



TMG0069N04DF

N-Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

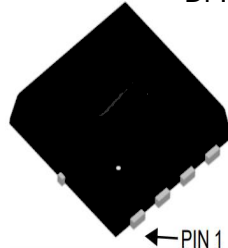
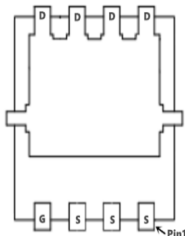
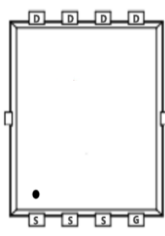
General Features

$V_{DS} = 40V$ $I_D = 60A$

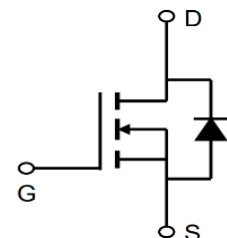
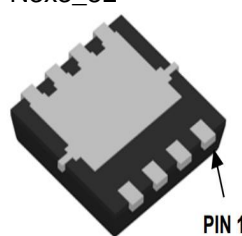
$R_{DS(ON)} = 6.9m\Omega$ (typ.) @ $V_{GS} = 10V$

100% UIS Tested

100% R_g Tested



DF:DFN3x3_8L



Marking: 60N04

Absolute Maximum Ratings ($T_A = 25^\circ C$ Unless Otherwise Noted)

| Symbol | Parameter | Rating | Units |
|---------------------------|--|------------|------------|
| V_{DS} | Drain-Source Voltage | 40 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current ¹ | 60 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current ¹ | 35 | A |
| I_{DM} | Pulsed Drain Current ² | 130 | A |
| EAS | Single Pulse Avalanche Energy ³ | 48 | mJ |
| I_{AS} | Avalanche Current | 35 | A |
| $P_D @ T_C = 25^\circ C$ | Total Power Dissipation ⁴ | 39 | W |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ C$ |

Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|-----------------|---|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) ¹ | --- | 60 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 3.2 | $^\circ C/W$ |

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|--|--|------|------|------|------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 40 | --- | --- | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =10V, I _D =12A | --- | 6.9 | 8.5 | mΩ |
| | | V _{GS} =4.5V, I _D =10A | --- | 10.0 | 15 | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 1.35 | --- | 3 | V |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =32V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =32V, V _{GS} =0V, T _J =55°C | --- | --- | 5 | |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 1.7 | --- | Ω |
| Q _g | Total Gate Charge (4.5V) | V _{DS} =20V, V _{GS} =4.5V, I _D =12A | --- | 5.8 | --- | nC |
| Q _{gs} | Gate-Source Charge | | --- | 3 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 1.2 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =15V, V _{GS} =10V, R _G =3.3Ω I _D =1A | --- | 14.3 | --- | ns |
| T _r | Rise Time | | --- | 5.6 | --- | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 20 | --- | |
| T _f | Fall Time | | --- | 11 | --- | |
| C _{iss} | Input Capacitance | V _{DS} =15V, V _{GS} =0V, f=1MHz | --- | 690 | --- | pF |
| C _{oss} | Output Capacitance | | --- | 193 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 38 | --- | |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|--|---|------|------|------|------|
| I _S | Continuous Source Current ^{1,5} | V _G =V _D =0V, Force Current | --- | --- | 60 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1 | V |

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=31A
- The power dissipation is limited by 150°C junction temperature
- The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.



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Typical Characteristics

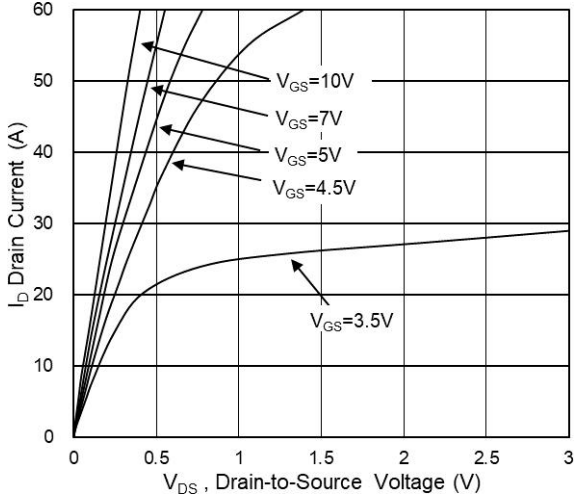


Fig.1 Typical Output Characteristics

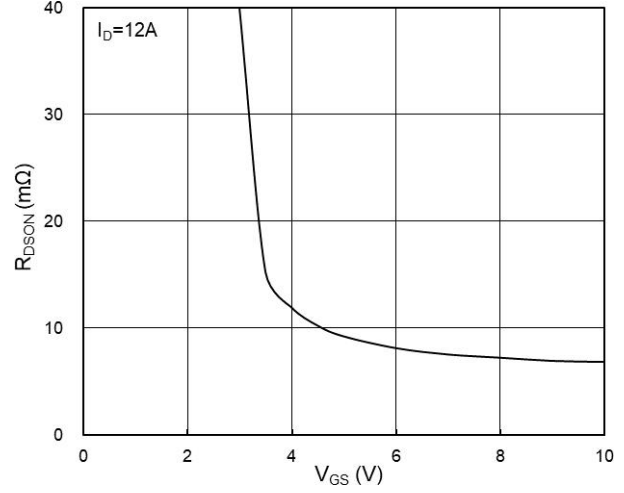


Fig.2 On-Resistance vs G-S Voltage

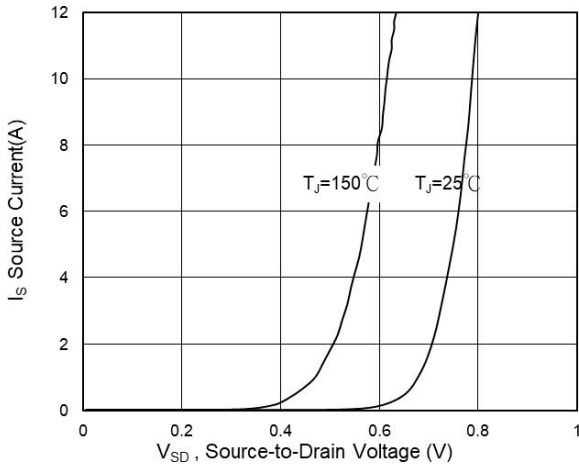


Fig.3 Source Drain Forward Characteristics

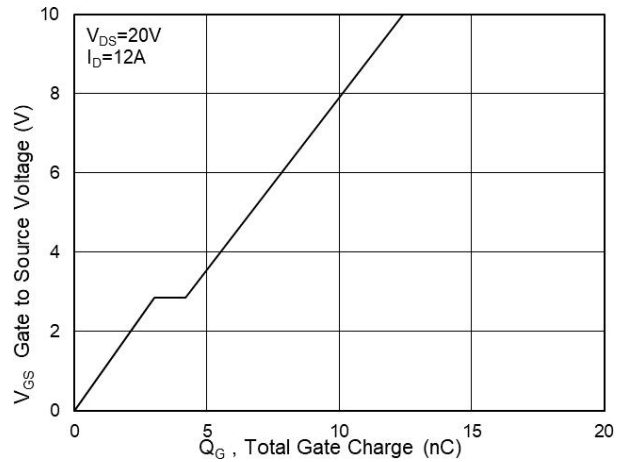


Fig.4 Gate-Charge Characteristics

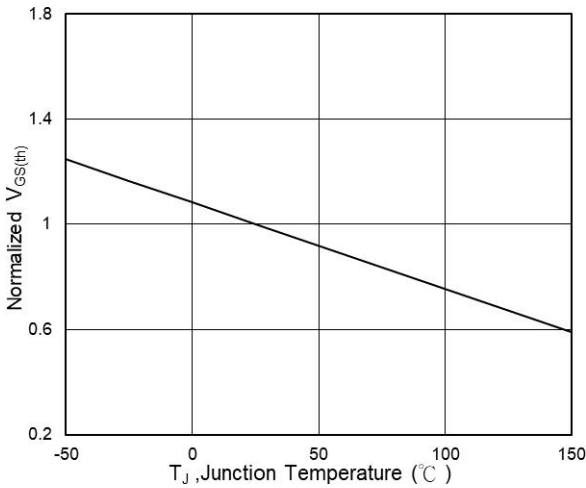


Fig.5 Normalized $V_{GS(th)}$ vs T_J

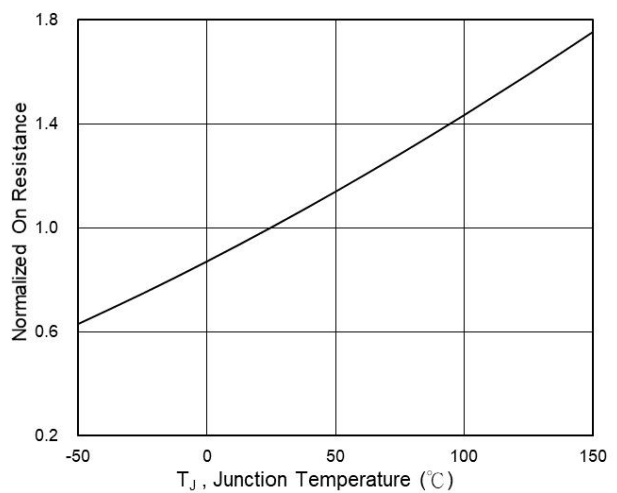


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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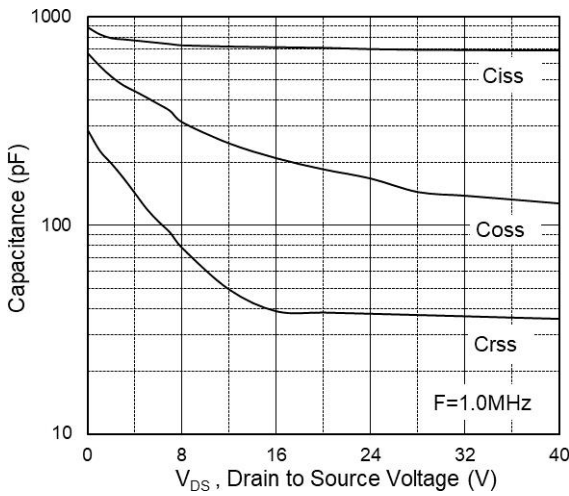


Fig.7 Capacitance

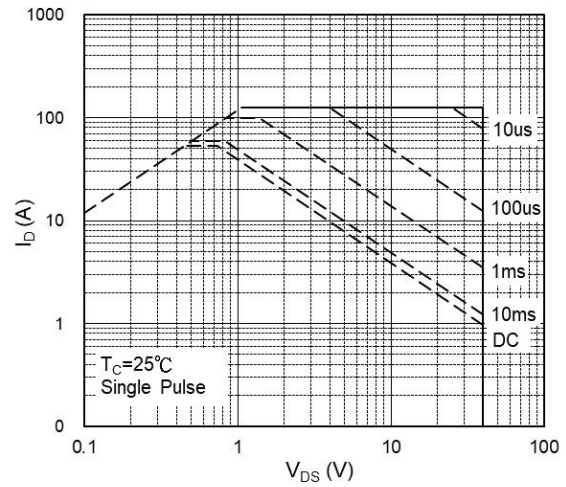


Fig.8 Safe Operating Area

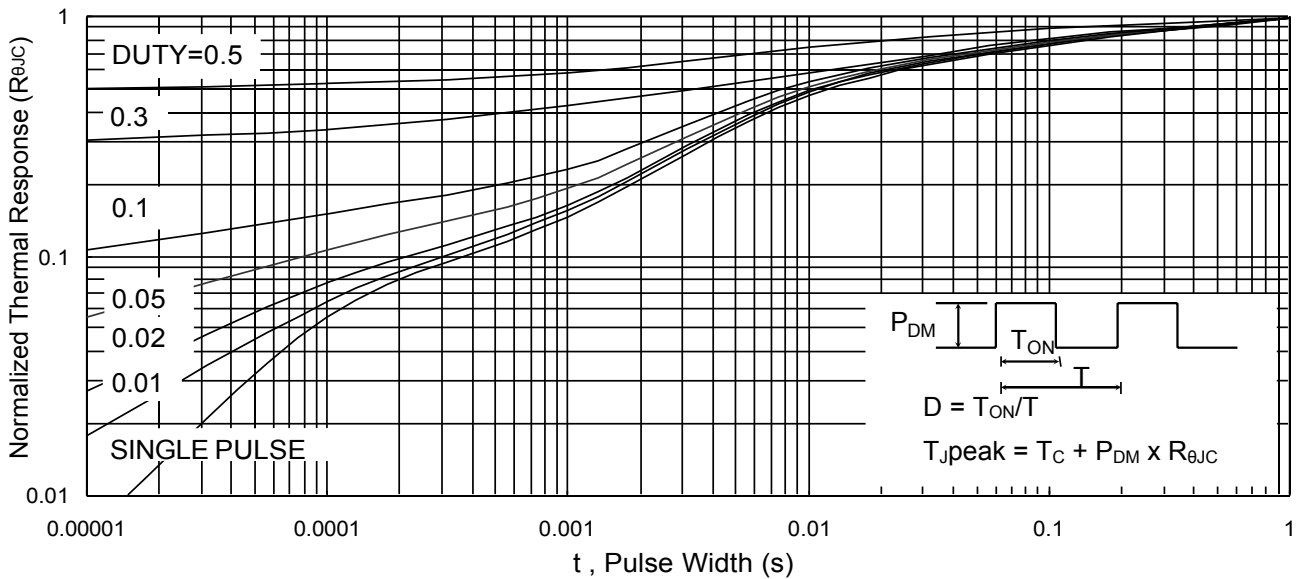


Fig.9 Normalized Maximum Transient Thermal Impedance

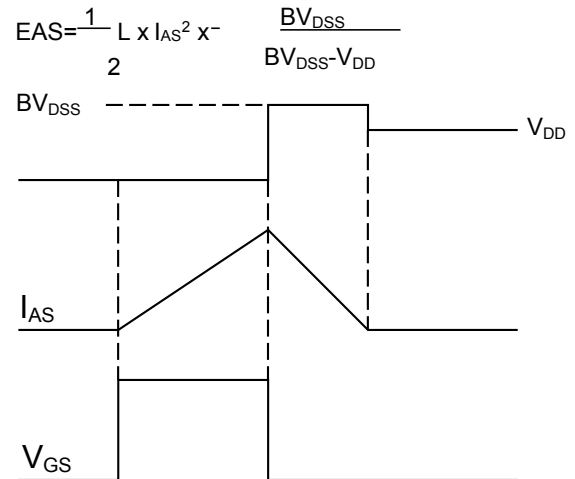
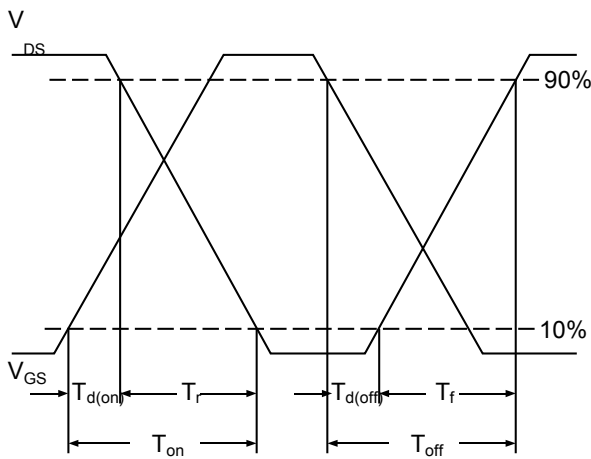
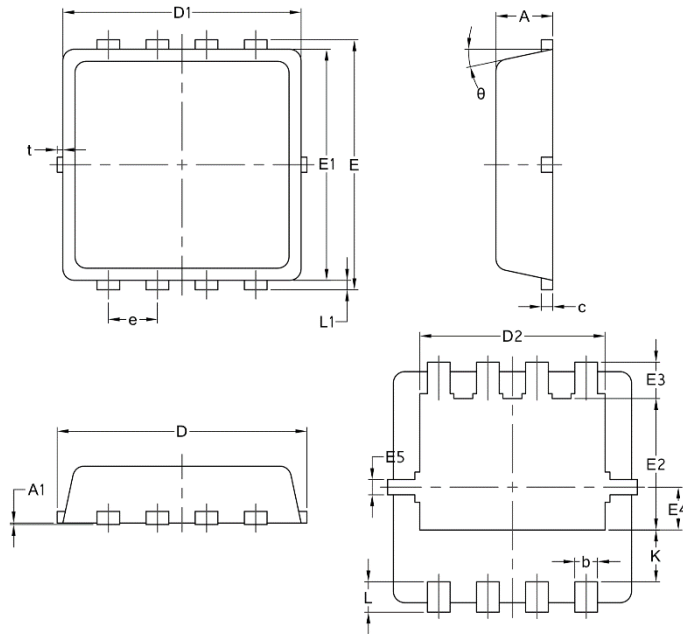


Fig.11 Unclamped Inductive Waveform

Package Mechanical Data:DFN3x3–8L



| Symbol | Common | | |
|--------|--------|-------|------|
| | mm | | |
| | Mim | Nom | Max |
| A | 0.70 | 0.75 | 0.85 |
| A1 | / | / | 0.05 |
| b | 0.20 | 0.30 | 0.40 |
| c | 0.10 | 0.152 | 0.25 |
| D | 3.15 | 3.30 | 3.45 |
| D1 | 3.00 | 3.15 | 3.25 |
| D2 | 2.29 | 2.45 | 2.65 |
| E | 3.15 | 3.30 | 3.45 |
| E1 | 2.90 | 3.05 | 3.20 |
| E2 | 1.54 | 1.74 | 1.94 |
| E3 | 0.28 | 0.48 | 0.65 |
| E4 | 0.37 | 0.57 | 0.77 |
| E5 | 0.10 | 0.20 | 0.30 |
| e | 0.60 | 0.65 | 0.70 |
| K | 0.59 | 0.69 | 0.89 |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.06 | 0.125 | 0.20 |
| t | 0 | 0.075 | 0.13 |
| Φ | 10 | 12 | 14 |

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