# JMS4710N

## *Product Preview*

### 30V Dual Asymmetric N-Channel MOSFET

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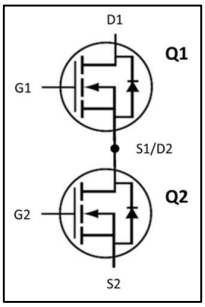
## Features

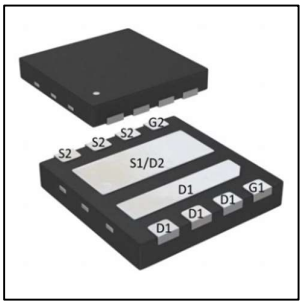
- Advanced shielded-gate technology
- Ultra-low on-resistance and gate-charge
- RoHS compliant

| Product Summary | | |
|---|---|---|
| Device | Q1 | Q2 |
| $V_{DS}$ | 30V | 30V |
| $R_{DS(ON)}$ | 8.3mΩ (Typ.) | 6.9mΩ (Typ.) |
| | 10.7mΩ (Max.) | 8.9mΩ (Max.) |
| $I_D$ | 18A(1) | 18A(1) |

## Applications

- Motor controllers
- DC-to-DC convertors
- Battery-driven electronic products, electrical equipment and machines




## Ordering Information

| Part Number | Marking | Package | Packaging |
|---|---|---|---|
| JMS4710N | MS4710N | DFN3x3 Dual Asymmetric | Tape & Reel |



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## Absolute Maximum Ratings

| Parameter | Symbol | Limit | | Unit |
|---|---|---|---|---|
| | | Q1 | Q2 | |
| Drain-to-Source Voltage | $V_{DS}$ | 30 | 30 | V |
| Gate-to-Source Voltage | $V_{GS}$ | ±20 | ±20 | |
| Continuous Drain Current ($T_C$ = 25°C) (1),(2) | $I_D$ | 18 | 18 | A |
| Continuous Drain Current ($T_C$ = 100°C) (1),(2) | $I_D$ | 18 | 18 | |
| Continuous Drain Current ($T_A$ = 25°C) (3),(4) | $I_D$ | 11 | 12 | |
| Continuous Drain Current ($T_A$ = 100°C) (3),(4) | $I_D$ | 7 | 8 | |
| Pulsed Drain Current (5) | $I_{DM}$ | 72 | 72 | |
| Power Dissipation ($T_C$ = 25°C) | $P_D$ | 22.7 | 25 | W |
| Linear Derating Factor | - | 0.18 | 0.2 | W/°C |
| Single Pulse Avalanche Energy (6) | $E_{AS}$ | 12 | 17 | mJ |
| Avalanche Current (7) | $I_{AS}$ | 11 | 13 | A |
| Junction Temperature | $T_J$ | -55 to 150 | -55 to 150 | °C |
| Storage Temperature | $T_{STG}$ | -55 to 150 | -55 to 150 | |

## Thermal Characteristics

| Parameter | Symbol | Max | | Unit |
|---|---|---|---|---|
| | | Q1 | Q2 | |
| Junction-to-Ambient Thermal Resistance (4) | $R_{\theta JA}$ | 62 | 62 | °C/W |
| Junction-to-Case Thermal Resistance | $R_{\theta JC}$ | 5.5 | 5.0 | |

(1) Limit by package.

(2) Rated according to $R_{\theta JC}$.

(3) Rated according to $R_{\theta JA}$.

(4) Surface−mounted on 1 inch² FR4 board, 2 oz Cu.

(5) Limited by maximum $T_J$.

(6) Starting $T_J$ = 25°C, L = 0.1mH, $V_{DD}$ = 20V, $V_{GS}$ = 10V.

(7) Pulse width limited by maximum $T_J$.

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## Q1:

### Static Electrical Characteristics (8)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-to-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 30 | - | - | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$ = $V_{GS}$ , $I_D$ = 250μA | 1.0 | - | 2.0 | |
| Drain-to-Source Leakage Current | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| Drain-to-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 13A | - | 8.3 | 10.7 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 10A | - | 13.3 | 17.2 | mΩ |

### Dynamic Electrical Characteristics (8)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 10A | - | 35 | - | S |
| Total Gate Charge | $Q_g$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $I_D$ = 15A | - | 8.8 | - | nC |
| Gate-to-Source Charge | $Q_{gs}$ | | - | 1.2 | - | |
| Gate-to-Drain Charge | $Q_{gd}$ | | - | 1.8 | - | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $I_D$ = 15A, $R_G$ = 3.0Ω | - | 2.9 | - | ns |
| Rise Time | $t_r$ | | - | 2.8 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 18 | - | |
| Fall Time | $t_f$ | | - | 4 | - | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1MHz | - | 530 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 220 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 15 | - | |

### Diode Characteristics (8)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0V, $I_S$ = 10A | - | 0.8 | - | V |
| Reverse Recovery Time | $T_{rr}$ | $V_{GS}$ = 0V, $I_S$ = 10A, $dI_S/dt$ = 100A/μs | - | 16 | - | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 12 | - | nC |

(8) $T_J$ = 25°C unless otherwise specified.

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## Q1 : Typical Electrical Characteristics

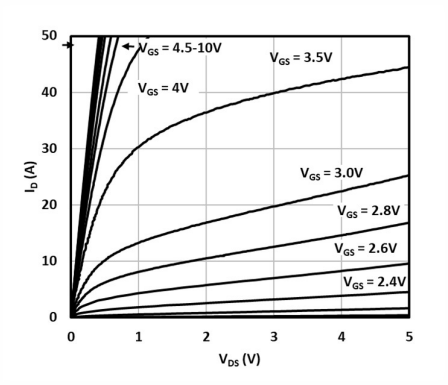


Fig. 1 Output characteristics

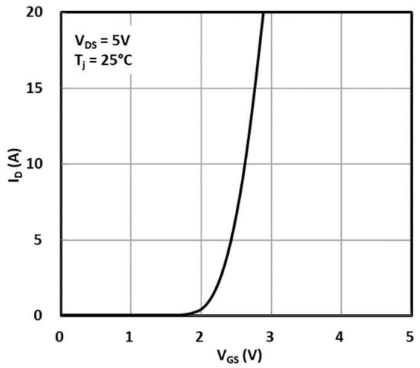


Fig. 2 Transfer characteristics

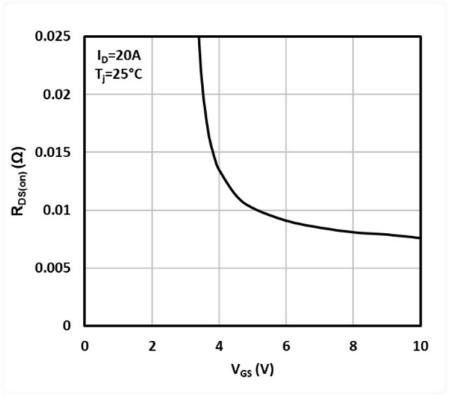


Fig.3 On-resistance vs. gate voltage

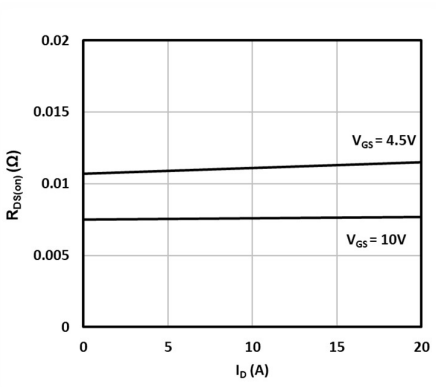


Fig.4 On-resistance vs. drain current

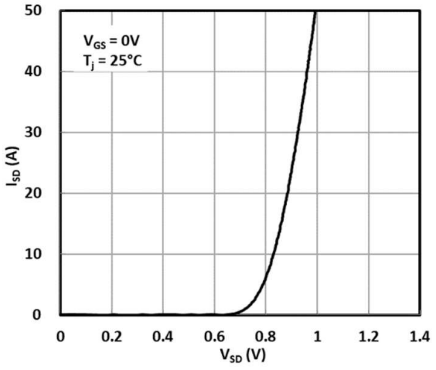


Fig.5 Source-to-drain diode forward characteristics

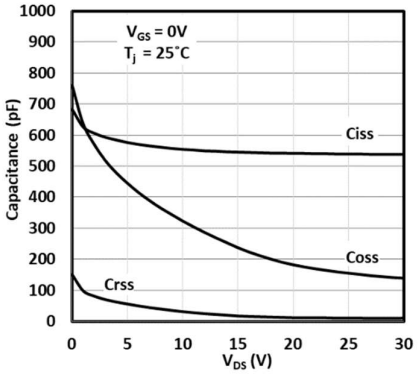


Fig.6 Capacitance vs. drain-to-source voltage



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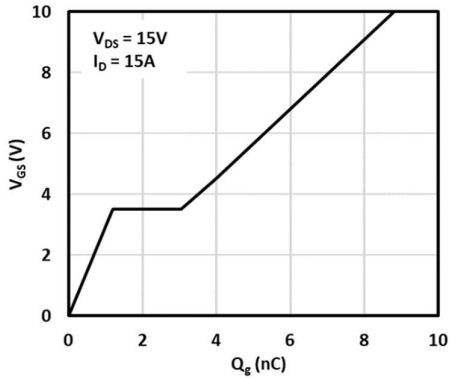


Fig.7 Gate-to-source voltage vs. gate charge

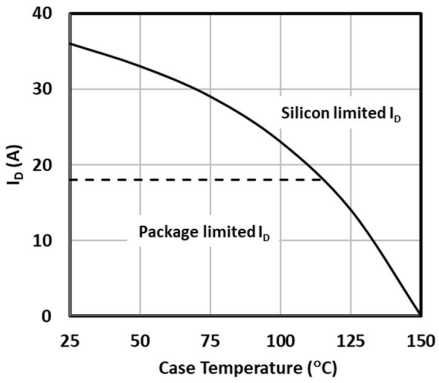


Fig.8 Maximum drain current vs. case temperature

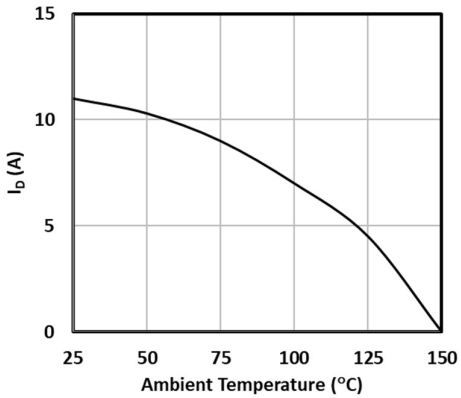


Fig. 9 Maximum drain current vs. ambient temperature



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## Q2:

### Static Electrical Characteristics [8]

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-to-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 30 | - | - | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$ = $V_{GS}$ , $I_D$ = 250μA | 1.0 | - | 2.0 | |
| Drain-to-Source Leakage Current | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| Drain-to-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 15A | - | 6.9 | 8.9 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 10A | - | 10.9 | 14.1 | mΩ |

### Dynamic Electrical Characteristics [8]

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 10A | - | 40 | - | S |
| Total Gate Charge | $Q_g$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $I_D$ = 15A | - | 10.9 | - | nC |
| Gate-to-Source Charge | $Q_{gs}$ | | - | 1.3 | - | |
| Gate-to-Drain Charge | $Q_{gd}$ | | - | 2.2 | - | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $I_D$ = 15A, $R_G$ = 3.0Ω | - | 3.1 | - | ns |
| Rise Time | $t_r$ | | - | 3.1 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 27 | - | |
| Fall Time | $t_f$ | | - | 5.8 | - | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1MHz | - | 680 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 300 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 20 | - | |

### Diode Characteristics [8]

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0V, $I_S$ = 10A | - | 0.8 | - | V |
| Reverse Recovery Time | $T_{rr}$ | $V_{GS}$ = 0V, $I_S$ = 10A, $dI_S/dt$ = 100A/μs | - | 18 | - | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 24 | - | nC |

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## Q2 : Typical Electrical Characteristics

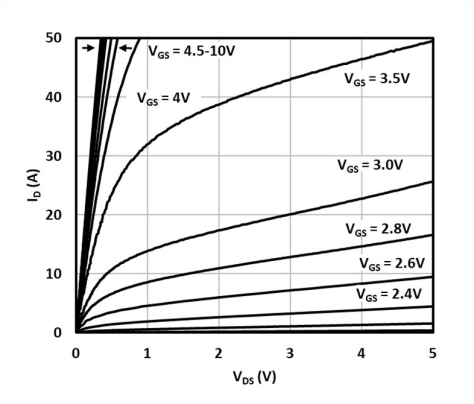


Fig. 1 Output characteristics

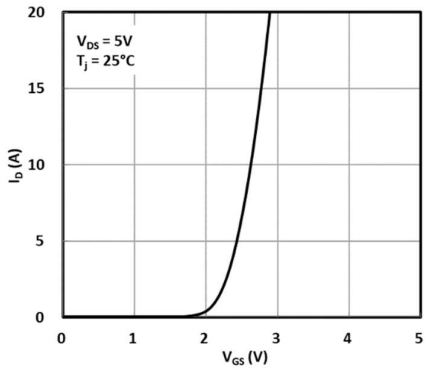


Fig. 2 Transfer characteristics

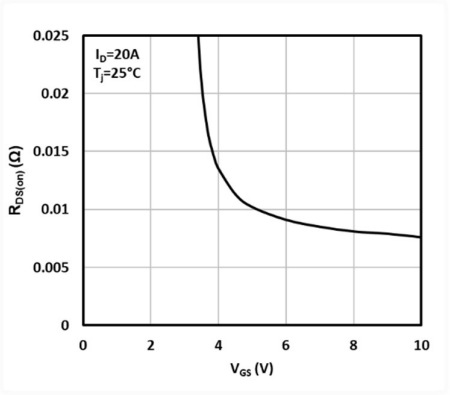


Fig.3 On-resistance vs. gate voltage

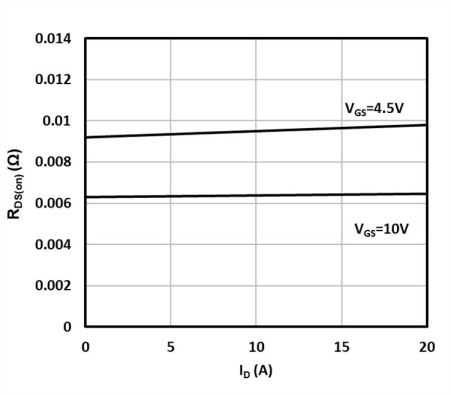


Fig.4 On-resistance vs. drain current

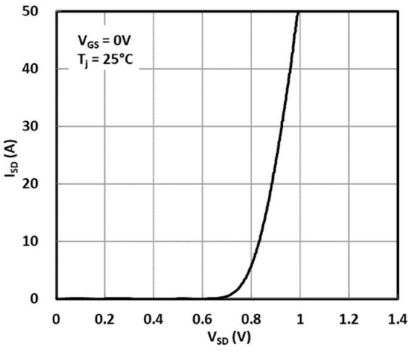


Fig.5 Source-to-drain diode forward characteristics

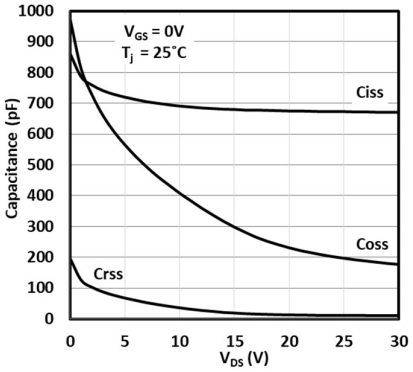


Fig.6 Capacitance vs. drain-to-source voltage

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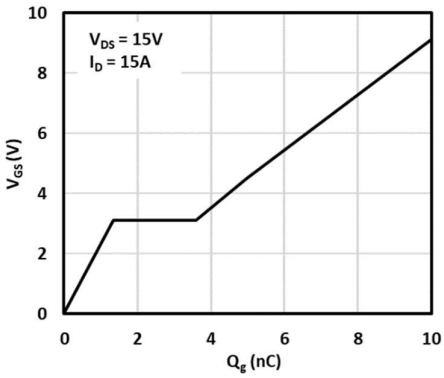


Fig.7 Gate-to-source voltage vs. gate charge

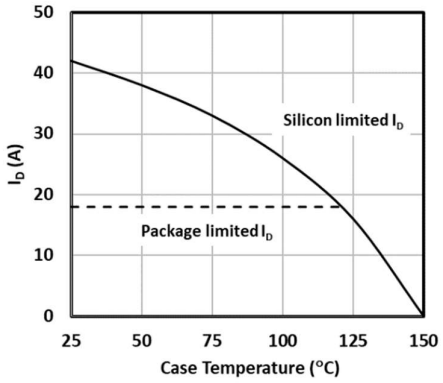


Fig.8 Maximum drain current vs. case temperature

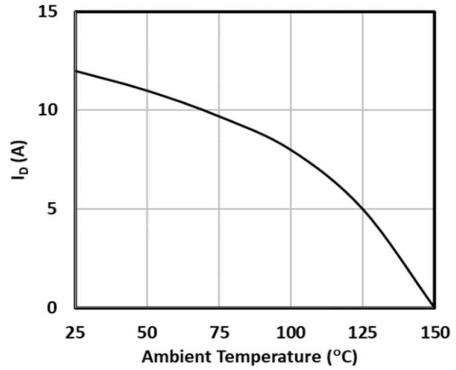


Fig. 9 Maximum drain current vs. ambient temperature



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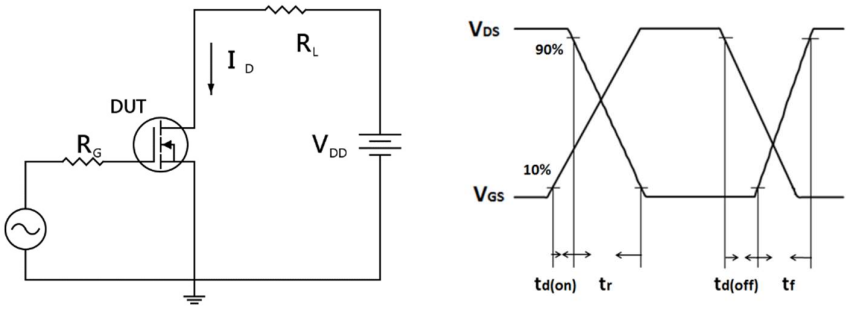
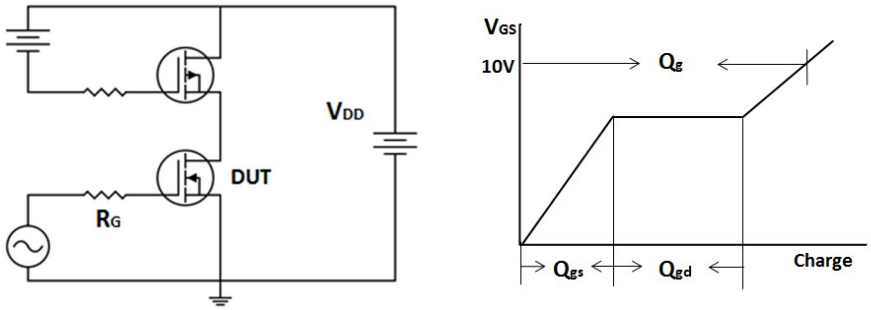
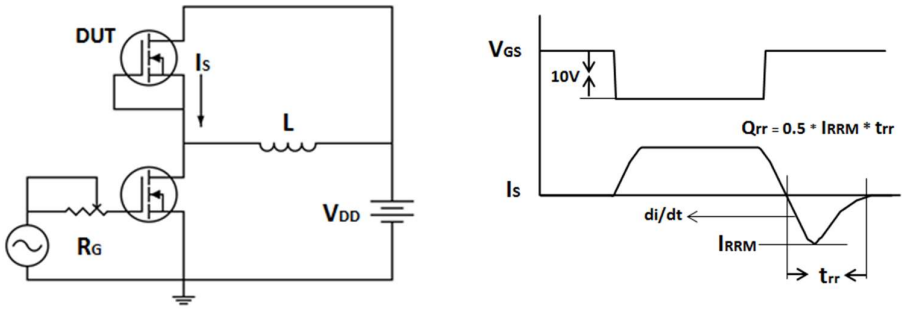
## Test Circuits and Waveforms




**Resistive switching time test circuit & waveforms**




**Gate charge test circuit & waveform**




**Peak diode recovery dv/dt test circuit & waveforms**



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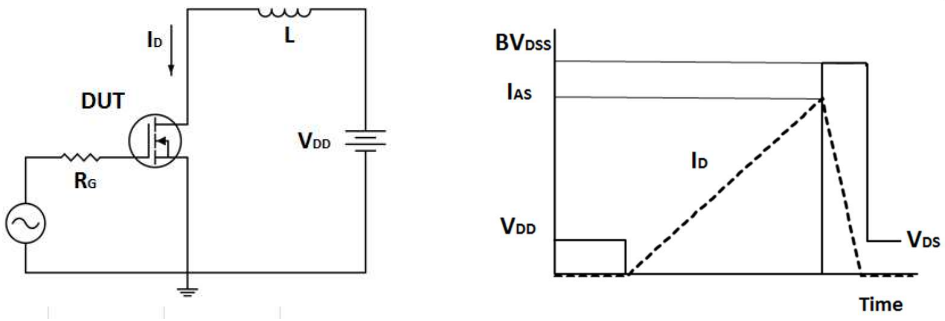
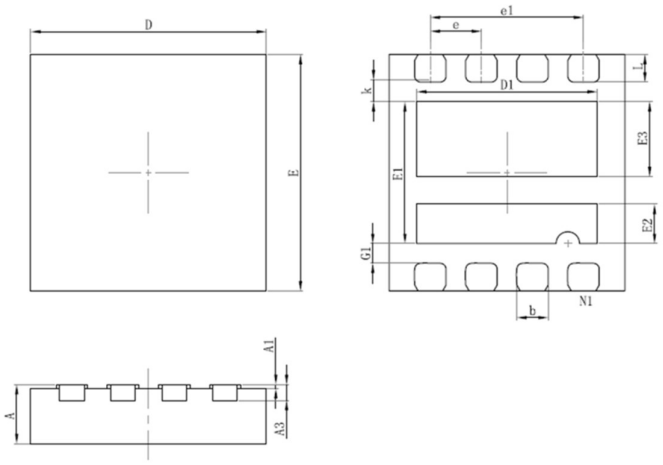



**Unclamped inductive switching test circuit & waveforms**

## Package Drawing




| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | Min. | Max. |
| A | 0.700 | 0.800 |
| A1 | 0.000 | 0.050 |
| A3 | 0.203REF. | |
| D | 2.950 | 3.050 |
| E | 2.950 | 3.050 |
| D1 | 2.250 | 2.350 |
| E1 | 1.700 | 1.900 |
| E2 | 0.450 | 0.550 |
| E3 | 0.900 | 1.000 |
| k | 0.200 | 0.300 |
| G1 | 0.200 | 0.300 |
| b | 0.350 | 0.450 |
| e | 0.650BSC | |
| e1 | 1.95BSC | |
| L | 0.300 | 0.400 |

**DFN3x3 Dual Asymmetric**



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**Revision History of JMS4710N Specification**

| Version | Change Items | Effective Date |
|---|---|---|
| 1.00 | Initial Release | 04-Mar-20 |

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