
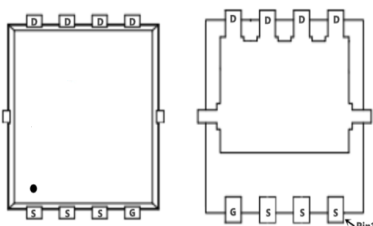


TM012P03DF

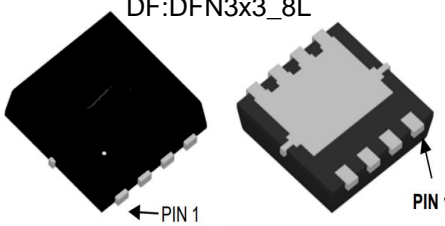
P -Channel Enhancement Mosfet

| | |
|--|--|
| <p>General Description</p> <ul style="list-style-type: none"> • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant <p>Applications</p> <ul style="list-style-type: none"> • Load switch • PWM | <p>General Features</p> <p>$V_{DS} = -30V$ $I_D = -40A$</p> <p>$R_{DS(ON)} = 12m\Omega$ (typ.) @ $V_{GS} = -10V$</p> <p>100% UIS Tested 100% R_g Tested</p>  |
|--|--|

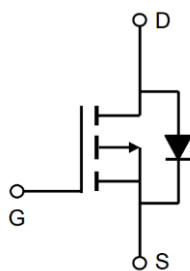


Marking:40P03

DF:DFN3x3_8L



PIN 1



D
G
S

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

| Symbol | Parameter | Rating | | Units |
|---------------------------|---|------------|--------------|------------|
| | | 10s | Steady State | |
| V_{DS} | Drain-Source Voltage | -30 | | V |
| V_{GS} | Gate-Source Voltage | ± 20 | | V |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -40 | | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -25 | | A |
| I_{DM} | Pulsed Drain Current ² | -120 | | A |
| EAS | Single Pulse Avalanche Energy ³ | 105 | | mJ |
| I_{AS} | Avalanche Current | -50 | | A |
| $P_D @ T_A = 25^\circ C$ | Total Power Dissipation ⁴ | 15 | | 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 ¹ | --- | 66 | $^\circ C/W$ |

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

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|--|------|------|-----------|------------|
| Off Characteristic | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=-250\mu A$ | -30 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=-30V, V_{GS}=0V,$ | - | - | -1 | μA |
| I_{GSS} | Gate to Body Leakage Current | $V_{DS}=0V, V_{GS}=\pm 20V$ | - | - | ± 100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1.0 | -1.5 | -2.5 | V |
| $R_{DS(on)}$ | Static Drain-Source on-Resistance <small>Note3</small> | $V_{GS}=-10V, I_D=-10A$ | - | 12 | 18 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-5A$ | - | 18 | 27 | |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS}=-15V, V_{GS}=0V,$ $f=1.0MHz$ | - | 1330 | - | pF |
| C_{oss} | Output Capacitance | | - | 183 | - | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 156 | - | pF |
| Q_g | Total Gate Charge | $V_{DS}=-15V, I_D=-5A,$ $V_{GS}=-10V$ | - | 22 | - | nC |
| Q_{gs} | Gate-Source Charge | | - | 1.0 | - | nC |
| Q_{gd} | Gate-Drain("Miller") Charge | | - | 1.8 | - | nC |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}=-15V, I_D=-10A,$ $V_{GS}=-10V, R_{GEN}=2.5\Omega$ | - | 9 | - | ns |
| t_r | Turn-on Rise Time | | - | 13 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 48 | - | ns |
| t_f | Turn-off Fall Time | | - | 20 | - | ns |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I_S | Maximum Continuous Drain to Source Diode Forward Current | | - | - | -40 | A |
| I_{SM} | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | -90 | A |
| V_{SD} | Drain to Source Diode Forward Voltage | $V_{GS}=0V, I_S=-15A$ | - | -0.8 | -1.2 | V |
| trr | Reverse Recovery Time | $T_J=25^\circ\text{C},$ | - | 64 | - | ns |
| Qrr | Reverse Recovery Charge | $V_{DD}=-24V, I_F=-2.8A,$ $di/dt=-100A/\mu s$ | - | 25 | - | nC |

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: $T_J=25^\circ\text{C}, V_{GS}=10V, R_G=25\Omega, L=0.5mH, I_{AS}=-12.7A$

3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

Typical Performance Characteristics

Figure 1: Output Characteristics

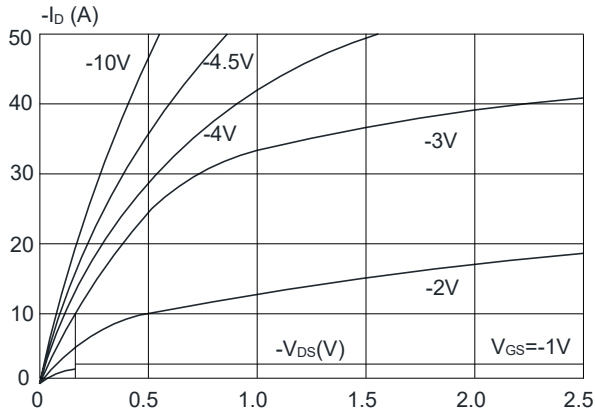


Figure 2: Typical Transfer Characteristics

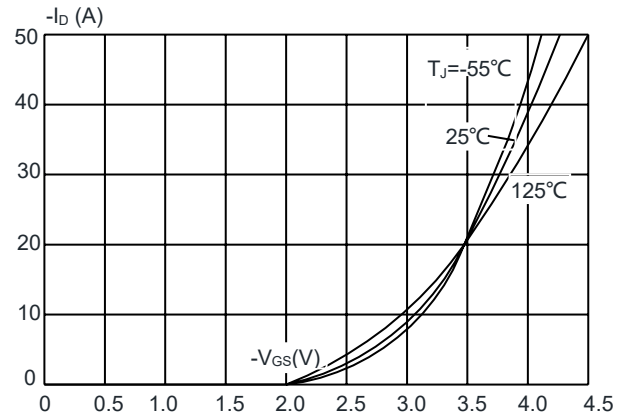


Figure 3: On-resistance vs. Drain Current

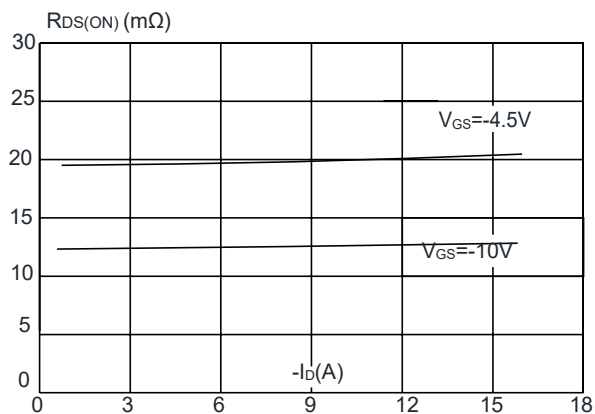


Figure 4: Body Diode Characteristics

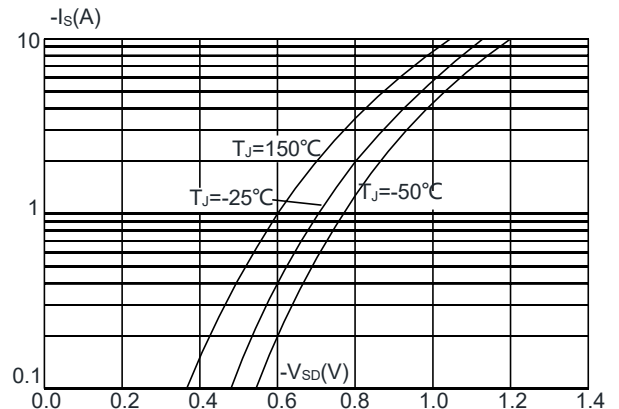


Figure 5: Gate Charge Characteristics

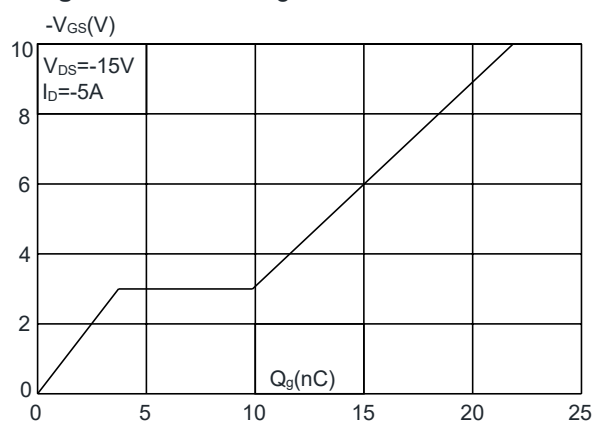
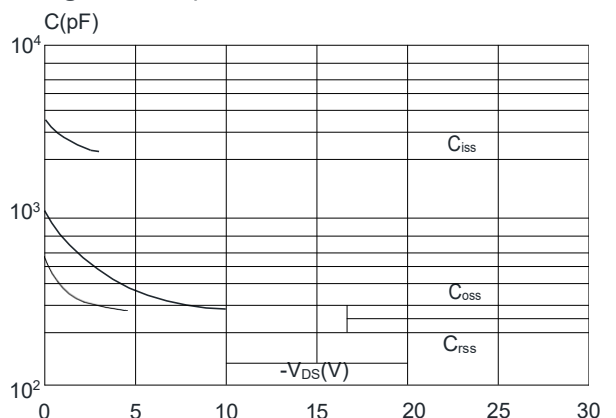


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

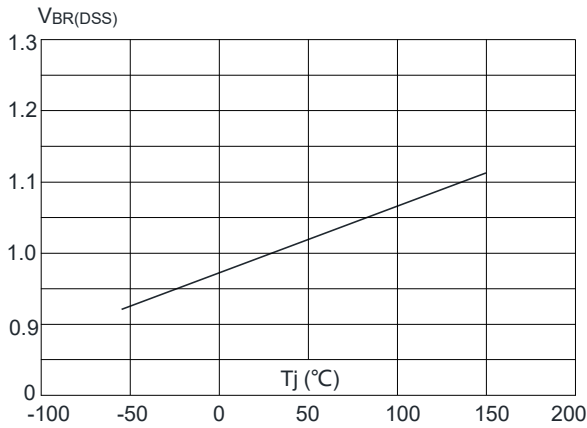


Figure 8: Normalized on Resistance vs. Junction Temperature

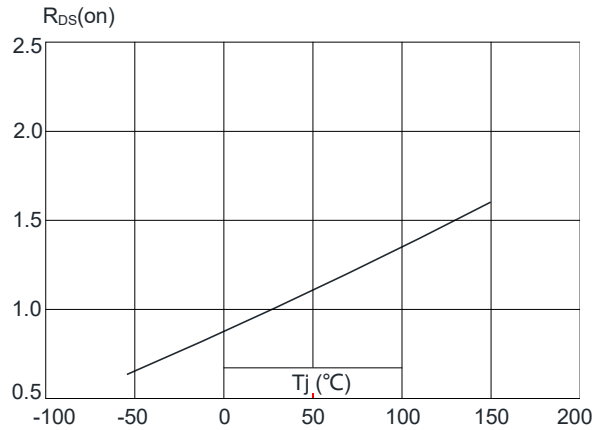


Figure 9: Maximum Safe Operating Area

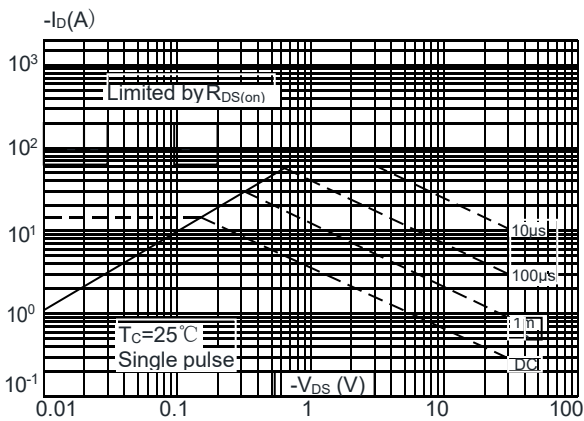


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

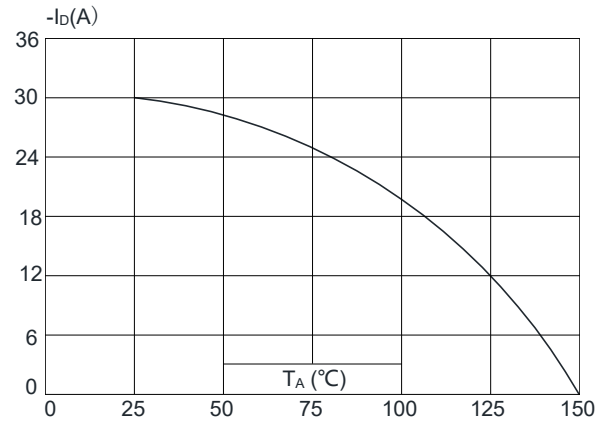
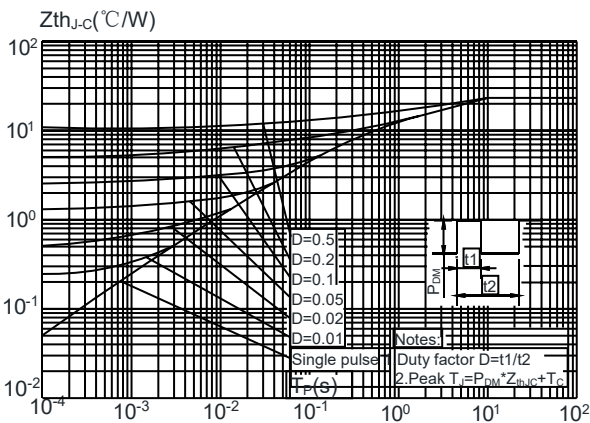
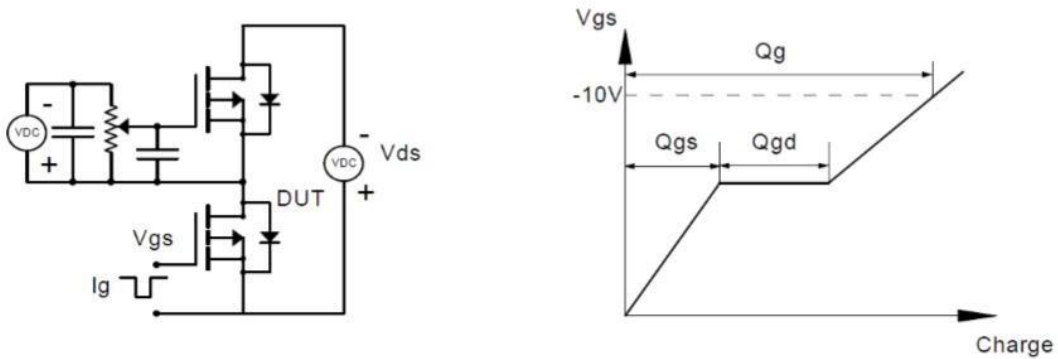


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

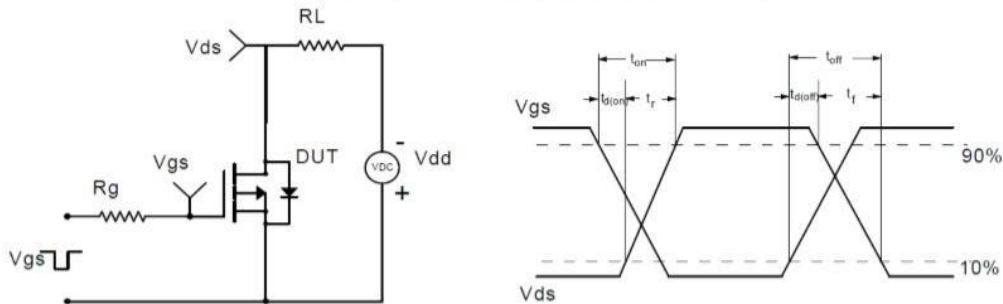


Test Circuit

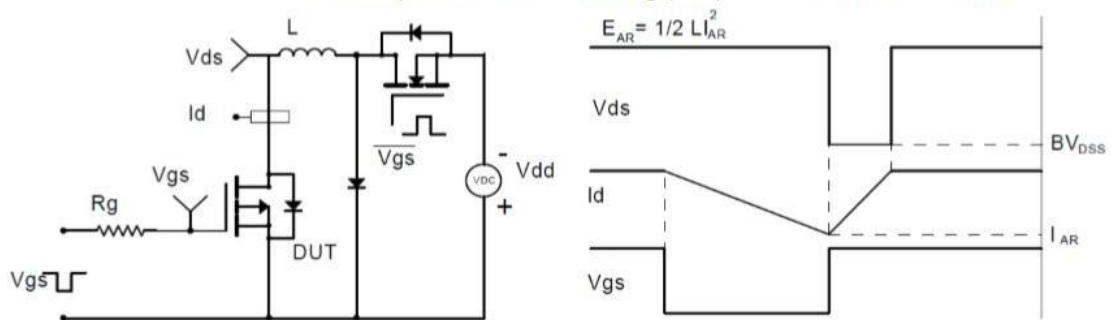
Gate Charge Test Circuit & Waveform



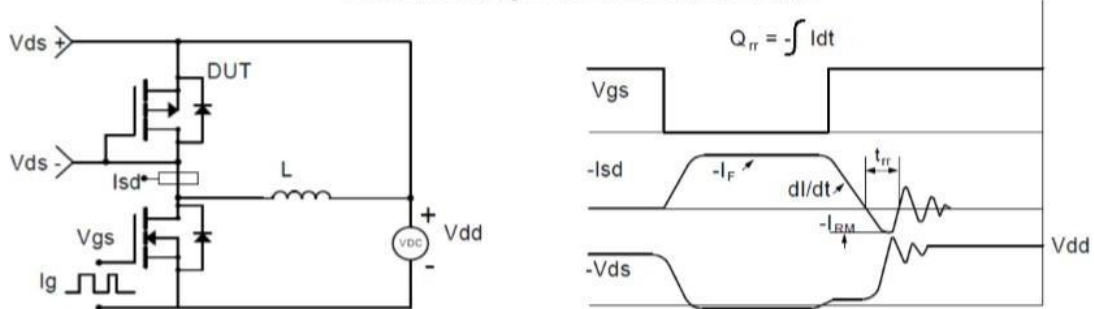
Resistive Switching Test Circuit & Waveforms



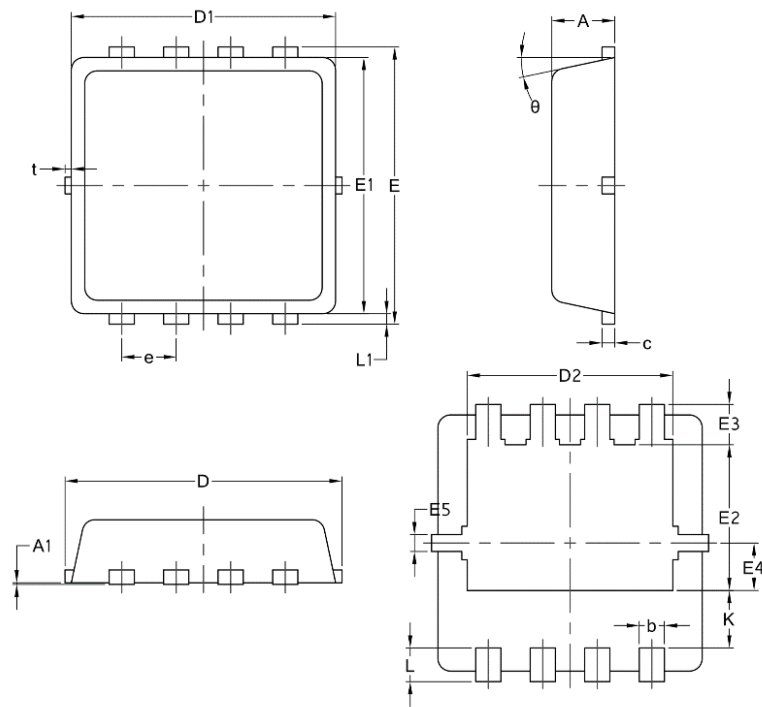
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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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