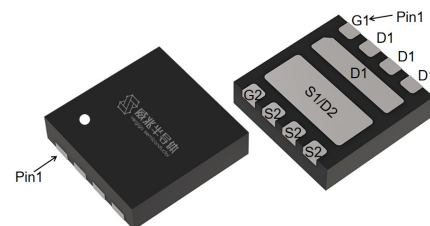


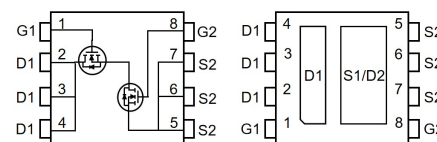
## Features

- Dual Asymmetric N-Channel
- VitoMOS<sup>®</sup> II Technology
- 100% Avalanche Tested, 100% R<sub>g</sub> Tested

|                               |     |     |    |
|-------------------------------|-----|-----|----|
| $V_{DS}$                      | 30  | 30  | V  |
| $R_{DS(on),TYP@ V_{GS}=10V}$  | 6.6 | 4.5 | mΩ |
| $R_{DS(on),TYP@ V_{GS}=4.5V}$ | 10  | 7   | mΩ |
| $I_D$ (Wire bond Limited)     | 24  | 36  | A  |

**DFN3x3**


| Part ID  | Package Type | Marking | Packing      |
|----------|--------------|---------|--------------|
| VS3625DB | DFN3x3       | 3625DB  | 5000pcs/Reel |



## Maximum ratings, at T<sub>A</sub> =25°C, unless otherwise specified

| Symbol   | Parameter                                            |                       | Rating     |            | Unit |
|----------|------------------------------------------------------|-----------------------|------------|------------|------|
|          |                                                      |                       | Q1         | Q2         |      |
| V(BR)DSS | Drain-Source breakdown voltage                       |                       | 30         | 30         | V    |
| VGS      | Gate-Source voltage                                  |                       | ±20        | ±20        | V    |
| IS       | Diode continuous forward current                     | T <sub>C</sub> =25°C  | 8.3        | 17         | A    |
| ID       | Continuous drain current @VGS=10V(Wire bond Limited) | T <sub>C</sub> =25°C  | 24         | 36         | A    |
|          | Continuous drain current @VGS=10V(Silicon Limited)   | T <sub>C</sub> =100°C | 17         | 29         | A    |
| IDM      | Pulse drain current tested ①                         | T <sub>C</sub> =25°C  | 108        | 184        | A    |
| IDSM     | Continuous drain current @VGS=10V                    | T <sub>A</sub> =25°C  | 12         | 15         | A    |
|          |                                                      | T <sub>A</sub> =70°C  | 9          | 12         | A    |
| EAS      | Avalanche energy, single pulsed ②                    |                       | 42         | 56         | mJ   |
| PD       | Maximum power dissipation ③                          | T <sub>C</sub> =25°C  | 10         | 20         | W    |
| PDSM     | Maximum power dissipation ④                          | T <sub>A</sub> =25°C  | 1.7        | 2.1        | W    |
| TSTG,TJ  | Storage and Junction Temperature Range               |                       | -55 to 150 | -55 to 150 | °C   |

## Thermal Characteristics

| Symbol | Parameter                                 | Typical |     | Max |     | Unit |
|--------|-------------------------------------------|---------|-----|-----|-----|------|
|        |                                           | Q1      | Q2  | Q1  | Q2  |      |
| RθJC   | Thermal Resistance, Junction-to-Case ⑤    | 11      | 5.3 | 13  | 6.4 | °C/W |
| RθJA   | Thermal Resistance, Junction-to-Ambient ⑥ | 60      | 50  | 72  | 60  | °C/W |

**Q1-Channel Electrical Characteristics**

| Symbol                                                                               | Parameter                                               | Condition                                                                                    | Min | Typ | Max  | Unit |
|--------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------|-----|-----|------|------|
| Static Electrical Characteristics @ T <sub>J</sub> = 25°C (unless otherwise stated)  |                                                         |                                                                                              |     |     |      |      |
| V(BR)DSS                                                                             | Drain-Source Breakdown Voltage                          | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                   | 30  | --  | --   | V    |
| I <sub>DSS</sub>                                                                     | Zero Gate Voltage Drain Current(T <sub>J</sub> =25°C)   | V <sub>DS</sub> =30V,V <sub>GS</sub> =0V                                                     | --  | --  | 1    | μA   |
|                                                                                      | Zero Gate Voltage Drain Current(T <sub>J</sub> =125°C)⑦ | V <sub>DS</sub> =30V,V <sub>GS</sub> =0V                                                     | --  | --  | 100  | μA   |
| I <sub>GSS</sub>                                                                     | Gate-Body Leakage Current                               | V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V                                                    | --  | --  | ±100 | nA   |
| V <sub>GS(th)</sub>                                                                  | Gate Threshold Voltage                                  | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA                                      | 1.0 | 1.4 | 2.0  | V    |
| R <sub>DS(on)</sub>                                                                  | Drain-Source On-State Resistance ⑧                      | V <sub>GS</sub> =10V, I <sub>D</sub> =13A                                                    | --  | 6.6 | 8.6  | mΩ   |
|                                                                                      |                                                         | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                                   | --  | 10  | 13   | mΩ   |
| Dynamic Electrical Characteristics @ T <sub>J</sub> = 25°C (unless otherwise stated) |                                                         |                                                                                              |     |     |      |      |
| C <sub>iss</sub>                                                                     | Input Capacitance ⑦                                     | V <sub>DS</sub> =15V,V <sub>GS</sub> =0V,<br>f=1MHz                                          | --  | 605 | --   | pF   |
| C <sub>oss</sub>                                                                     | Output Capacitance ⑦                                    |                                                                                              | --  | 495 | --   | pF   |
| C <sub>rss</sub>                                                                     | Reverse Transfer Capacitance ⑦                          |                                                                                              | --  | 60  | --   | pF   |
| R <sub>g</sub>                                                                       | Gate Resistance                                         | f=1MHz                                                                                       | --  | 1.8 | --   | Ω    |
| Q <sub>g</sub> (10V)                                                                 | Total Gate Charge ⑦                                     | V <sub>DS</sub> =15V,I <sub>D</sub> =13A,<br>V <sub>GS</sub> =10V                            | --  | 12  | --   | nC   |
| Q <sub>g</sub> (4.5V)                                                                | Total Gate Charge ⑦                                     |                                                                                              | --  | 6.2 | --   | nC   |
| Q <sub>gs</sub>                                                                      | Gate Source Charge ⑦                                    |                                                                                              | --  | 1.7 | --   | nC   |
| Q <sub>gd</sub>                                                                      | Gate Drain Charge ⑦                                     |                                                                                              | --  | 2.5 | --   | nC   |
| Switching Characteristics ⑦                                                          |                                                         |                                                                                              |     |     |      |      |
| T <sub>d(on)</sub>                                                                   | Turn on Delay Time                                      | V <sub>DD</sub> =15V,<br>I <sub>D</sub> =13A,<br>R <sub>G</sub> =3Ω,<br>V <sub>GS</sub> =10V | --  | 5   | --   | ns   |
| T <sub>r</sub>                                                                       | Turn on Rise Time                                       |                                                                                              | --  | 39  | --   | ns   |
| T <sub>d(off)</sub>                                                                  | Turn Off Delay Time                                     |                                                                                              | -   | 14  | --   | ns   |
| T <sub>f</sub>                                                                       | Turn Off Fall Time                                      |                                                                                              | --  | 6.8 | --   | ns   |
| Source Drain Diode Characteristics                                                   |                                                         |                                                                                              |     |     |      |      |
| V <sub>SD</sub>                                                                      | Forward on voltage                                      | I <sub>SD</sub> =13A,V <sub>GS</sub> =0V                                                     | --  | 0.8 | 1.2  | V    |
| T <sub>rr</sub>                                                                      | Reverse Recovery Time ⑦                                 | V <sub>DD</sub> =15V,<br>I <sub>sd</sub> =13A, V <sub>GS</sub> =0V<br>di/dt=100A/μs          | --  | 16  | --   | ns   |
| Q <sub>rr</sub>                                                                      | Reverse Recovery Charge ⑦                               |                                                                                              | --  | 3.7 | --   | nC   |

NOTE:

① Single pulse; pulse width ≤ 100μs.

② Q1: EAS of 42mJ is based on starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 13A, V<sub>GS</sub> = 10V; 100% FT tested at L = 0.5mH, I<sub>AS</sub> = 7A.

Q2: EAS of 56mJ is based on starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 15A, V<sub>GS</sub> = 10V; 100% FT tested at L = 0.5mH, I<sub>AS</sub> = 8A.

③ The power dissipation Pd is based on T<sub>J</sub>(max), using junction-to-case thermal resistance RθJC.

④ The power dissipation Pds is based on T<sub>J</sub>(max), using junction-to-ambient thermal resistance RθJA.

⑤ These tests are performed respectively with the device mounted on a 1 in2 pad and a minimum pad of 2oz. Copper FR-4 board in a still air environment with TA=25°C, using Transient Dual Interface method to acquire RθJC.

⑥ These tests are performed with the device mounted on 1 in2 FR-4 board with 2oz. Copper, in a still air environment with TA=25°C.

⑦ Guaranteed by design, not subject to production testing.

⑧ Pulse width ≤ 380μs; duty cycles ≤ 2%.

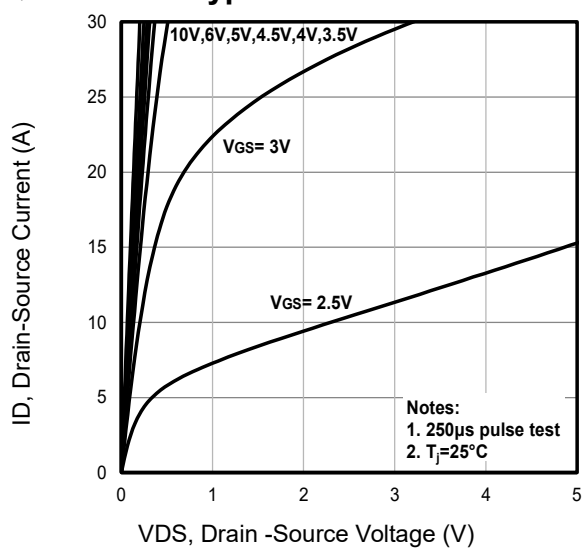
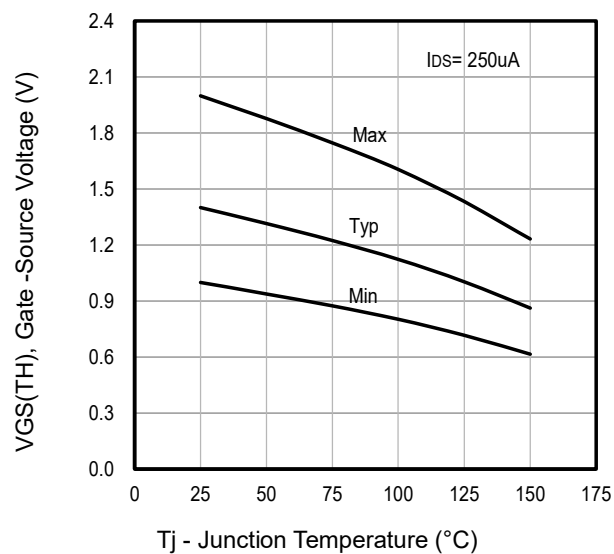
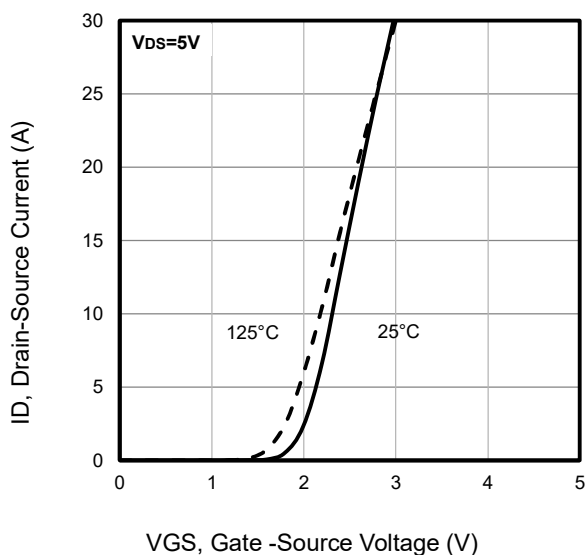
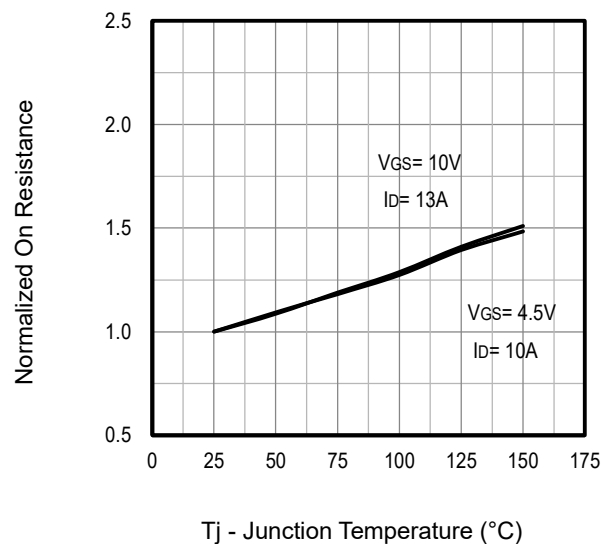
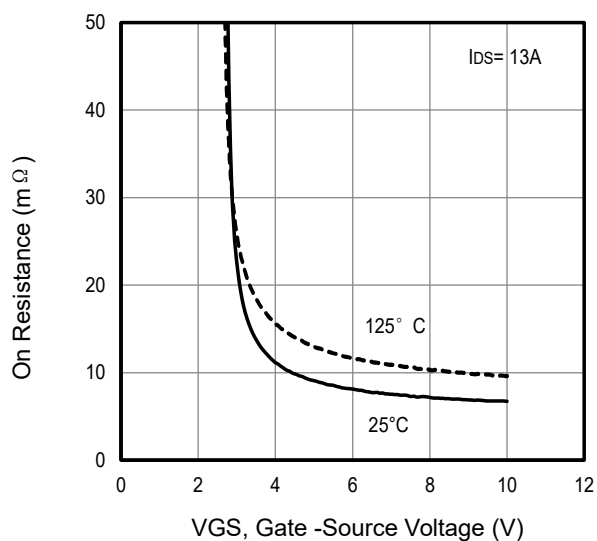
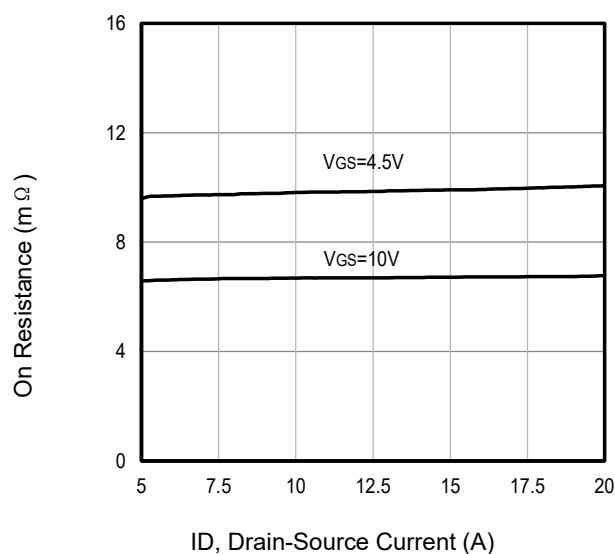
**Q2-Channel Electrical Characteristics**

| Symbol                                                                               | Parameter                                                 | Condition                                                                                    | Min | Typ | Max  | Unit |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------|-----|-----|------|------|
| Static Electrical Characteristics @ T <sub>J</sub> = 25°C (unless otherwise stated)  |                                                           |                                                                                              |     |     |      |      |
| V(BR)DSS                                                                             | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                   | 30  | --  | --   | V    |
| IDSS                                                                                 | Zero Gate Voltage Drain Current t(T <sub>J</sub> =25°C)   | V <sub>DS</sub> =30V,V <sub>GS</sub> =0V                                                     | --  | --  | 1    | μA   |
|                                                                                      | Zero Gate Voltage Drain Current t(T <sub>J</sub> =125°C)⑦ | V <sub>DS</sub> =30V,V <sub>GS</sub> =0V                                                     | --  | --  | 100  | μA   |
| IGSS                                                                                 | Gate-Body Leakage Current                                 | V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V                                                    | --  | --  | ±100 | nA   |
| V <sub>GS(th)</sub>                                                                  | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA                                      | 1.0 | 1.5 | 2.1  | V    |
| R <sub>DS(on)</sub>                                                                  | Drain-Source On-State Resistance ⑧                        | V <sub>GS</sub> =10V, I <sub>D</sub> =15A                                                    | --  | 4.5 | 5.9  | mΩ   |
|                                                                                      |                                                           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                                   | --  | 7   | 9.1  | mΩ   |
| Dynamic Electrical Characteristics @ T <sub>J</sub> = 25°C (unless otherwise stated) |                                                           |                                                                                              |     |     |      |      |
| C <sub>iss</sub>                                                                     | Input Capacitance ⑦                                       | V <sub>DS</sub> =15V,V <sub>GS</sub> =0V,<br>f=1MHz                                          | --  | 825 | --   | pF   |
| C <sub>oss</sub>                                                                     | Output Capacitance ⑦                                      |                                                                                              | --  | 485 | --   | pF   |
| C <sub>rss</sub>                                                                     | Reverse Transfer Capacitance ⑦                            |                                                                                              | --  | 70  | --   | pF   |
| R <sub>g</sub>                                                                       | Gate Resistance                                           | f=1MHz                                                                                       | --  | 2.5 | --   | Ω    |
| Q <sub>g</sub> (10V)                                                                 | Total Gate Charge ⑦                                       | V <sub>DS</sub> =15V,I <sub>D</sub> =15A,<br>V <sub>GS</sub> =10V                            | --  | 16  | --   | nC   |
| Q <sub>g</sub> (4.5V)                                                                | Total Gate Charge ⑦                                       |                                                                                              | --  | 8   | --   | nC   |
| Q <sub>gs</sub>                                                                      | Gate Source Charge ⑦                                      |                                                                                              | --  | 2.3 | --   | nC   |
| Q <sub>gd</sub>                                                                      | Gate Drain Charge ⑦                                       |                                                                                              | --  | 3.2 | --   | nC   |
| Switching Characteristics ⑦                                                          |                                                           |                                                                                              |     |     |      |      |
| T <sub>d(on)</sub>                                                                   | Turn on Delay Time                                        | V <sub>DD</sub> =15V,<br>I <sub>D</sub> =15A,<br>R <sub>G</sub> =3Ω,<br>V <sub>GS</sub> =10V | --  | 5.2 | --   | ns   |
| T <sub>r</sub>                                                                       | Turn on Rise Time                                         |                                                                                              | --  | 44  | --   | ns   |
| T <sub>d(off)</sub>                                                                  | Turn Off Delay Time                                       |                                                                                              | -   | 17  | --   | ns   |
| T <sub>f</sub>                                                                       | Turn Off Fall Time                                        |                                                                                              | --  | 11  | --   | ns   |
| Source Drain Diode Characteristics                                                   |                                                           |                                                                                              |     |     |      |      |
| V <sub>SD</sub>                                                                      | Forward on voltage                                        | I <sub>SD</sub> =15A,V <sub>GS</sub> =0V                                                     | --  | 0.8 | 1.2  | V    |
| T <sub>rr</sub>                                                                      | Reverse Recovery Time ⑦                                   | V <sub>DD</sub> =15V,<br>I <sub>sd</sub> =15A, V <sub>GS</sub> =0V<br>di/dt=100A/μs          | --  | 16  | --   | ns   |
| Q <sub>rr</sub>                                                                      | Reverse Recovery Charge ⑦                                 |                                                                                              | --  | 5.2 | --   | nC   |

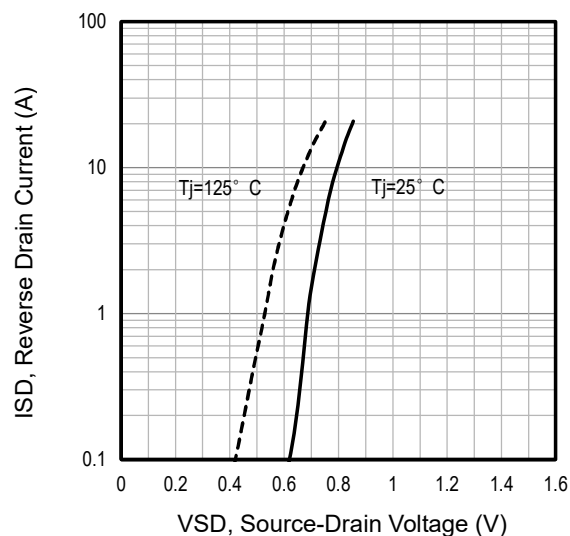
NOTE:

- ① Single pulse; pulse width ≤ 100μs.
- ② Q1: EAS of 42mJ is based on starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 13A, V<sub>GS</sub>=10V; 100% FT tested at L = 0.5mH, I<sub>AS</sub> = 7A.  
Q2: EAS of 56mJ is based on starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 15A, V<sub>GS</sub>=10V; 100% FT tested at L = 0.5mH, I<sub>AS</sub> = 8A.
- ③ The power dissipation Pd is based on T<sub>J</sub>(max), using junction-to-case thermal resistance RθJC.
- ④ The power dissipation PdsM is based on T<sub>J</sub>(max), using junction-to-ambient thermal resistance RθJA.
- ⑤ These tests are performed respectively with the device mounted on a 1 in2 pad and a minimum pad of 2oz. Copper FR-4 board in a still air environment with TA=25°C, using Transient Dual Interface method to acquire RθJC.
- ⑥ These tests are performed with the device mounted on 1 in2 FR-4 board with 2oz. Copper, in a still air environment with TA=25°C.
- ⑦ Guaranteed by design, not subject to production testing.
- ⑧ Pulse width ≤ 380μs; duty cycles ≤ 2%.

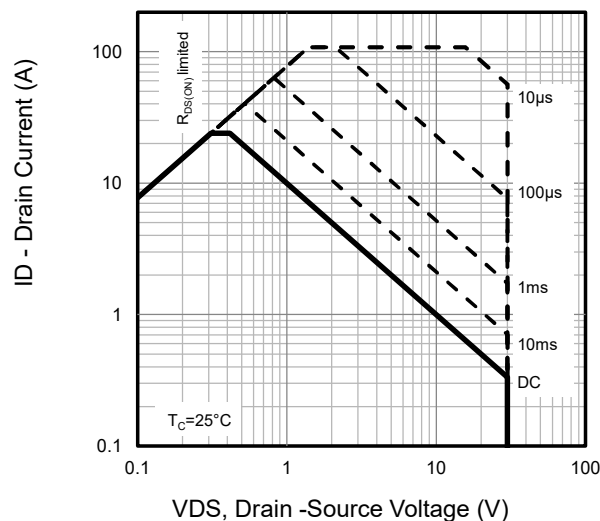
## Q1-Channel Typical Characteristics


**Fig1.** Typical Output Characteristics

**Fig2.** Typical  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$ 

**Fig3.** Typical Transfer Characteristics

**Fig4.** Typical Normalized On-Resistance Vs.  $T_j$ 

**Fig5.** Typical On Resistance Vs Gate-Source Voltage

**Fig6.** Typical On Resistance Vs Drain Current

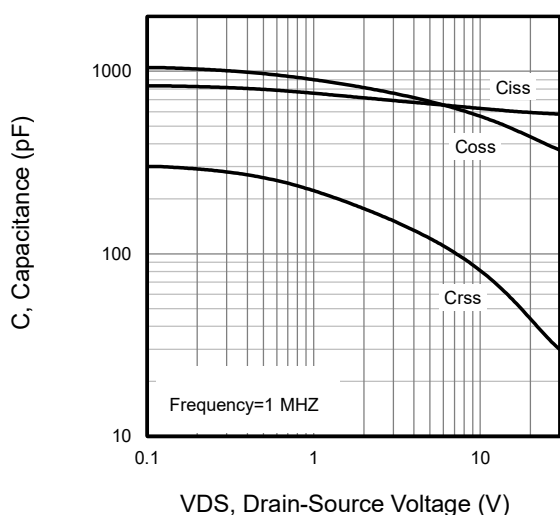
## Q1-Channel Typical Characteristics



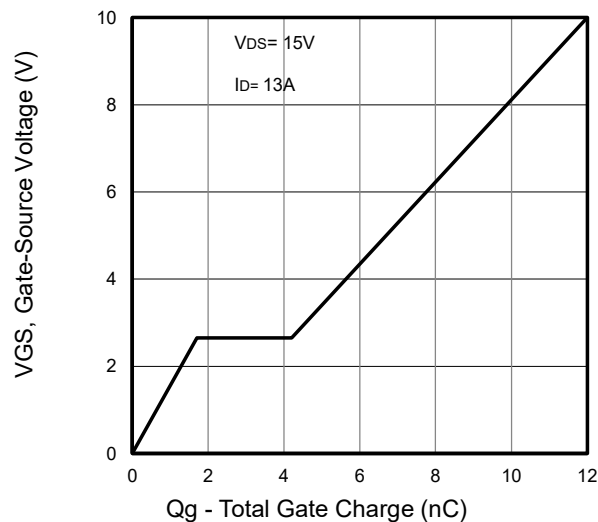
**Fig7.** Typical Source-Drain Diode Forward Voltage



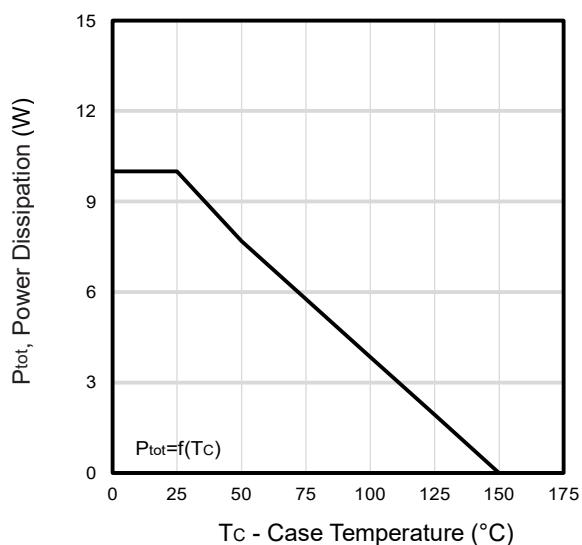
**Fig8.** Maximum Safe Operating Area



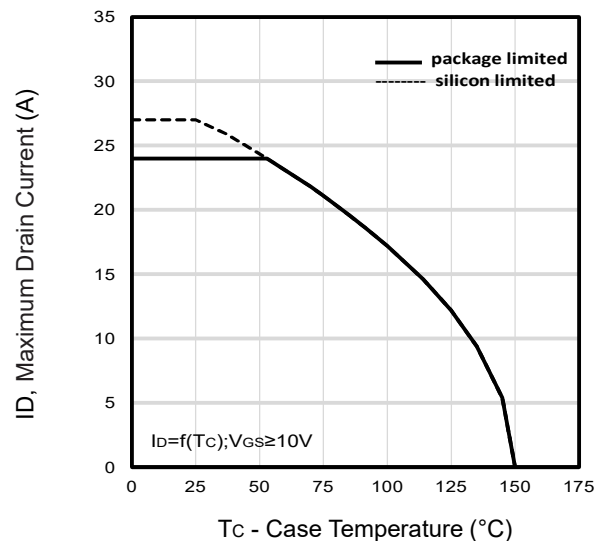
**Fig9.** Typical Capacitance Vs. Drain-Source Voltage



**Fig10.** Typical Gate Charge Vs. Gate-Source Voltage

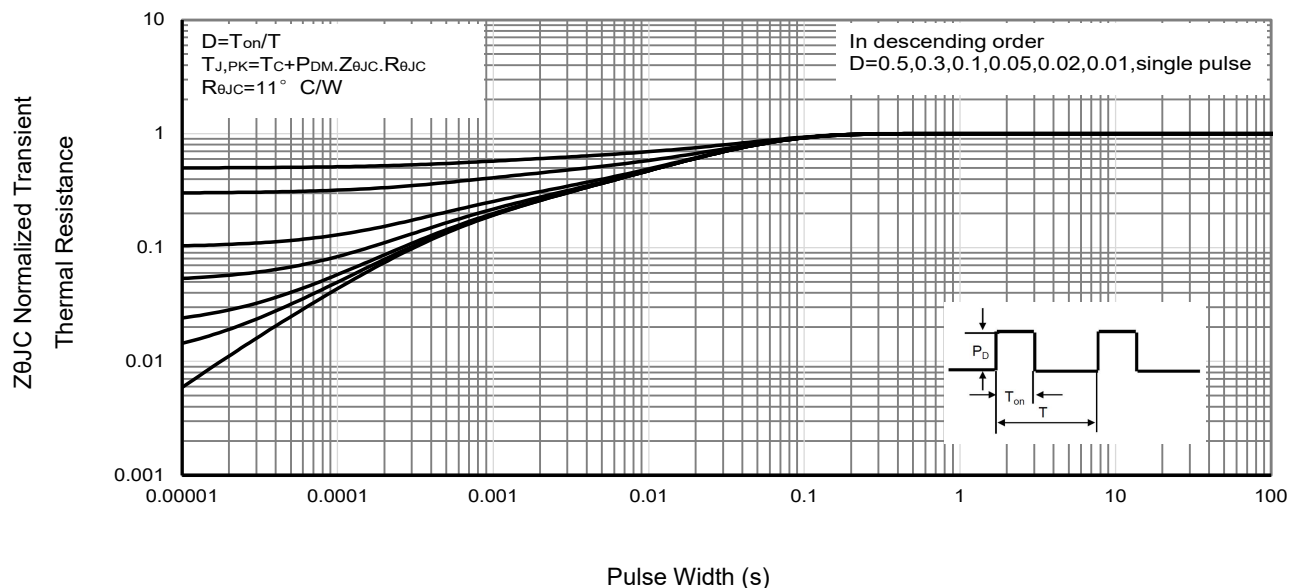


**Fig11.** Power Dissipation Vs. Case Temperature

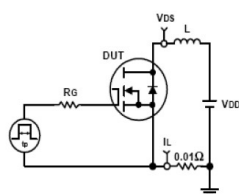


**Fig12.** Maximum Drain Current Vs. Case Temperature

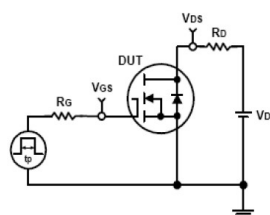
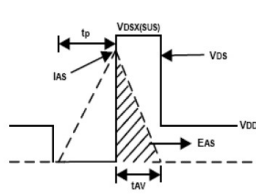
## Q1-Channel Typical Characteristics



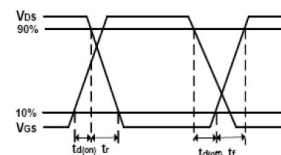
**Fig13 . Normalized Maximum Transient Thermal Impedance**



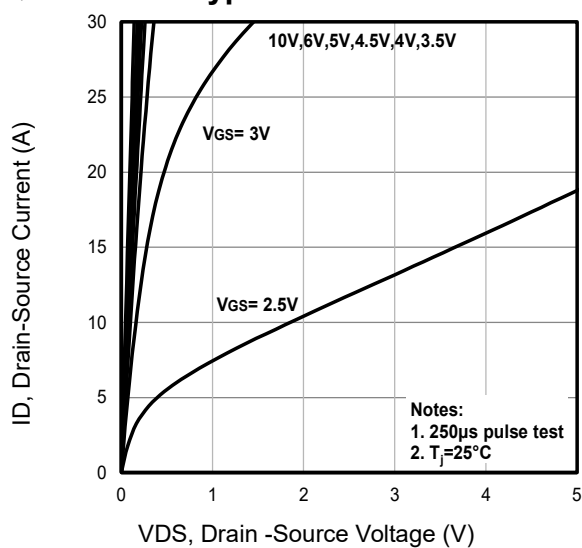
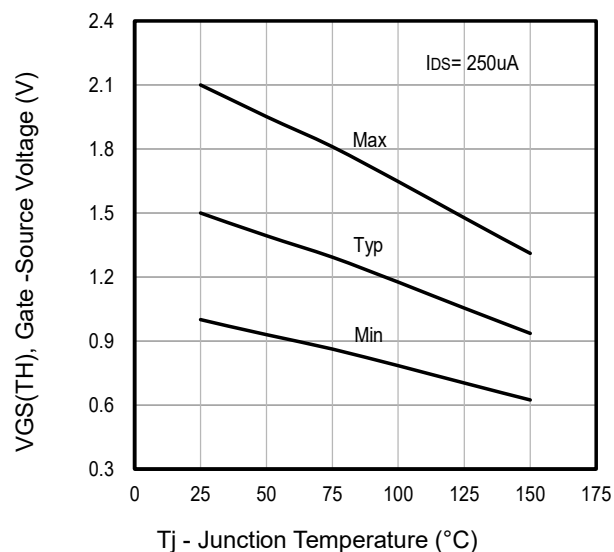
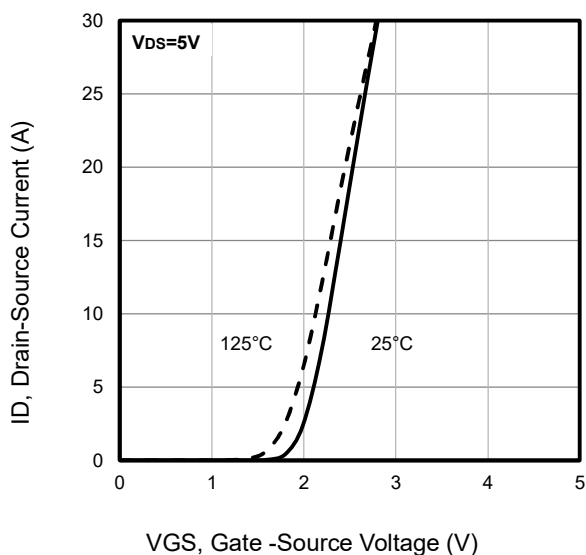
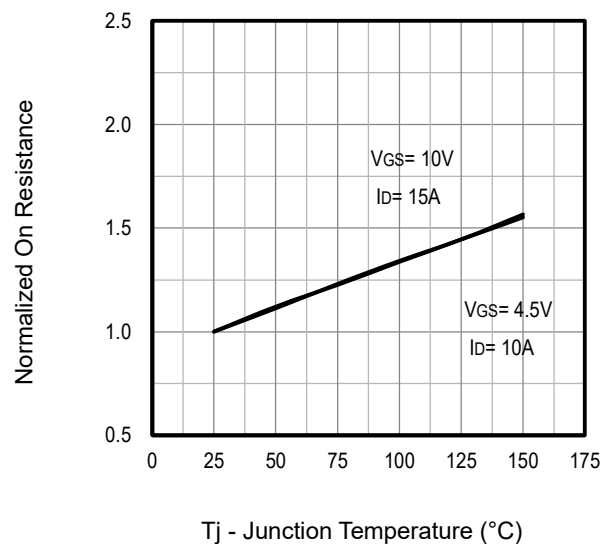
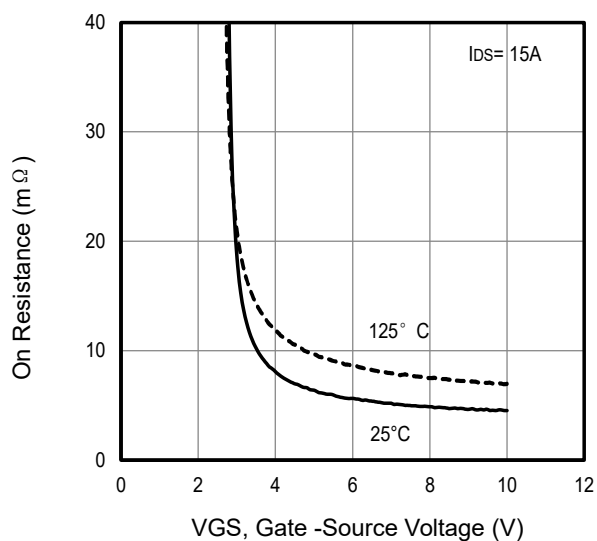
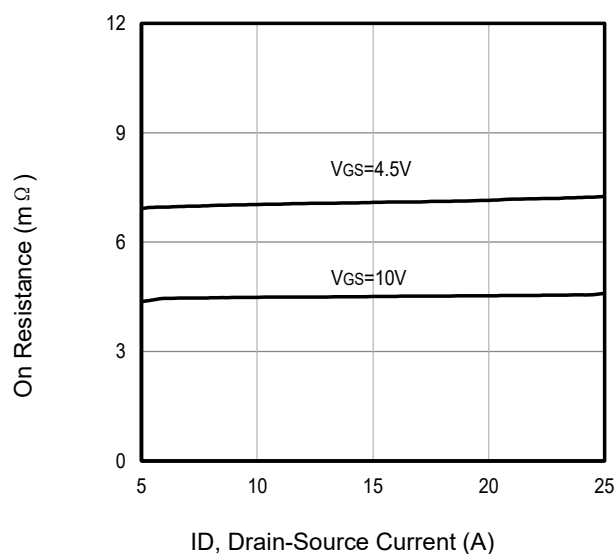
**Fig14. Unclamped Inductive Test Circuit and waveforms**



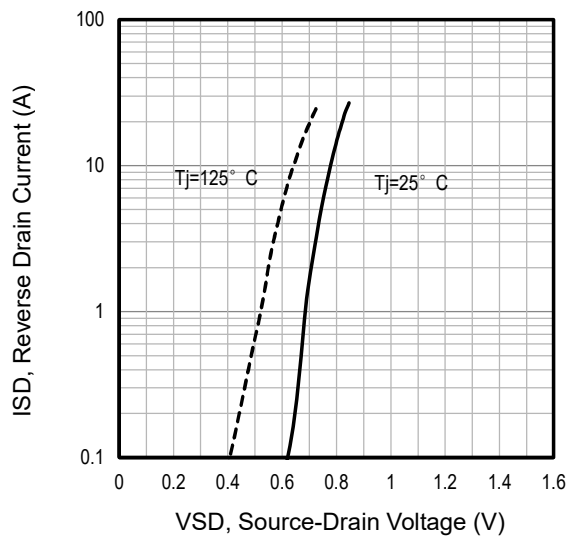
**Fig15. Switching Time Test Circuit and waveforms**



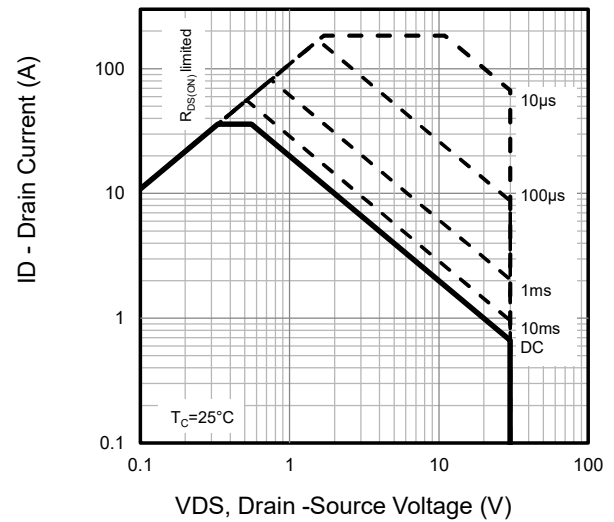
## Q2-Channel Typical Characteristics


**Fig1.** Typical Output Characteristics

**Fig2.** Typical  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$ 

**Fig3.** Typical Transfer Characteristics

**Fig4.** Typical Normalized On-Resistance Vs.  $T_j$ 

**Fig5.** Typical On Resistance Vs Gate-Source Voltage

**Fig6.** Typical On Resistance Vs Drain Current

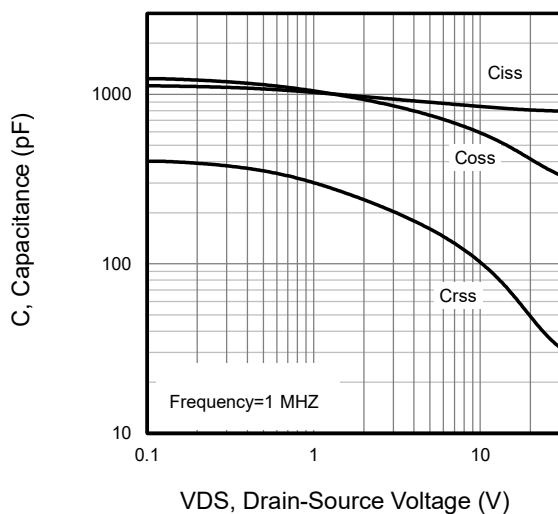
## Q2-Channel Typical Characteristics



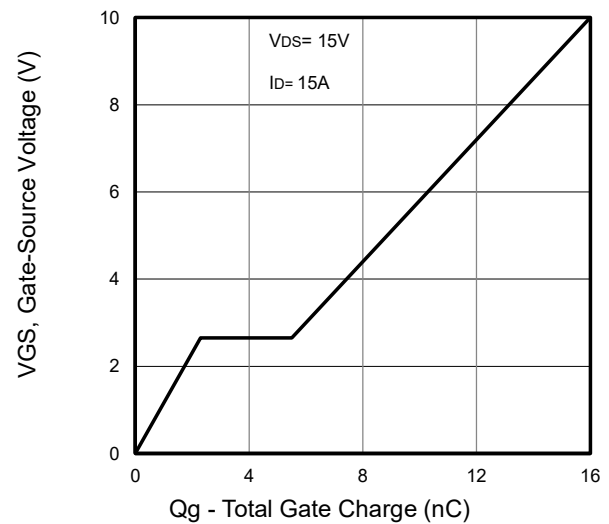
**Fig7.** Typical Source-Drain Diode Forward Voltage



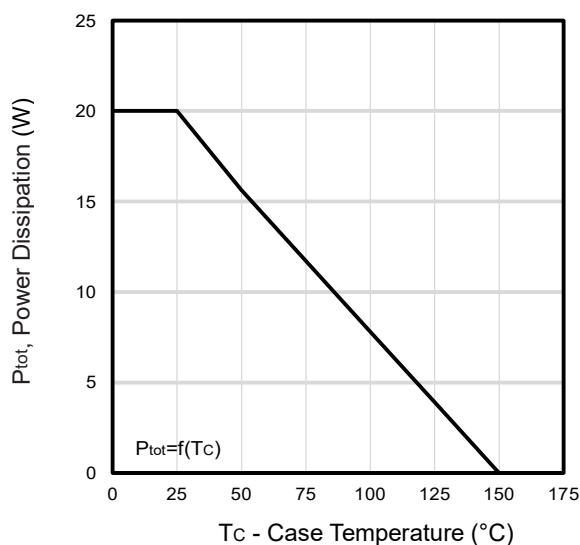
**Fig8.** Maximum Safe Operating Area



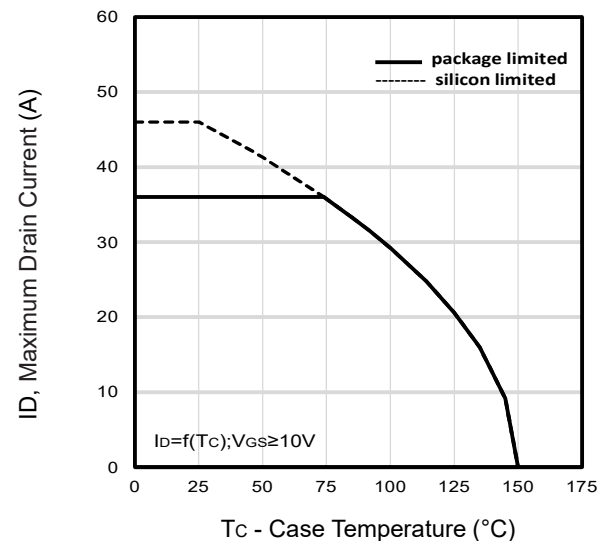
**Fig9.** Typical Capacitance Vs. Drain-Source Voltage



**Fig10.** Typical Gate Charge Vs. Gate-Source Voltage

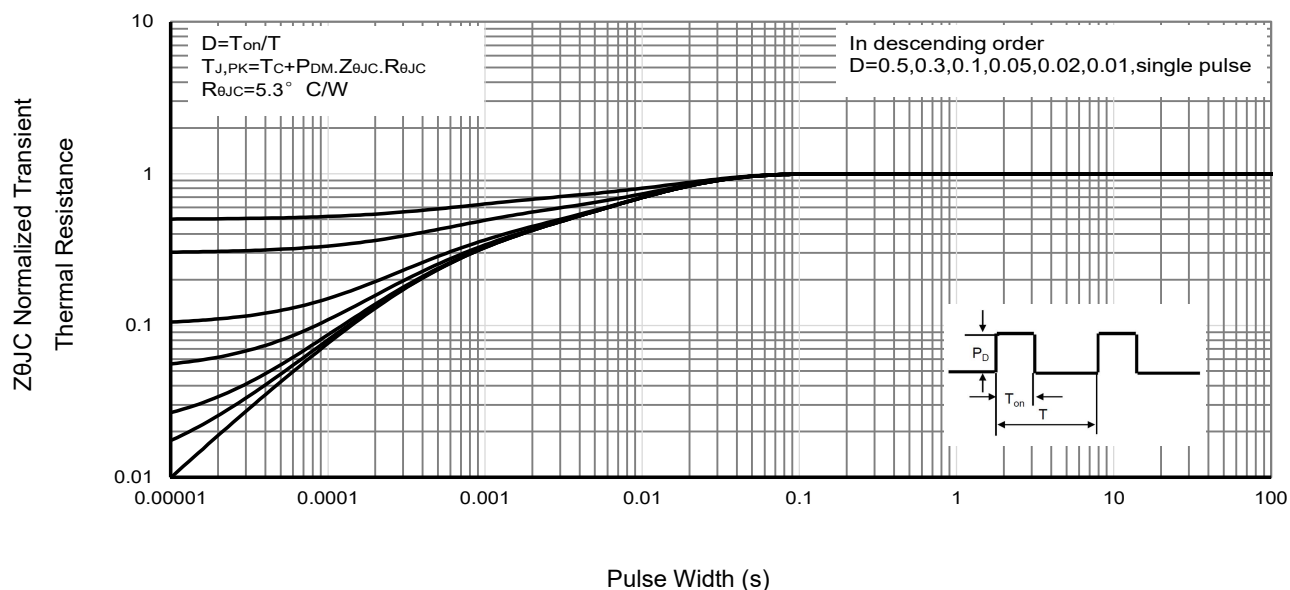


**Fig11.** Power Dissipation Vs. Case Temperature

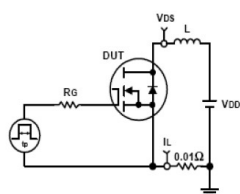


**Fig12.** Maximum Drain Current Vs. Case Temperature

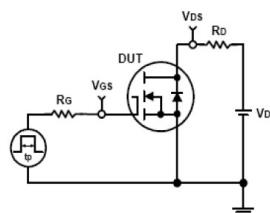
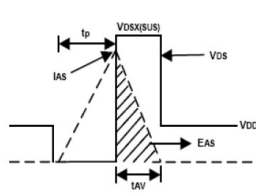
## Q2-Channel Typical Characteristics



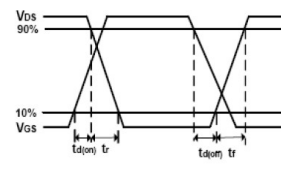
**Fig13 . Normalized Maximum Transient Thermal Impedance**



**Fig14. Unclamped Inductive Test Circuit and waveforms**



**Fig15. Switching Time Test Circuit and waveforms**



**Marking Information**


1<sup>st</sup> line: Vergiga Code (Vs)

2<sup>nd</sup> line: Part Number (3625DB)

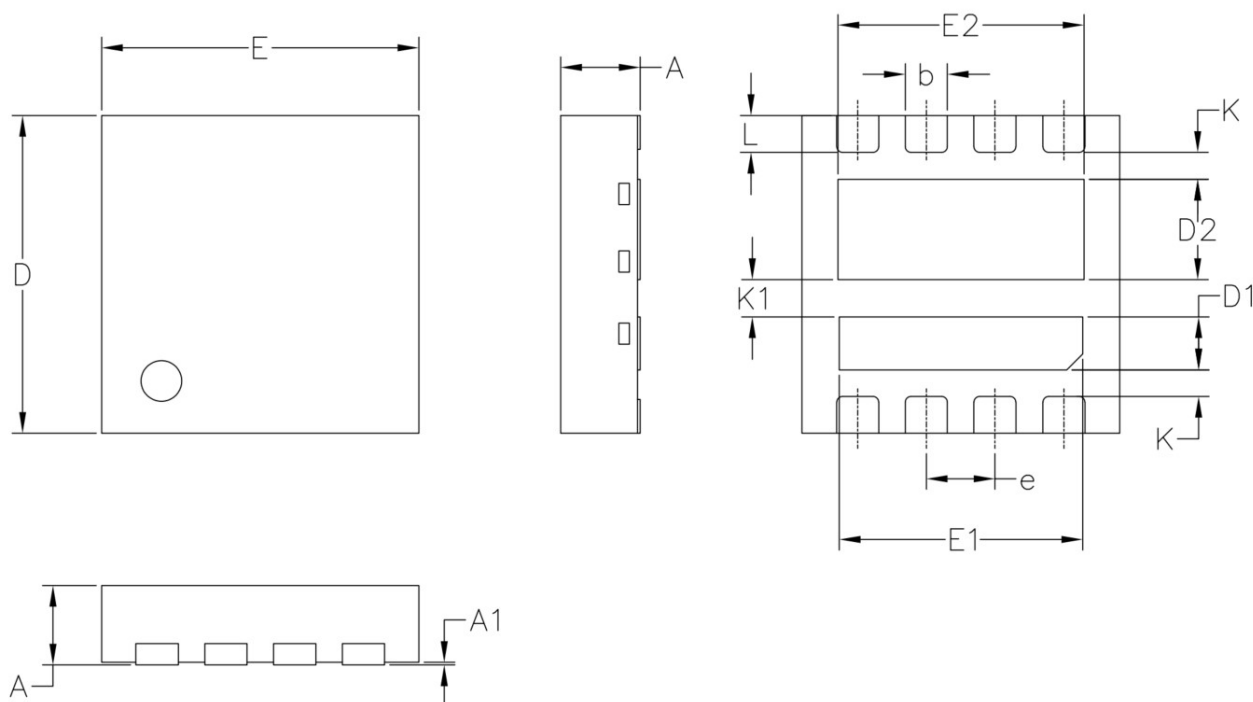
3<sup>rd</sup> line: Date code (XXXYWW)

XXX: Wafer Lot Number Code, code changed with Lot Number

Y: Year Code, refer to table below

WW: Week Code (01 to 53)

| Code | C    | D    | E    | F    | G    | H    | J    | K    | L    | M    | N    | P    | Q    | R    | S    | T    |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Year | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |

**DFN3x3 Package Outline Data**


| Symbol    | Dimensions (unit: mm) |       |      |
|-----------|-----------------------|-------|------|
|           | Min                   | Typ   | Max  |
| <b>A</b>  | 0.70                  | 0.75  | 0.80 |
| <b>A1</b> | 0.00                  | --    | 0.05 |
| <b>b</b>  | 0.35                  | 0.40  | 0.45 |
| <b>D</b>  | 2.90                  | 3.00  | 3.10 |
| <b>D1</b> | 0.40                  | 0.50  | 0.60 |
| <b>D2</b> | 0.85                  | 0.95  | 1.05 |
| <b>E</b>  | 2.90                  | 3.00  | 3.10 |
| <b>E1</b> | 2.20                  | 2.30  | 2.40 |
| <b>E2</b> | 2.20                  | 2.325 | 2.45 |
| <b>e</b>  | 0.55                  | 0.65  | 0.75 |
| <b>K</b>  | 0.15                  | 0.25  | 0.35 |
| <b>K1</b> | 0.25                  | 0.35  | 0.45 |
| <b>L</b>  | 0.27                  | --    | 0.40 |

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