

## 30V Common-Source Dual N-Channel MOSFET

### General Description

EM14DN30Z uses advanced silicon power trench technology that has been especially tailored to minimize the on-state resistance. This device is suitable for uni-directional or bi-directional load switch, facilitated by its common-source configuration.

### Features

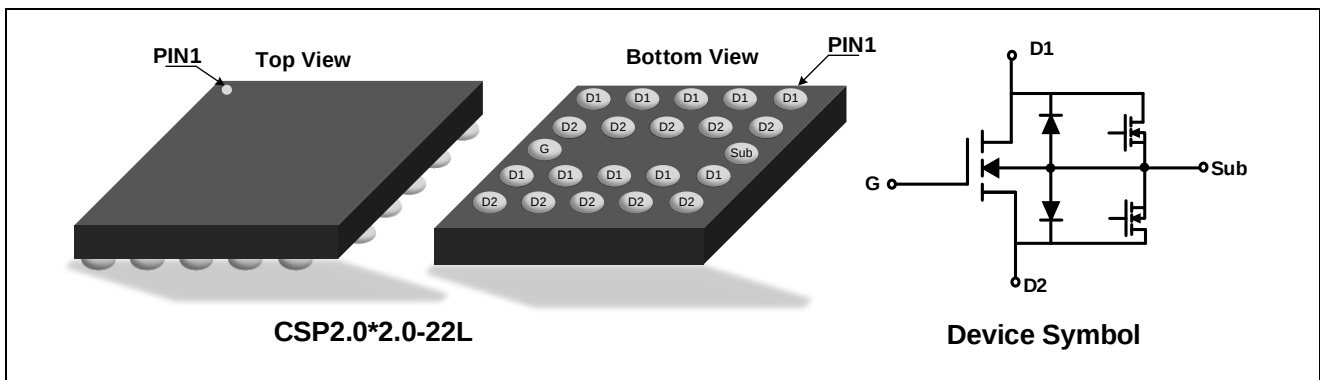
- $V_{DS} = 30V$ ,  $I_D = 14A$
- Super High Dense Cell for Low  $R_{D1D2(on)}$ 
  - $R_{D1D2(on)} = 7.2m\Omega$  @  $V_{GS} = 10V$
  - $R_{D1D2(on)} = 9.5m\Omega$  @  $V_{GS} = 4.5V$
- Bi-directional Blocking Capability
- Package Information:

| Part No.  | Package                                |
|-----------|----------------------------------------|
| EM14DN30Z | CSP22L (2.0mm*2.0mm, ball pitch=0.4mm) |

### Application

- High Side Load Switch
- OVP Protection in Smart Phone USB port

### Schematic & PIN Configuration



# EM14DN30Z

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| Parameter                                        |                           | Symbol         | Value      | Unit             |
|--------------------------------------------------|---------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             |                           | $V_{DS}$       | 30         | V                |
| Gate-Source Voltage                              |                           | $V_{GS}$       | $\pm 20$   | V                |
| Continuous Drain Current                         | $T_A = 25^\circ\text{C}$  | $I_D$          | 14         | A                |
|                                                  | $T_A = 100^\circ\text{C}$ |                | 8.8        |                  |
| Pulsed Drain Current <sup>(1)</sup>              |                           | $I_{DM}$       | 20         | A                |
| Total Power Dissipation                          | $T_A = 25^\circ\text{C}$  | $P_D$          | 4          | W                |
| Operating Junction and Storage Temperature Range |                           | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |

## Thermal Characteristics

| Parameter                                                  | Symbol          | Value | Unit               |
|------------------------------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance from Junction-to-Ambient <sup>(3)</sup> | $R_{\theta JA}$ | 31.2  | $^\circ\text{C/W}$ |

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## Electrical Characteristics (T<sub>J</sub> = 25°C, unless otherwise noted)

| Parameter                                | Symbol                | Test Conditions                                                                          | Min | Typ  | Max  | Unit |
|------------------------------------------|-----------------------|------------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics                   |                       |                                                                                          |     |      |      |      |
| Drain-Source Breakdown Voltage           | V <sub>(BR)D1SS</sub> | V <sub>GS</sub> = 0V, I <sub>D1</sub> = 250μA                                            | 30  | -    | -    | V    |
|                                          | V <sub>(BR)D2SS</sub> | V <sub>GS</sub> = 0V, I <sub>D2</sub> = 250μA                                            | 30  | -    | -    |      |
| Gate-body Leakage Current                | I <sub>GSS</sub>      | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±10V                                             | -   | -    | ±100 | nA   |
| Zero Gate Voltage Drain Current          | I <sub>D1SS</sub>     | V <sub>D1S</sub> = 24V, V <sub>GS</sub> = 0V                                             | -   | -    | 1    | μA   |
|                                          | I <sub>D2SS</sub>     | V <sub>D2S</sub> = 24V, V <sub>GS</sub> = 0V                                             | -   | -    | 1    |      |
| Gate-Threshold Voltage                   | V <sub>GS(th)</sub>   | V <sub>D1S</sub> = V <sub>GS</sub> , I <sub>D1</sub> = 250μA                             | 1   | 1.5  | 2    | V    |
|                                          |                       | V <sub>D2S</sub> = V <sub>GS</sub> , I <sub>D2</sub> = 250μA                             | 1   | 1.5  | 2    |      |
| Drain-Drain on-Resistance <sup>(2)</sup> | R <sub>D1D2(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A                                               | -   | 7.2  | 10   | mΩ   |
|                                          |                       | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4A                                              | -   | 9.5  | 13.5 |      |
| Dynamic Characteristics <sup>(3)</sup>   |                       |                                                                                          |     |      |      |      |
| Input Capacitance                        | C <sub>iss</sub>      | V <sub>DS</sub> = 15V,<br>V <sub>GS</sub> =0V,<br>f =1MHz                                | -   | 2110 | -    | pF   |
| Output Capacitance                       | C <sub>oss</sub>      |                                                                                          | -   | 980  | -    |      |
| Reverse Transfer Capacitance             | C <sub>rss</sub>      |                                                                                          | -   | 562  | -    |      |
| Switching Characteristics <sup>(3)</sup> |                       |                                                                                          |     |      |      |      |
| Total Gate Charge                        | Q <sub>g</sub>        | V <sub>DS</sub> = 15V,<br>V <sub>GS</sub> = 10V,<br>I <sub>D</sub> = 4A                  | -   | 60   | -    | nC   |
| Gate-Source Charge                       | Q <sub>gs</sub>       |                                                                                          | -   | 15.5 | -    |      |
| Gate-Drain Charge                        | Q <sub>gd</sub>       |                                                                                          | -   | 9    | -    |      |
| Turn-on Delay Time                       | t <sub>d(on)</sub>    | V <sub>GS</sub> =10V, V <sub>DD</sub> = 15V,<br>R <sub>G</sub> = 3Ω, I <sub>D</sub> = 4A | -   | 8.8  | -    | ns   |
| Rise Time                                | t <sub>r</sub>        |                                                                                          | -   | 37   | -    |      |
| Turn-off Delay Time                      | t <sub>d(off)</sub>   |                                                                                          | -   | 94   | -    |      |
| Fall Time                                | t <sub>f</sub>        |                                                                                          | -   | 67   | -    |      |
| Drain-Source Diode Characteristics       |                       |                                                                                          |     |      |      |      |
| Diode Forward Voltage                    | V <sub>SD1</sub>      | I <sub>Sub</sub> = 20mA, V <sub>GS</sub> = 0V                                            | -   | -    | 1.2  | V    |
|                                          | V <sub>SD2</sub>      |                                                                                          | -   | -    | 1.2  |      |

**Note1.** Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.

**Note2.** The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.

**Note3.** This value is guaranteed by design hence it is not included in the production test.

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## Typical Characteristics

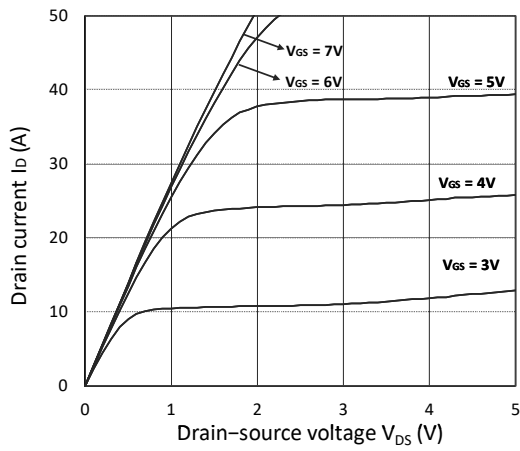


Figure 1. Output Characteristics

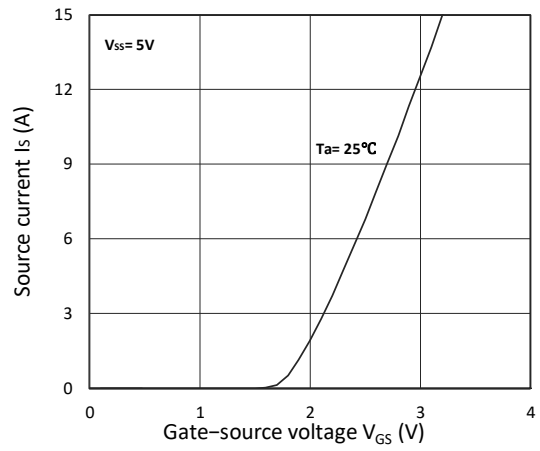


Figure 2. Transfer Characteristics

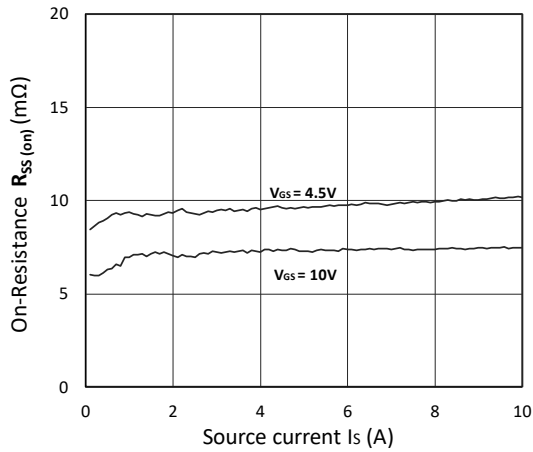


Figure 3.  $R_{SS(ON)}$  vs.  $I_S$

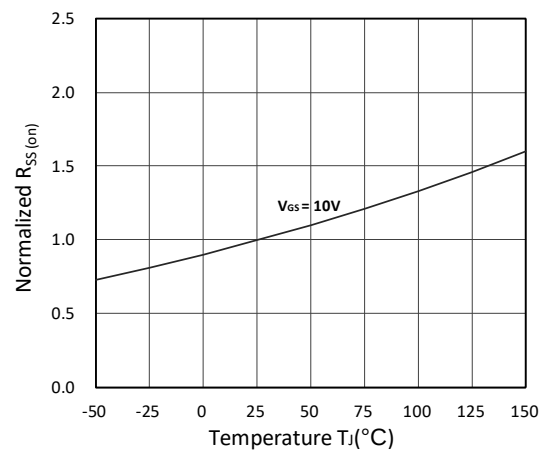


Figure 4. Normalized  $R_{SS(on)}$  vs. Temperature

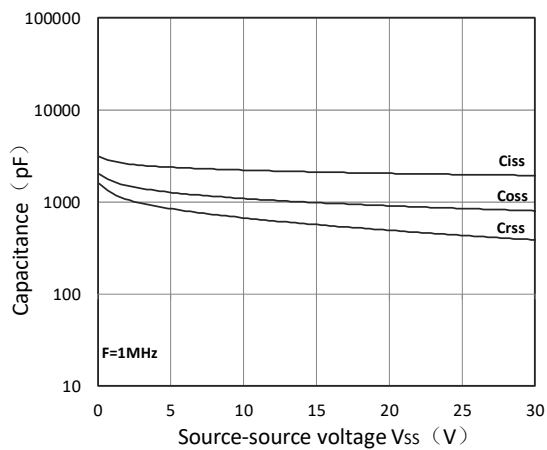


Figure 5. Capacitance Characteristics

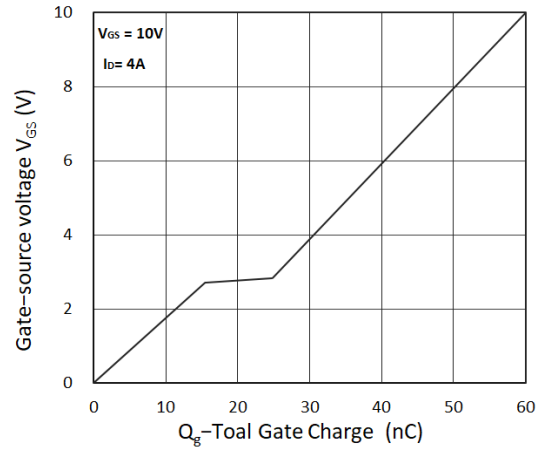
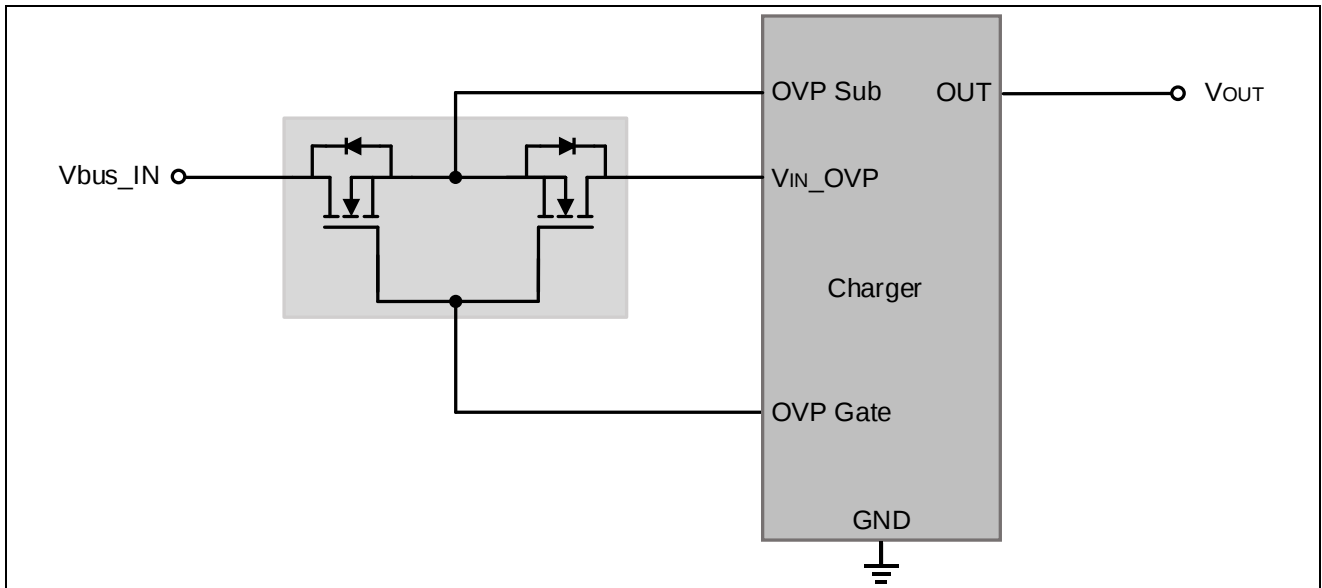


Figure 6. Gate Charge Characteristics

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## Typical Application Circuit

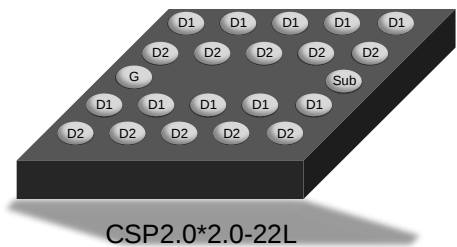
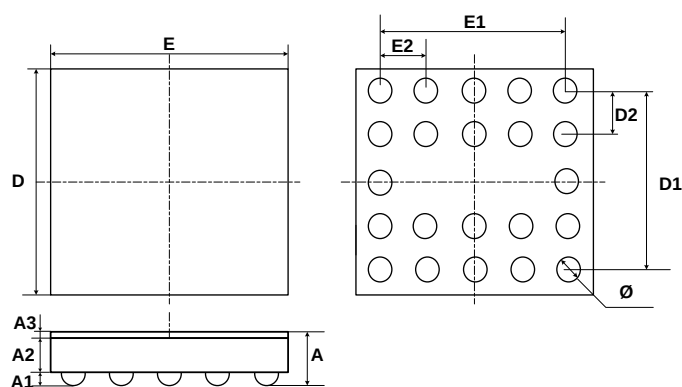


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## Package Dimension

CSP2.0\*2.0-22L

PACKAGE OUTLINE



CSP2.0\*2.0-22L

| COMMON DIMENSIONS |            |       |       |
|-------------------|------------|-------|-------|
| SYMBOL            | MILLIMETER |       |       |
|                   | MIN        | NOM   | MAX   |
| A                 | 0.270      | 0.300 | 0.330 |
| A1                | 0.045      | 0.060 | 0.074 |
| A2                | 0.202      | 0.215 | 0.228 |
| A3                | 0.020      | 0.025 | 0.030 |
| D                 | 1.975      | 2.000 | 2.025 |
| D1                | -          | 1.600 | -     |
| D2                | -          | 0.400 | -     |
| E                 | 1.975      | 2.000 | 2.025 |
| E1                | -          | 1.600 | -     |
| E2                | -          | 0.400 | -     |
| Ø                 | 0.248      | 0.268 | 0.288 |

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Revision History and Checking Table

| Version | Date       | Revision Item        | Modifier    | Function & Spec<br>Checking | Package & Tape<br>Checking |
|---------|------------|----------------------|-------------|-----------------------------|----------------------------|
| 0.0     | 2023-11-16 | Preliminary Version  | Yin Peng    | Qi Shu Kun                  | Liu Jia Ying               |
| 1.0     | 2025-03-18 | Update Specification | Pan Shun Ye | Qi Shu Kun                  | Liu Jia Ying               |
| 1.1     | 2025-03-28 | Update Typeset       | Yin Peng    | Qi Shu Kun                  | Liu Jia Ying               |
|         |            |                      |             |                             |                            |