



20V Dual N-Channel MOSFETs

General Description

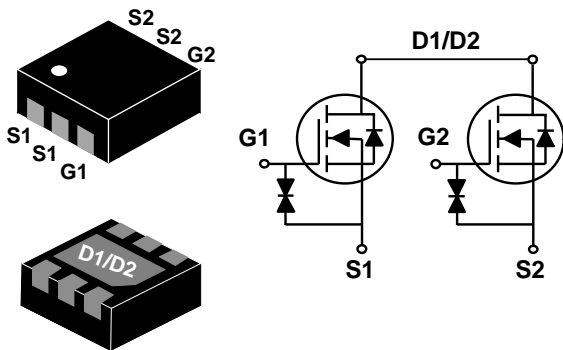
These N Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

| BV_{DSS} | $R_{DS(ON)}$ | I_D |
|------------|----------------|-------|
| 20 V | 6.7 m Ω | 32 A |

Features

- $R_{DS(ON)} \leq 6.7m\Omega @ V_{GS}=4.5V$
- Fast switching
- Green Device Available
- Improved dv/dt capability

DFN2x3-6L Pin Configuration



Applications

- Handheld Instruments
- POL Applications
- Battery Protection Applications

Absolute Maximum Ratings $T_C=25^\circ C$ unless otherwise noted

| Symbol | Parameter | Rating | Units |
|--------------|--|---------------|---------------|
| V_{DS} | Drain-Source Voltage | 20 | V |
| V_{GS} | Gate-Source Voltage | ± 12 | V |
| I_D | Drain Current - Continuous ($T_C=25^\circ C$) | 32 | A |
| | Drain Current - Continuous ($T_C=100^\circ C$) | 20.2 | A |
| I_{DM} | Drain Current - Pulsed (NOTE 1) | 128 | A |
| P_D | Power Dissipation ($T_C=25^\circ C$) | 20 | W |
| | Power Dissipation - Derate above $25^\circ C$ | 0.16 | W/ $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ C$ |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ |
| Marking Code | | NB6P7, EB25A6 | |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|-----------------|--|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient | --- | 62 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 6.1 | $^\circ C/W$ |



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

Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------|--------------------------------|---|------|------|----------|---------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 20 | --- | --- | V |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=20V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | μA |
| | | $V_{DS}=16V, V_{GS}=0V, T_J=85^\circ\text{C}$ | --- | --- | 10 | μA |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 12V, V_{DS}=0V$ | --- | --- | ± 20 | μA |

On Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|-------------------------------|------|------|------|------------|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=4.5V, I_D=5.5A$ | --- | 5.6 | 6.7 | m Ω |
| | | $V_{GS}=4.0V, I_D=5.5A$ | --- | 5.8 | 7.2 | |
| | | $V_{GS}=3.7V, I_D=5.5A$ | --- | 6 | 7.6 | |
| | | $V_{GS}=3.1V, I_D=5.5A$ | --- | 6.5 | 8.2 | |
| | | $V_{GS}=2.5V, I_D=5.5A$ | --- | 7.4 | 9.6 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\mu A$ | 0.5 | 0.75 | 1.5 | V |
| gfs | Forward Transconductance | $V_{DS}=5V, I_D=5A$ | --- | 15 | --- | S |

Dynamic and switching Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|---|------|------|------|------|
| Q_g | Total Gate Charge | $V_{DS}=16V, V_{GS}=4.5V, I_D=5A$ (NOTE 2、3) | --- | 19.9 | 30 | nC |
| Q_{gs} | Gate-Source Charge | | --- | 2.3 | 3.8 | |
| Q_{gd} | Gate-Drain Charge | | --- | 8.2 | 12.3 | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}=15V, V_{GS}=10V, I_D=5A,$ $R_G=6\Omega$ (NOTE 2、3) | --- | 31 | 60 | nS |
| T_r | Rise Time | | --- | 69 | 140 | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 66 | 132 | |
| T_f | Fall Time | | --- | 58 | 119 | |
| C_{iss} | Input Capacitance | $V_{DS}=15V, V_{GS}=0V, F=1\text{MHz}$ | --- | 780 | 1180 | pF |
| C_{oss} | Output Capacitance | | --- | 237 | 356 | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 90 | 136 | |

Drain-Source Diode Characteristics and Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|---------------------------|---|------|------|------|------|
| I_S | Continuous Source Current | $V_G=V_D=0V$, Force Current | --- | --- | 32 | A |
| I_{SM} | Pulsed Source Current | | --- | --- | 64 | A |
| V_{SD} | Diode Forward Voltage | $V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$ | --- | --- | 1 | V |

NOTES :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
3. Essentially independent of operating temperature.



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Characteristics Curves

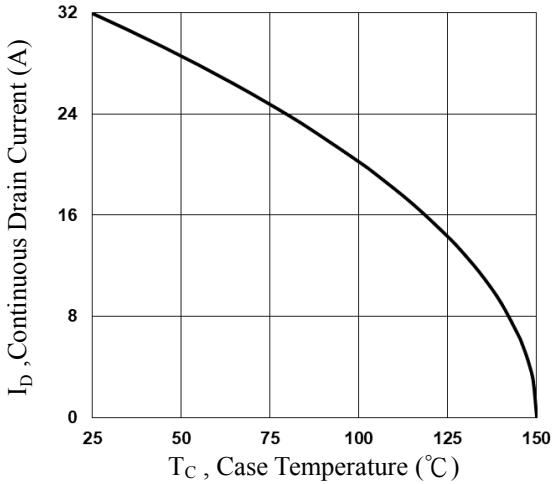


Fig.1 Continuous Drain Current vs. T_c

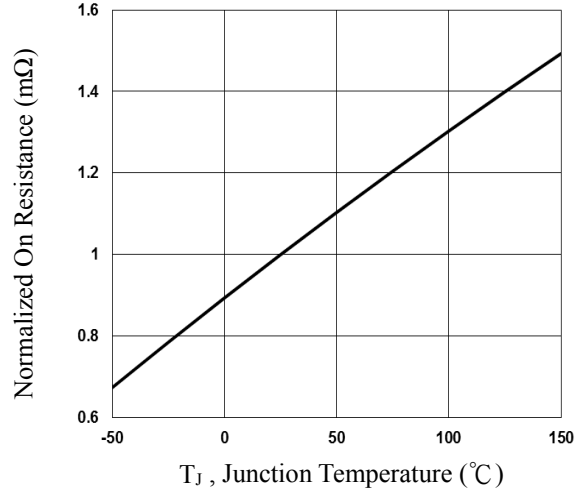


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

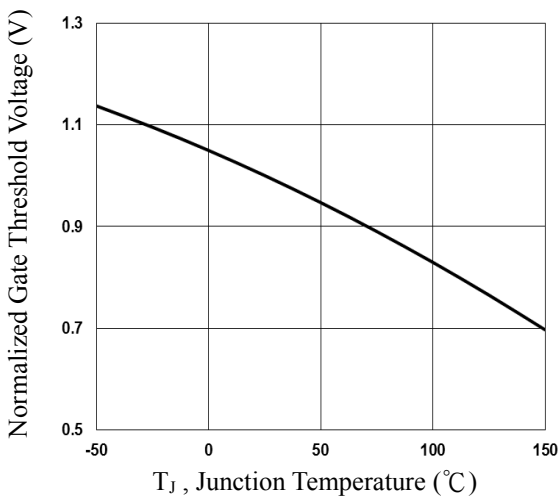


Fig.3 Normalized V_{th} vs. T_j

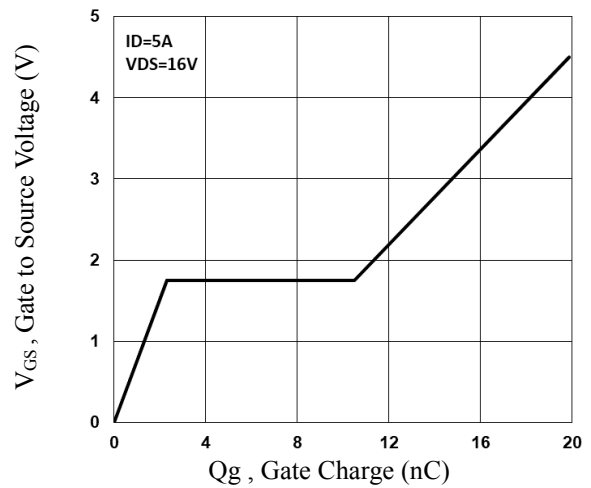


Fig.4 Gate Charge Waveform

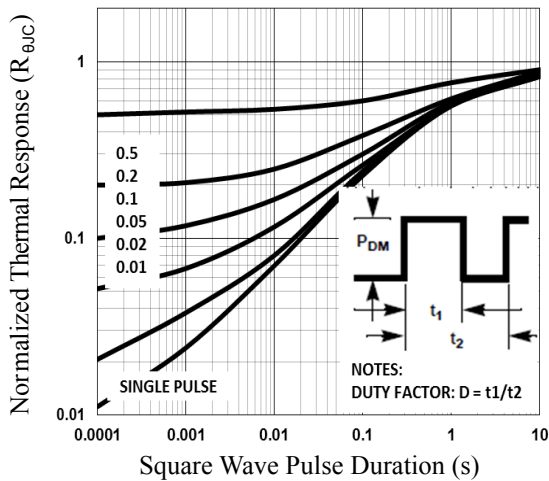


Fig.5 Normalized Transient Response

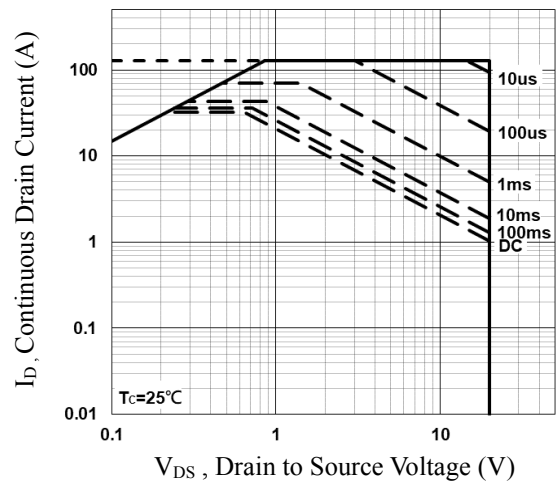


Fig.6 Maximum Safe Operation Area



Characteristics Curves

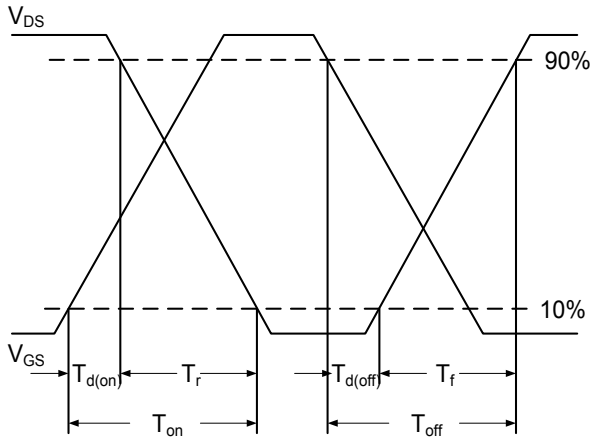


Fig.7 Switching Time Waveform

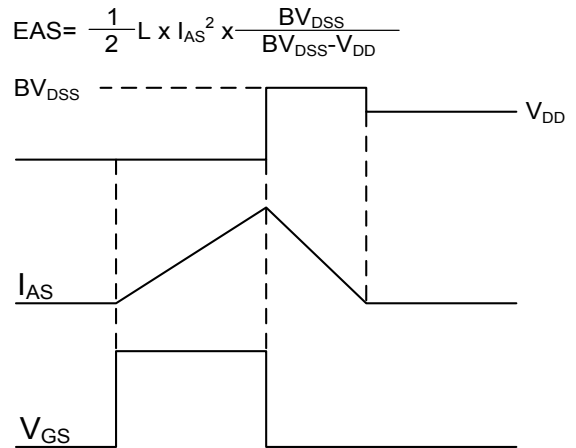
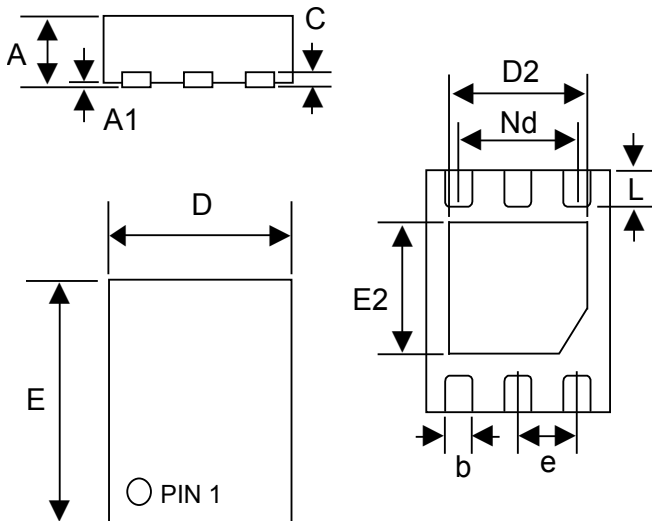


Fig.8 EAS Waveform

Package Outline Dimensions



| Symbol | Dimensions in millimeters | | Dimensions in inches | |
|--------|---------------------------|------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.70 | 0.80 | 0.027 | 0.032 |
| A1 | - | 0.05 | - | 0.002 |
| b | 0.20 | 0.35 | 0.007 | 0.014 |
| C | 0.18 | 0.25 | 0.007 | 0.010 |
| D | 1.90 | 2.10 | 0.074 | 0.083 |
| D2 | 1.40 | 1.60 | 0.055 | 0.063 |
| e | 0.50 BSC | | 0.020 BSC | |
| Nd | 1.00 BSC | | 0.040 BSC | |
| E | 2.90 | 3.10 | 0.114 | 0.123 |
| E2 | 1.65 | 1.75 | 0.064 | 0.069 |
| L | 0.30 | 0.40 | 0.011 | 0.016 |

DFN2x3-6L



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