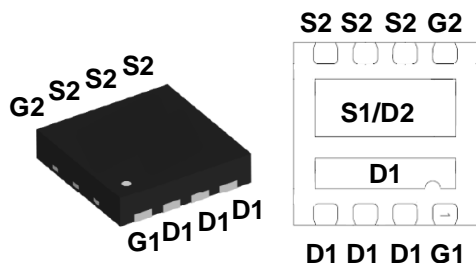


## A.Dual N-Channel 30-V (D-S) MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) MAX. | $I_D$ (A) <sup>a</sup> | $Q_g$ (TYP.) |
|--------------|--------------------------------|------------------------|--------------|
| 30           | 0.008 at $V_{GS} = 10V$        | 26                     | 15 nC        |

DFN3x3 Asymmetric Dual Pin Configuration

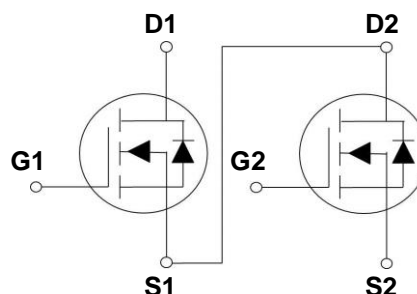


### FEATURES

- DT-Trench Power MOSFET
- 100 %  $R_g$  and UIS tested
- ESD Protection Diode Embedded

### APPLICATIONS

- MB / VGA / Vcore
- POLBuckApplications



### Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter  | Q1         | Q2       | Units               |
|-----------|--|------------|----------|---------------------|
| $V_{DS}$  | Drain-Source Voltage                                   | 30         | 30       | V                   |
| $V_{GS}$  | Gate-Source Voltage                                    | $\pm 20$   | $\pm 20$ | V                   |
| $I_D$     | Drain Current – Continuous ( $T_c=25^\circ\text{C}$ )  | 26         | 26       | A                   |
|           | Drain Current – Continuous ( $T_c=100^\circ\text{C}$ ) | 18.7       | 18.7     | A                   |
|           | Drain Current – Continuous ( $T_A=25^\circ\text{C}$ )  | 13.9       | 13.9     | A                   |
|           | Drain Current – Continuous ( $T_A=100^\circ\text{C}$ ) | 8.9        | 8.9      | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                    | 100        | 100      | A                   |
| EAS       | Single Pulse Avalanche Energy <sup>2</sup>             | 20         | 20       | mJ                  |
| IAS       | Single Pulse Avalanche Current <sup>2</sup>            | 20         | 20       | A                   |
| $P_D$     | Power Dissipation ( $T_c=25^\circ\text{C}$ )           | 27         | 27       | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$    | 0.01       | 0.01     | W/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                              | -55 to 150 |          | $^\circ\text{C}$    |
| $T_J$     | Operating Junction Temperature Range                   | -55 to 150 |          | $^\circ\text{C}$    |

### Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

| Symbol             | Parameter                              | Typ. | Max. | Unit               |
|--------------------|--|------|------|--------------------|
| $R_{\theta JA}$ Q1 | Thermal Resistance Junction to ambient | ---  | 61   | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ Q2 |  | ---  | 61   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ Q1 | Thermal Resistance Junction to Case    | ---  | 4.5  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ Q2 |  | ---  | 4.5  | $^\circ\text{C/W}$ |

**Absolute Maximum Ratings** Tc=25°C unless otherwise noted

| PARAMETER                           | SYMBOL   | TEST CONDITIONS  |    | MIN. | TYP. | MAX. | UNIT  |
|-------------------------------------|--|--|----|------|------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V , I <sub>D</sub> =250uA                        | Q1 | 30   | ---  | ---  | V     |
|                                     |  |  | Q2 | 30   | ---  | ---  | V     |
| △BV <sub>DSS</sub> /△T <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C , I <sub>D</sub> =1mA                            | Q1 | ---  | 0.04 | ---  | V/°C  |
|                                     |  |  | Q2 | ---  | 0.04 | ---  | V/°C  |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =30V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C  | Q1 | ---  | ---  | 1    | uA    |
|                                     |  |  | Q2 | ---  | ---  | 1    | uA    |
|                                     |  | V <sub>DS</sub> =24V , V <sub>GS</sub> =0V , T <sub>J</sub> =125°C | Q1 | ---  | ---  | 10   | uA    |
|                                     |  |  | Q2 | ---  | ---  | 10   | uA    |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V                        | Q1 | ---  | ---  | ±100 | nA    |
|                                     |  |  | Q2 | ---  | ---  | ±100 | nA    |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>3</sup> | V <sub>GS</sub> =10V , I <sub>D</sub> =10A                         | Q1 | ---  | 8.0  | 10.5 | mΩ    |
|                                     |  | V <sub>GS</sub> =10V , I <sub>D</sub> =10A                         | Q2 | ---  | 8.0  | 10.5 | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V , I <sub>D</sub> =5A                         | Q1 | ---  | 11   | 14   | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V , I <sub>D</sub> =5A                         | Q2 | ---  | 11   | 14   | mΩ    |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA           | Q1 | 1.2  | 1.6  | 2.5  | V     |
|                                     |  |  | Q2 | 1.2  | 1.6  | 2.5  | V     |
| △V <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |  | Q1 | ---  | -4   | ---  | mV/°C |
|                                     |  |  | Q2 | ---  | -4   | ---  | mV/°C |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =5V , I <sub>D</sub> =5A                           | Q1 | ---  | 12   | ---  | S     |
|                                     |  | V <sub>DS</sub> =5V , I <sub>D</sub> =5A                           | Q2 | ---  | 12   | ---  | S     |

**Dynamic Characteristics**

|                     |                                     |  |    |     |     |    |    |
|---------------------|-------------------------------------|--|----|-----|-----|----|----|
| Q <sub>g</sub>      | Total Gate Charge <sup>3, 4</sup>   | V <sub>DS</sub> =15V , V <sub>GS</sub> =10V , I <sub>D</sub> =5A                       | Q1 | --- | 15  | 32 | nC |
|                     |                                     |  | Q2 | --- | 15  | 32 |    |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>3, 4</sup>  |  | Q1 | --- | 2.2 | 5  |    |
|                     |                                     |  | Q2 | --- | 2.2 | 5  |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>3, 4</sup>   |  | Q1 | --- | 3   | 6  |    |
|                     |                                     |  | Q2 | --- | 3   | 6  |    |
| T <sub>d(on)</sub>  | Turn-On Delay Time <sup>3, 4</sup>  | V <sub>DD</sub> =15V , V <sub>GS</sub> =10V , R <sub>G</sub> =6Ω<br>I <sub>D</sub> =1A | Q1 | --- | 3.8 | 7  | ns |
|                     |                                     |  | Q2 | --- | 3.8 | 7  |    |
| T <sub>r</sub>      | Rise Time <sup>3, 4</sup>           |  | Q1 | --- | 10  | 19 |    |
|                     |                                     |  | Q2 | --- | 10  | 19 |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>3, 4</sup> |  | Q1 | --- | 22  | 43 |    |
|                     |                                     |  | Q2 | --- | 22  | 43 |    |
| T <sub>f</sub>      | Fall Time <sup>3, 4</sup>           |  | Q1 | --- | 6.6 | 14 |    |
|                     |                                     |  | Q2 | --- | 6.6 | 14 |    |

**Absolute Maximum Ratings**  $T_c=25^{\circ}\text{C}$  unless otherwise noted

| Symbol           | Parameter                    | Conditions  |    | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|---|----|------|------|------|------|
| C <sub>iss</sub> | Input Capacitance            | V <sub>DS</sub> =25V , V <sub>GS</sub> =0V , F=1MHz | Q1 | ---  | 625  | 900  | pF   |
|                  |                              |   | Q2 | ---  | 625  | 900  |      |
| C <sub>oss</sub> | Output Capacitance           |   | Q1 | ---  | 84   | 125  |      |
|                  |                              |   | Q2 | ---  | 84   | 125  |      |
| C <sub>rss</sub> | Reverse Transfer Capacitance |   | Q1 | ---  | 62   | 90   |      |
|                  |                              |   | Q2 | ---  | 62   | 90   |      |
| R <sub>g</sub>   | Gate resistance              | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz    | Q1 | ---  | 2.8  | 5.6  | Ω    |
|                  |                              |   | Q2 | ---  | 2.8  | 5.6  | Ω    |

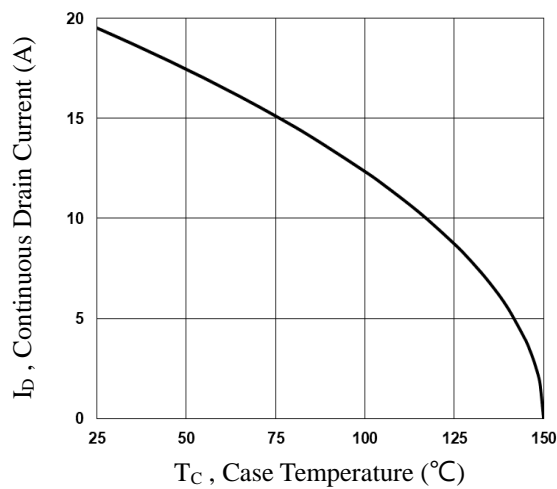
**Drain-Source Diode Characteristics**

|                 |                                    |  |   |     |     |     |   |   |
|-----------------|------------------------------------|--|---|-----|-----|-----|---|---|
| I <sub>S</sub>  | Continuous Source Current          | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current | Q1  | --- | --- | 26  | A |   |
|                 |                                    |  | Q2  | --- | --- | 26  | A |   |
| I <sub>SM</sub> | Pulsed Source Current <sup>3</sup> |  | Q1  | --- | --- | 42  | A |   |
|                 |                                    |  | Q2  | --- | --- | 42  | A |   |
| V <sub>SD</sub> | Diode Forward Voltage <sup>3</sup> |  | V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C | Q1  | --- | --- | 1 | V |
|                 |                                    |  |   | Q2  | --- | --- | 1 | V |

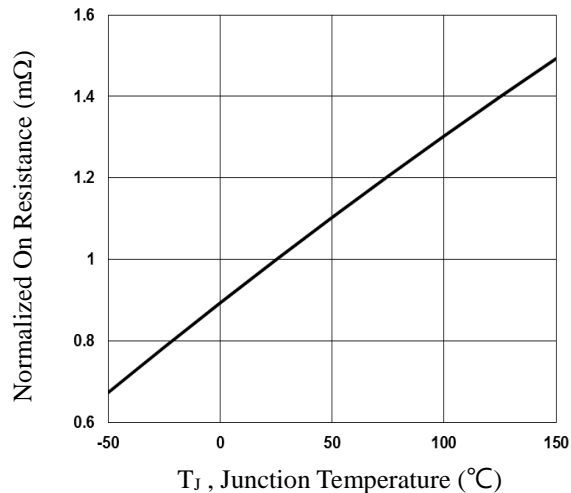
Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=25\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $L=0.1\text{mH}$ , Q1:  $I_{AS}=16\text{A}$ , Q2:  $I_{AS}=42\text{A}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu\text{s}$  , duty cycle  $\leq 2\%$ .
4. Essentially independent of operating temperature.

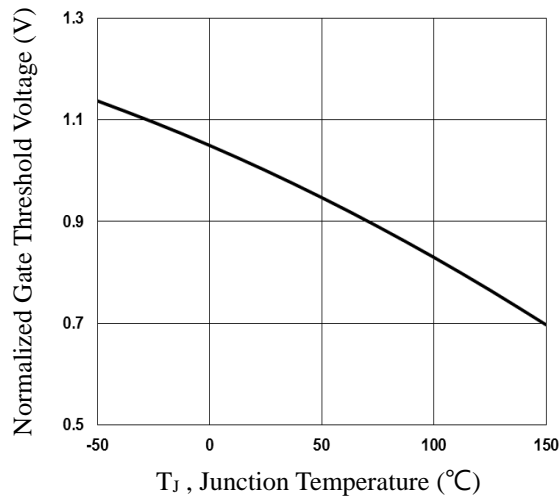
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



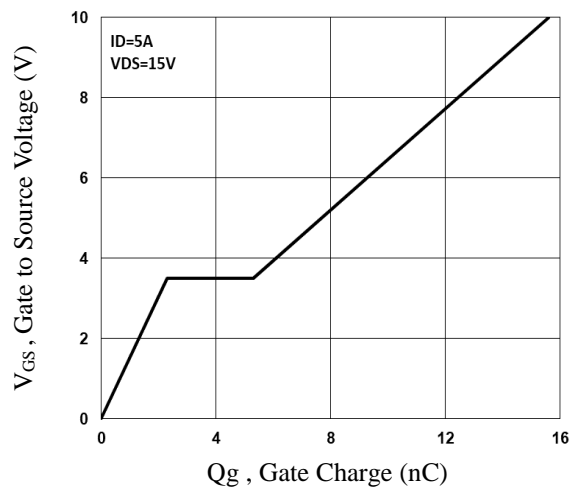
**Fig.1 Q1 Continuous Drain Current vs.  $T_C$**



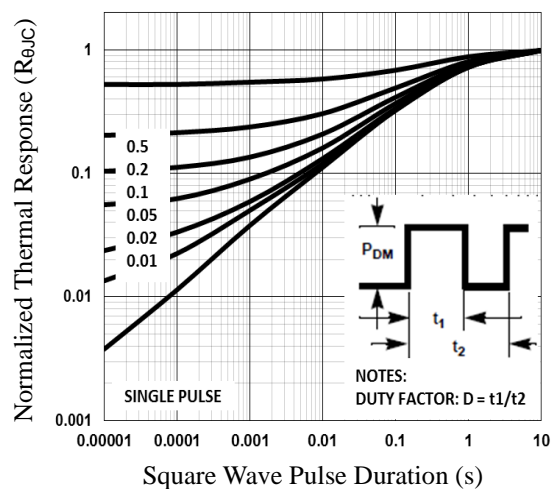
**Fig.2 Q1 Normalized  $R_{DS(on)}$  vs.  $T_J$**



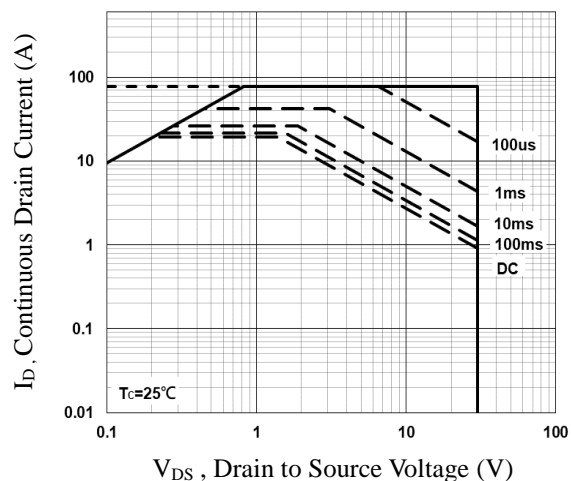
**Fig.3 Q1 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.4 Q1 Gate Charge Waveform**

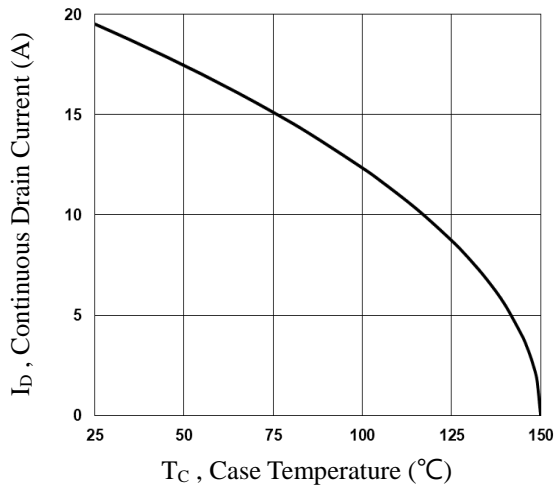


**Fig.5 Q1 Normalized Transient Impedance**

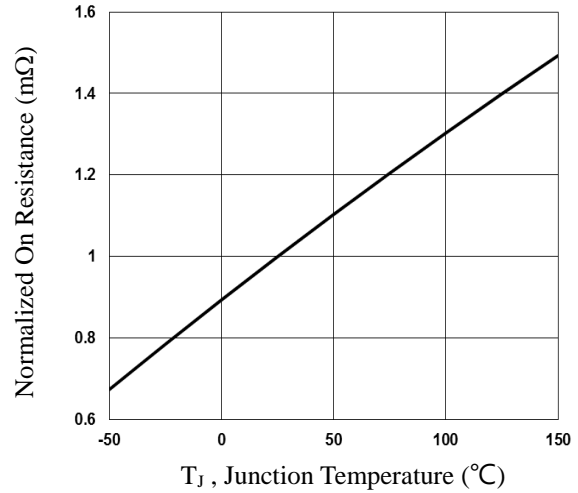


**Fig.6 Q1 Maximum Safe Operation Area**

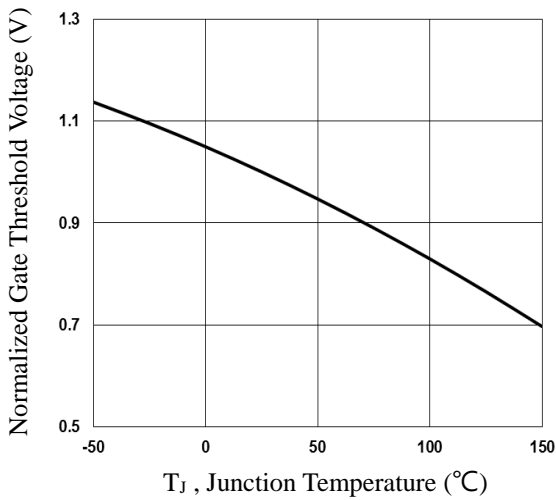
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



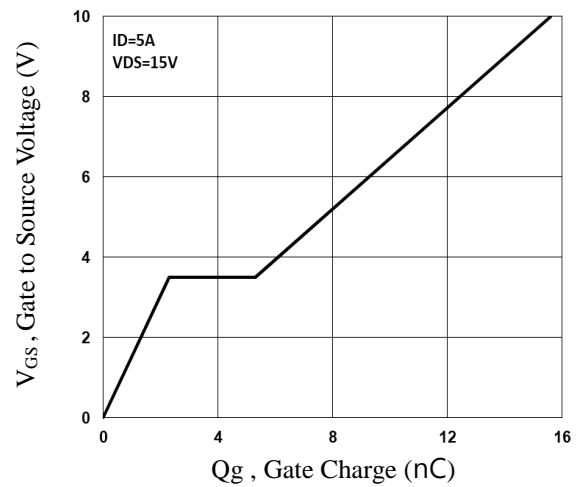
**Fig.7 Q2 Continuous Drain Current vs.  $T_c$**



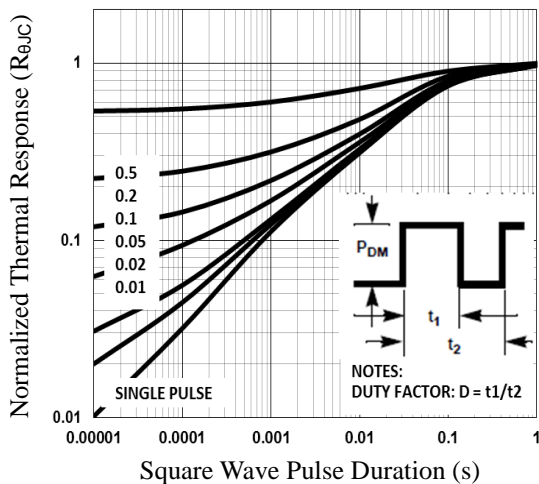
**Fig.8 Q2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



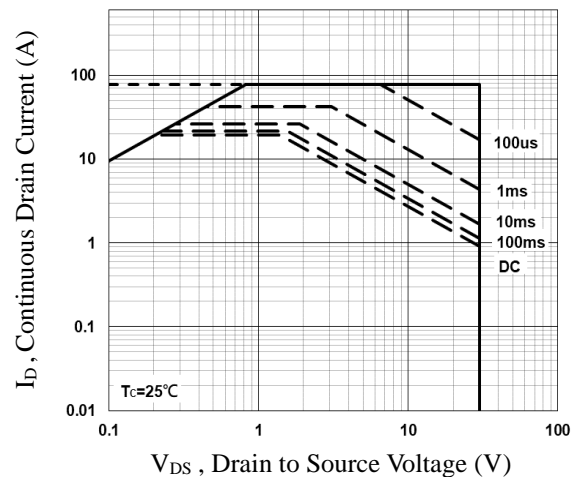
**Fig.9 Q2 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.10 Q2 Gate Charge Waveform**



**Fig.11 Q2 Normalized Transient Impedance**



**Fig.12 Q2 Maximum Safe Operation Area**

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