lead between 0.10 mm and 0.25 mm from the lead tip.
12. A1 is defined as the distance from the seating plane to the lowest point on the package body.
13. Dimensions D2 and E2 show the maximum exposed metal area on the package surface where the exposed pad is located (if present). It includes all metal protrusions from exposed pad itself.
14. Dimensions D3 and E3 show the minimum solderable area, defined as the portion of exposed pad which is guaranteed to be free from resin flashes/bleeds, bordered by internal edge of inner groove.
15. The optional exposed pad is generally coincident with the top or bottom side of the package and not allowed to protrude beyond that surface.
16. “N” is the number of terminal positions for the specified body size.

2.2 TQFP64EP (10x10x1 mm exp. pad down) marking information

Figure 4. TQFP64EP (10x10x1 mm exp. pad down) marking information



Parts marked as ‘ES’ are not yet qualified and therefore not approved for use in production. ST is not responsible for any consequences resulting from such use. In no event will ST be liable for the customer using any of these engineering samples in production. ST’s Quality department must be contacted prior to any decision to use these engineering samples to run a qualification activity.

Revision history

Table 2. **Document revision history**

Date	Version	Changes
03-Oct-2019	1	Initial release.

Contents

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