## General Description

It combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$.

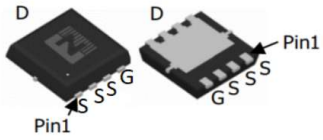
## Features

- ■Low $R_{DS(ON)}$ to minimize conductive loss
- ■Low Gate Charge for fast switching
- ■Low thermal resistance
- ■AEC-Q101 qualified

## Application

- ■BLDC motor driver
- ■DC-DC
- ■Load switch

## Product Summary

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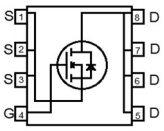



$V_{DS}$=60V

$R_{DS(ON)}$ =5.2mR

$I_D$=112A

RoHS REACH HF

## Ordering Information

| Part NO. | ZMSA050N06HMC |
|---|---|
| Marking | 050N06H |
| Packing information | REEL TAPE |
| Basic ordering unit (pcs) | 5000 |

## Absolute Maximum Ratings ($T_A$=25℃,unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | | - | 60 | V |
| Gate-source voltage① | $V_{GS}$ | | -20 | 20 | V |
| Continuous drain current | $I_D$ | $V_{GS}$=10V, $T_C$=25℃ | - | 112 | A |
| | $I_D$ | $V_{GS}$=10V, $T_C$=75℃ | - | 91 | A |
| | $I_D$ | $V_{GS}$=10V, $T_C$=100℃ | - | 79 | A |
| Pulsed drain current ① | $I_{DM}$ | Pulsed, $t_p$ ≤ 10 μs, $T_C$ = 25 °C | - | 448 | A |
| Diode continuous current | $I_S$ | $V_{GS}$=0V, $T_C$=25℃ | - | 112 | A |
| Diode pulse current | $I_{S,pulse}$ | $V_{GS}$=0V, Pulsed, $t_p$ ≤ 10 μs, $T_C$ = 25 °C | - | 448 | A |
| Total power dissipation | $P_D$ | $T_C$=25℃ | - | 155 | W |
| Total power dissipation | $P_D$ | $T_A$=25℃ | - | 2.5 | W |
| Operating junction temperature | $T_J$ | | -55 | 175 | ℃ |
| Storage temperature | $T_{STG}$ | | -55 | 175 | ℃ |
| Single pulse avalanche energy | $E_{AS}$ | L=0.1mH, $V_{GS}$=10V, $R_g$=25Ω | - | 65 | mJ |

| | | | | | |
|---|---|---|---|---|---|
| Single pulse avalanche energy | $E_{AS}$ | L=0.5mH, $V_{GS}$=10V, $R_g$=25Ω | - | 117 | mJ |
| ESD level (HBM) | | | CLASS 2 | | |

## ●Thermal resistance

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 0.97 | °C/W |
| Thermal resistance, junction - ambient | $R_{thJA}$② | - | - | 60 | °C/W |
| Soldering temperature | $T_{sold}$ | - | - | 260 | °C |

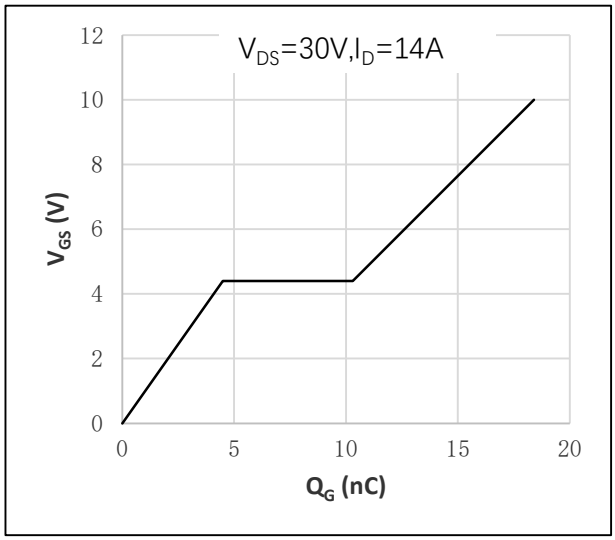
## ●Electronic Characteristics ($T_j$=25°C, unless otherwise specified)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$ =0V, $I_D$ =250uA | 60 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$, $I_D$=250uA | 2 | 2.7 | 4 | V |
| Drain-source leakage current | $I_{DSS}$ | $V_{GS}$=0V, $V_{DS}$=60V | - | - | 1 | uA |
| Gate- source leakage current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$ =0V | - | - | 100 | nA |
| Static drain-source on resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=14A, $T_j$=25℃ | - | 5.2 | 6.2 | mΩ |
| | | $V_{GS}$=10V, $I_D$=14A, $T_j$=175℃ | - | 10.4 | - | mΩ |
| Forward transconductance | $g_{FS}$ | $V_{DS}$ =5V, $I_{SD}$ = 10A | - | 10 | - | S |
| Diode forward voltage | $V_{FSD}$ | $V_{GS}$ =0V, $I_{SD}$ = 14A | - | 0.8 | 1.3 | V |

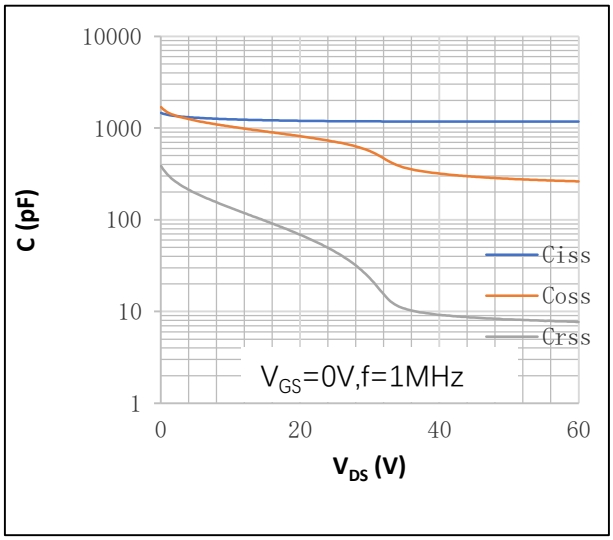
## ●Dynamic characteristics ($T_j$=25°C, unless otherwise specified)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | f = 1MHz, $V_{DS}$=30V, $V_{GS}$=0V | - | 1207 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 508 | - | pF |
| Reverse transfer capacitance | $C_{rss}$ | | - | 27 | - | pF |
| Gate resistance | $R_g$ | f = 1MHz | - | 1.4 | - | Ω |
| Total gate charge | $Q_g$ | $V_{DD}$ = 30V, $I_D$ = 14A, $V_{GS}$ = 10V | - | 18.4 | - | nC |
| Gate-source charge | $Q_{gs}$ | | - | 4.5 | - | nC |
| Gate-drain charge | $Q_{gd}$ | | - | 5.8 | - | nC |
| Turn-on delay time | $t_{D(on)}$ | $V_{GS}$=10V, $V_{DS}$=30V, $R_G$ =3.3Ω, $I_D$ =14A | - | 5 | - | ns |
| Turn-on rise time | $t_r$ | | - | 3 | - | ns |
| Turn-off delay time | $t_{D(off)}$ | | - | 15 | - | ns |
| Turn-off fall time | $t_f$ | | - | 3 | - | ns |
| Reverse recovery time | $t_{rr}$ | $V_{DD}$=30V, dIs/dt = 100A/us, Is=14A | - | 19 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 7 | - | nC |

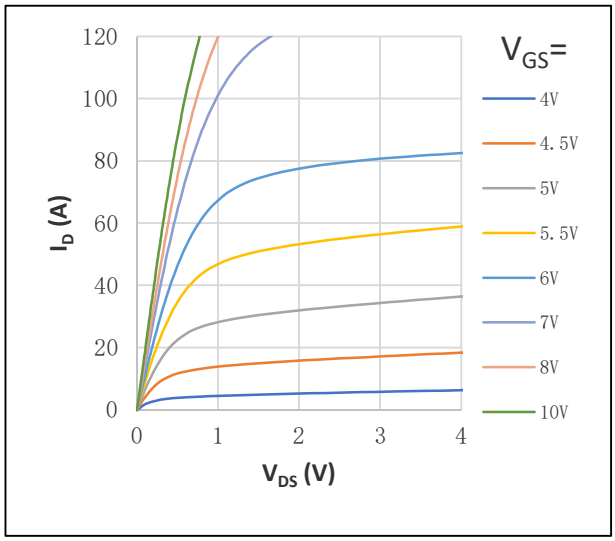
●Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j$=25℃



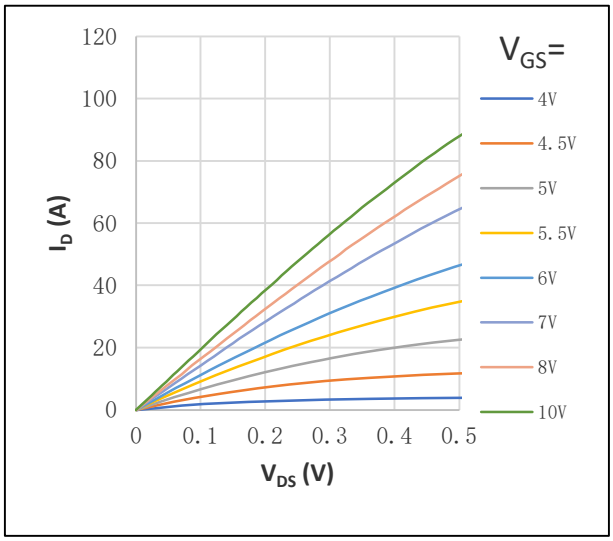

●Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j$=25℃



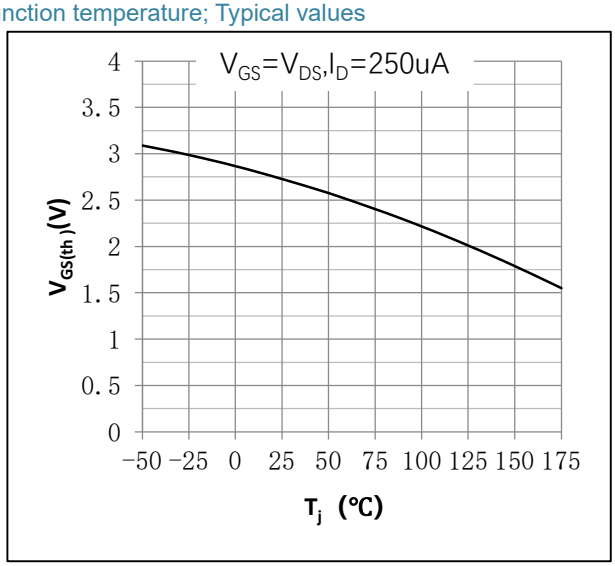

●Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j$=25℃



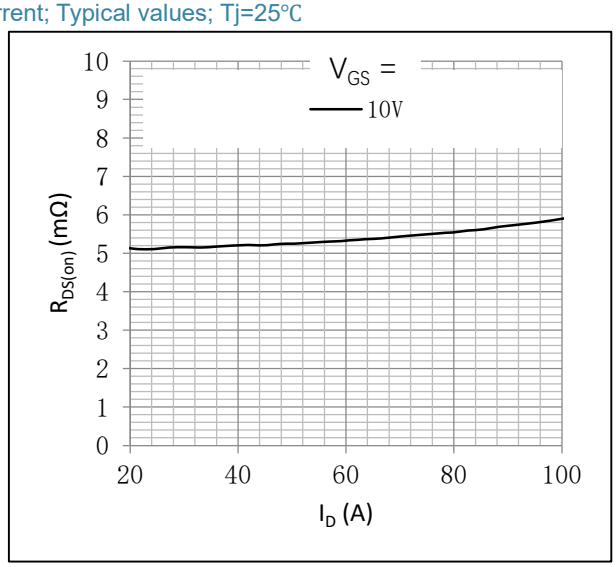

●Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j$=25℃



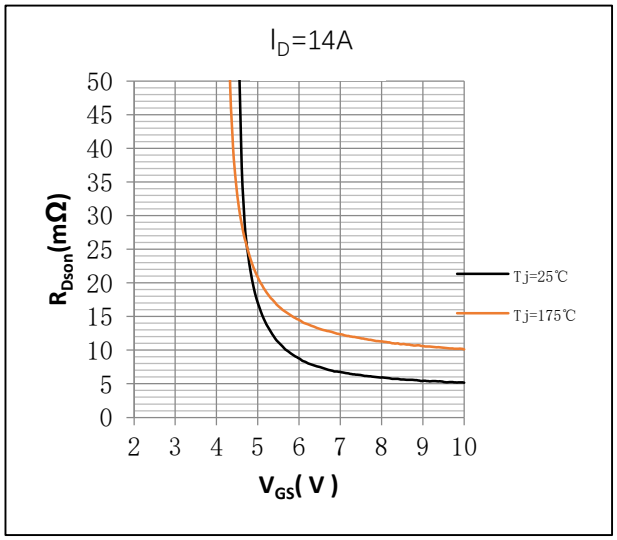

●Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values



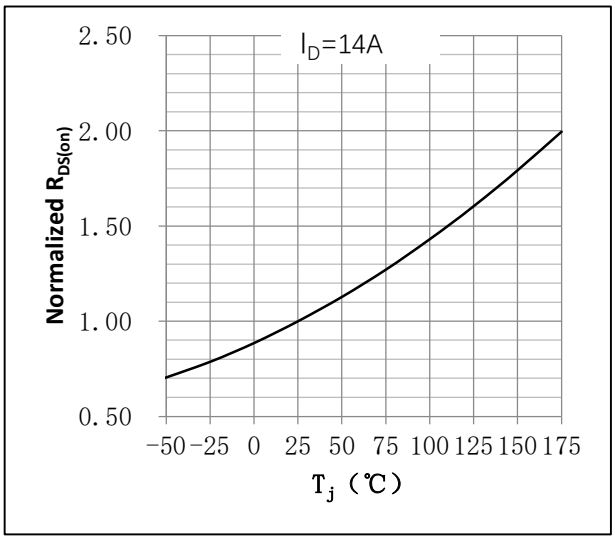

●Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; Tj=25℃



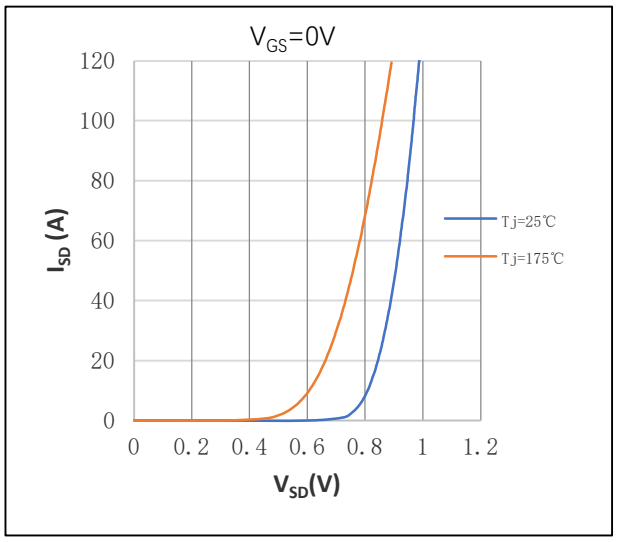
●Fig.7 Drain-source on-state resistance as a function of gate-source voltage; Typical values



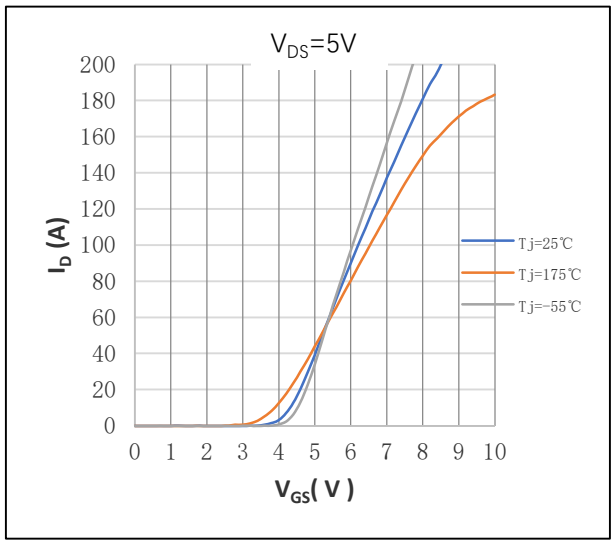

●Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance=$R_{DSon}$/$R_{DSon}$(25℃)



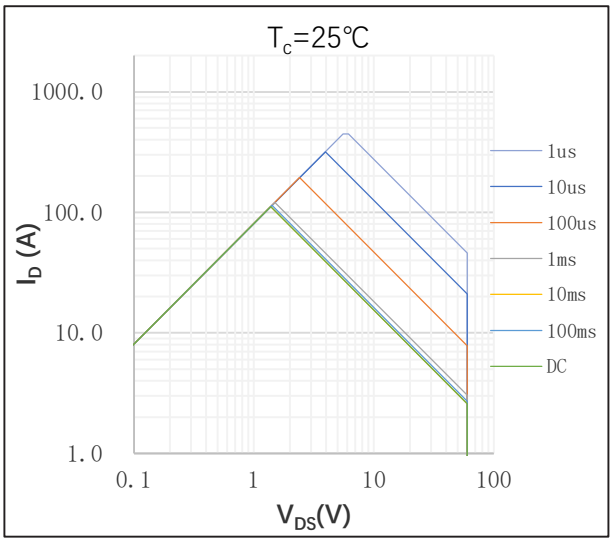

●Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values



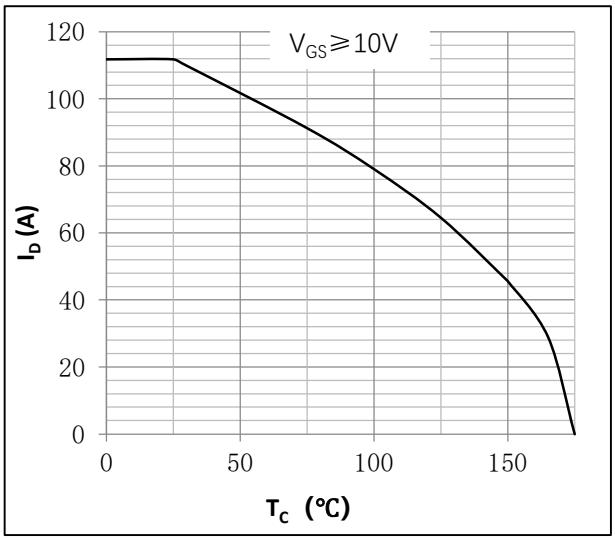

●Figure 10. Transfer characteristics: drain current as a function of gate-source voltage; Typical values



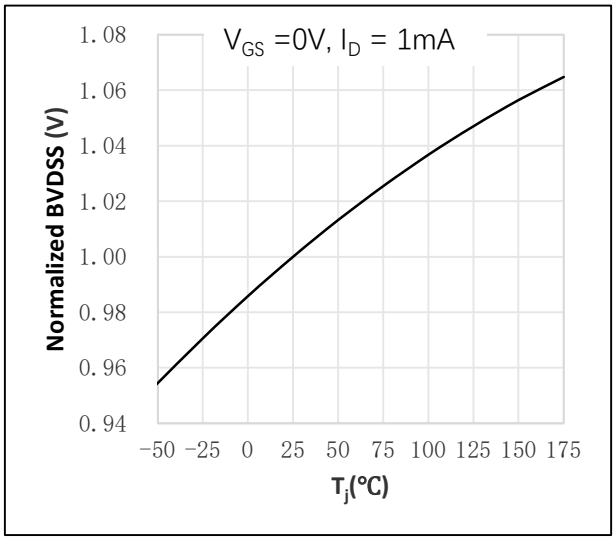

●Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



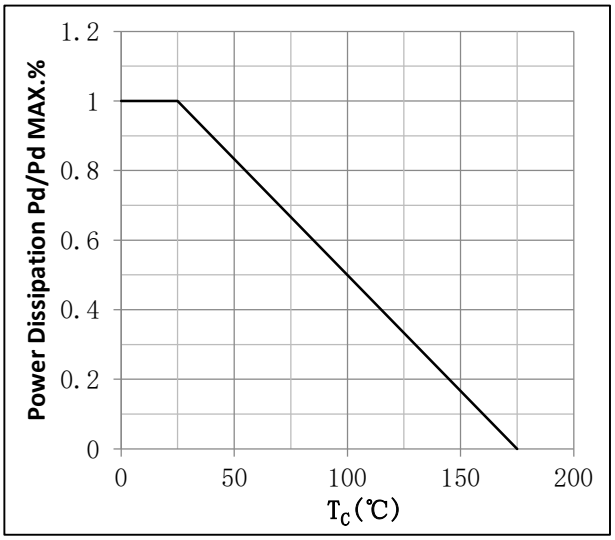

●Fig.12 Continuous drain current as a function of case temperature[3];Calculative values



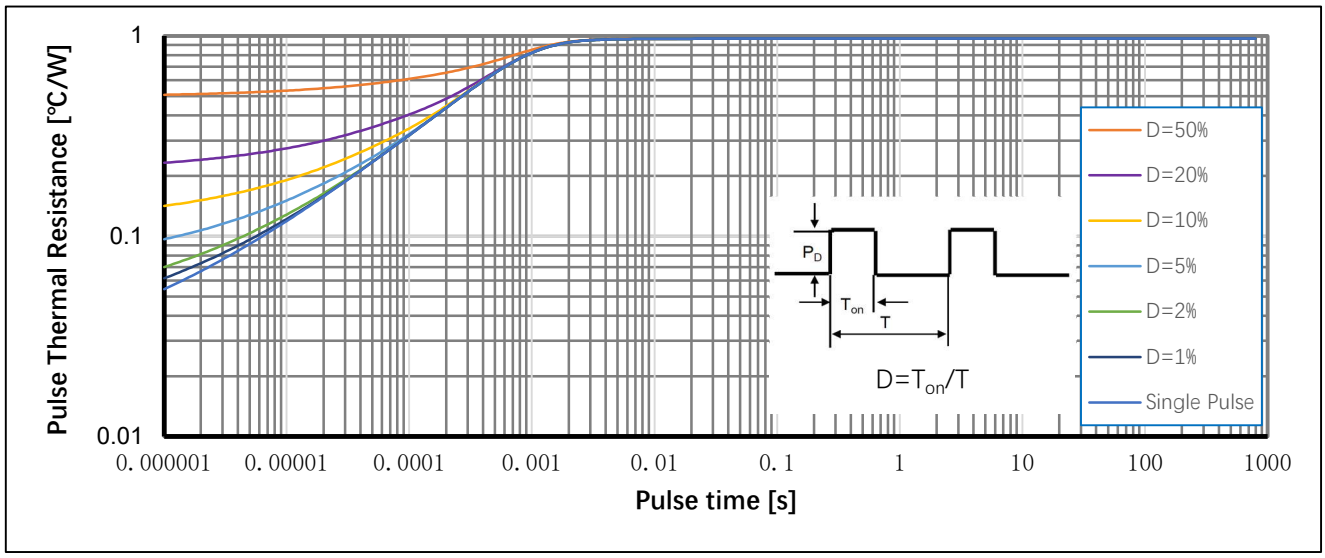
●Fig.13 Drain-source breakdown voltage as a function of junction temperature; Typical values



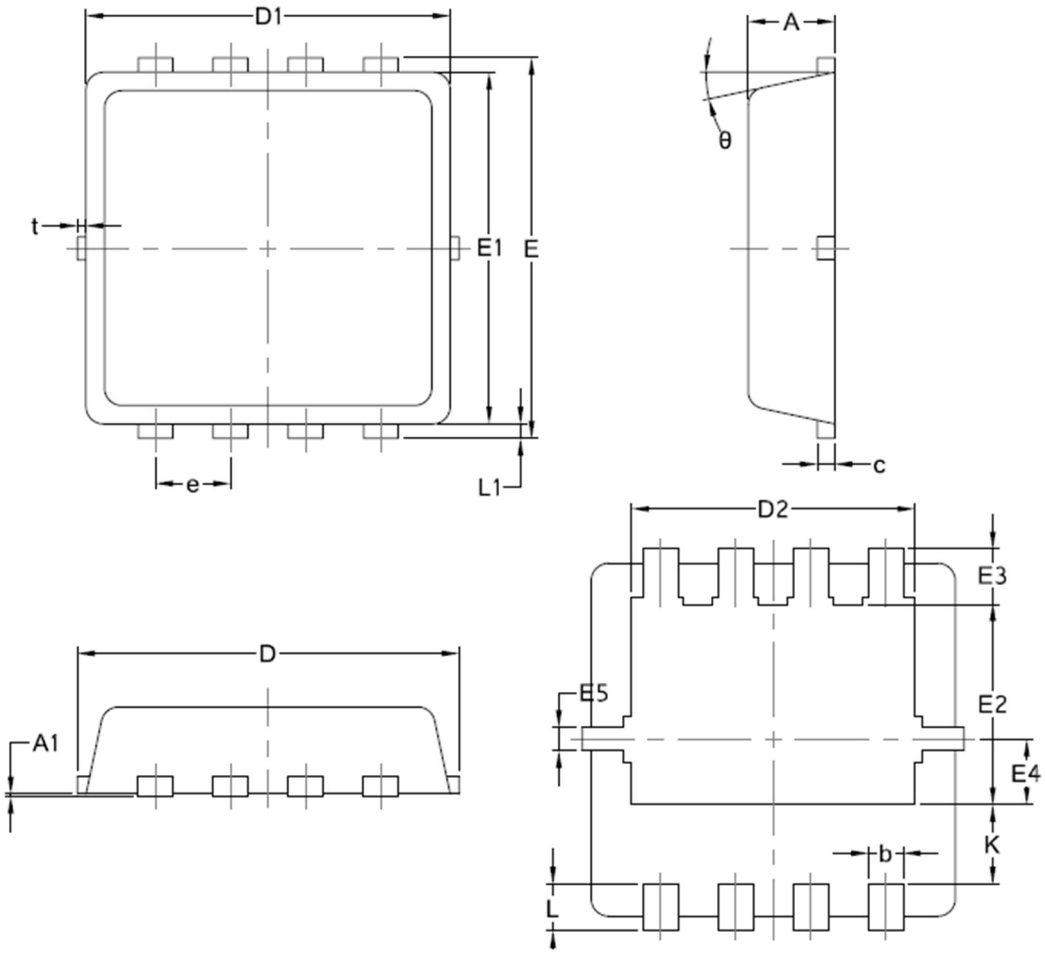

●Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation =$P_d/P_d$(25℃)




●Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



## ●Package Outline




| SYMBOL | COMMON | | |
|---|---|---|---|
| | MM | | |
| | MIN | 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 |
| ②D1 | 3.00 | 3.15 | 3.25 |
| ②D2 | 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 |
| ③E3 | 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 |
| ②K | 0.59 | 0.69 | 0.89 |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.06 | 0.125 | 0.20 |
| ②t | 0 | 0.075 | 0.13 |
| ②θ | 10° | 12° | 14° |

## Note

① Pulse : $V_{GS}$=+20V/-20V, Duty cycle=50%,$T_j$=175℃, t=1000 hours; For DC ， the following test conditions can be passed: $V_{GS}$=+20V/-10V, $T_j$=175℃, t=1000 hours;

② Device mounted on 1 square inch FR-4 substrate PCB, 1oz copper, minimum footprint, tested in a still air environment with TA=25°C;

③Practically the current will be limited by PCB, thermal design and operating temperature. $V_{GS}$=10V.

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## Revision History

| Version | Date | Change |
|---|---|---|
| A | 2025/10/11 | New |
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