General Description

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

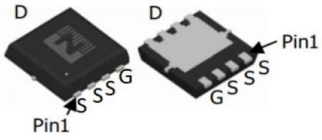
Features

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

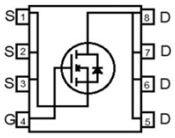
Application

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

Product Summary



DFN3*3



V_{DS}=100V

$R_{DS(ON)}$ =43.8mR

I_D=16A

RoHS REACH COMPLIANT HF

Ordering Information

Part NO.	ZMSA420N10M
Marking	420N10
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}	25℃≤Tj≤175℃	-	100	V
Gate-source voltage①	V_{GS}	DC; -55℃≤Tj≤175℃	-20	20	V
Continuous drain current	I_D	V_{GS}=10V, T_C=25℃	-	16	A
	I_D	V_{GS}=10V, T_C=75℃	-	13	A
	I_D	V_{GS}=10V, T_C=100℃	-	12	A
Pulsed drain current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_C = 25 °C;	-	51	A
Diode continuous current	I_S	V_{GS}=0V, T_C=25℃	-	16	A
Diode pulse current	$I_{S,pulse}$	Pulsed; t_p ≤ 10 μs; T_C = 25 °C;	-	51	A
Total power dissipation	P_D	V_{GS}＞6V, T_C=25℃	-	32	W
Total power dissipation	P_D	V_{GS}＞6V, 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	-	8	mJ

Single pulse avalanche energy	E_{AS}	L=0.5mH, V_{GS}=10V, R_g=25Ω	-	20	mJ
ESD level (HBM)			CLASS 1B		

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	4.7	°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)

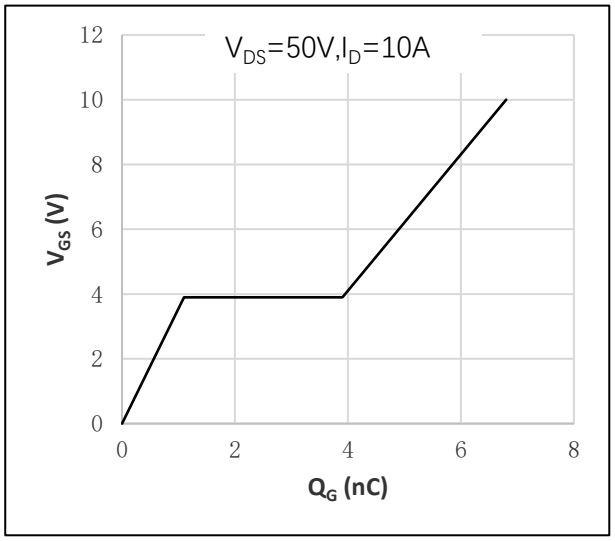
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	V_{GS} =0V, I_D =250uA, T_j=25℃	100	-	-	V
		V_{GS} =0V, I_D =1mA, T_j=-55℃	95.6	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250uA, T_j=25℃	1.4	1.9	2.5	V
		V_{GS}=V_{DS}, I_D=1mA, T_j=-55℃	-	-	2.9	V
		V_{GS}=V_{DS}, I_D=1mA, T_j=175℃	0.9	-	-	V
Drain-source leakage current	I_{DSS}	V_{GS}=0V, V_{DS}=100V, T_j=25℃	-	-	1	uA
		V_{GS}=0V, V_{DS}=100V, T_j=175℃	-	-	500	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=10A, T_j=25℃	-	43.8	54.8	mΩ
		V_{GS}=10V, I_D=10A, T_j=175℃	-	96.5	-	mΩ
		V_{GS}=4.5V, I_D=6A, T_j=25℃		60.4	75.5	mΩ
Forward transconductance	g_{FS}	V_{DS} =5V, I_D = 10A	-	7.4	-	S
Diode forward voltage	V_{FSD}	V_{GS} =0V, I_{SD} = 10A	-	0.9	1.3	V

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

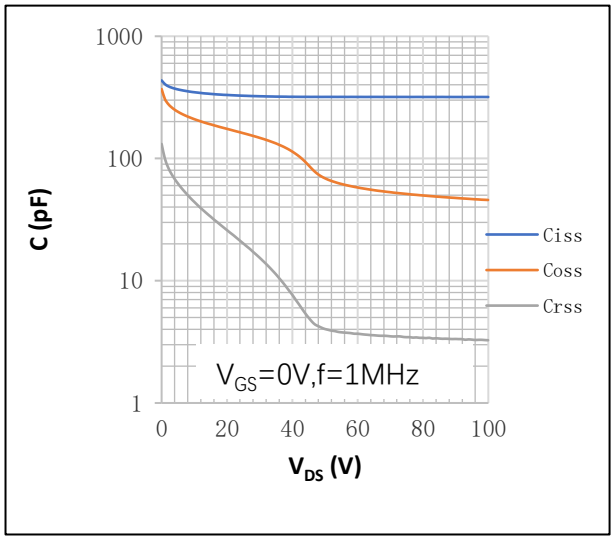
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	f = 1MHz, V_{DS}=50V, V_{GS}=0V	-	319	-	pF
Output capacitance	C_{oss}		-	68	-	pF
Reverse transfer capacitance	C_{rss}		-	4	-	pF
Gate resistance	R_g	f = 1MHz	-	1	-	Ω
Total gate charge	Q_g	V_{DD} = 50V, I_D = 10A, V_{GS} = 10V	-	6.8	-	nC
	Q_g(4.5V)			4.2	-	nC
Gate-source charge	Q_{gs}		-	1.1	-	nC
Gate-drain charge	Q_{gd}		-	2.8	-	nC

Turn-on delay time	$t_{D(on)}$	V_{GS}=10V, V_{DS}=50V, R_G =3.3Ω, I_D =10A	-	10	-	ns
Turn-on rise time	t_r		-	4.2	-	ns
Turn-off delay time	$t_{D(off)}$		-	15	-	ns
Turn-off fall time	t_f		-	4.4	-	ns
Reverse recovery time	t_{rr}	V_{DD}=50V, dI_S/dt = 100A/us, I_S=10A	-	57	-	ns
Reverse recovery charge	Q_{rr}		-	80	-	nC

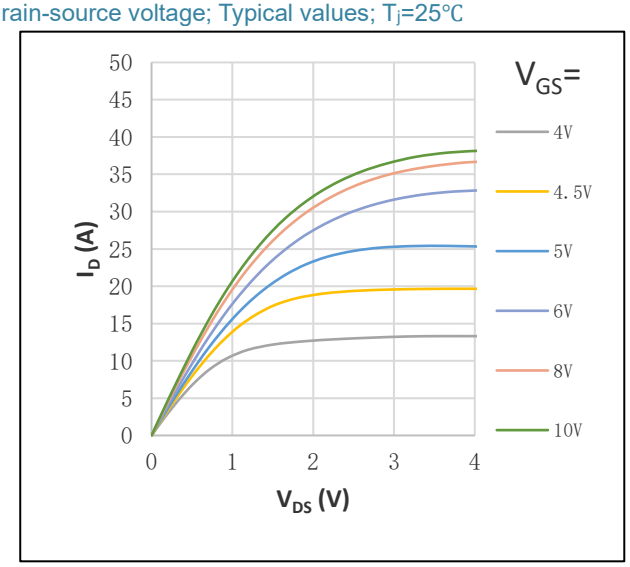
●Fig.1 Gate-source voltage as a function of gate charge; Typical values; T_j=25℃



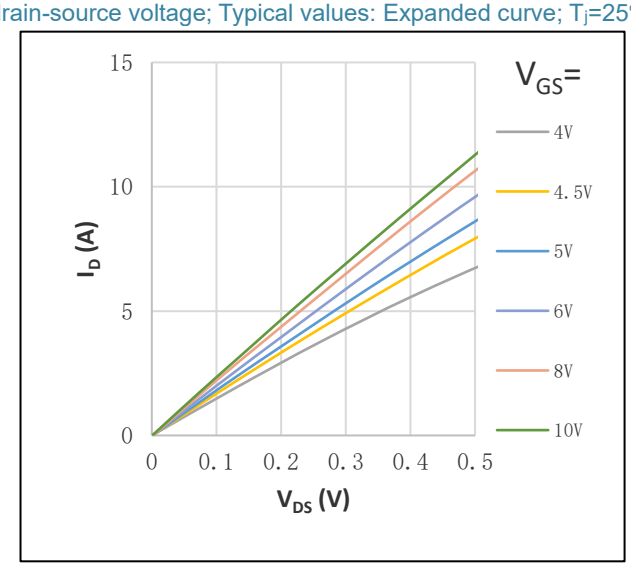
●Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; T_j=25℃



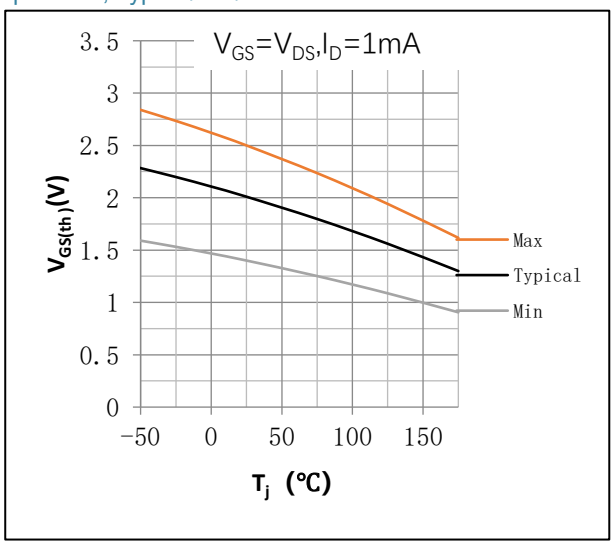
●Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; T_j=25℃



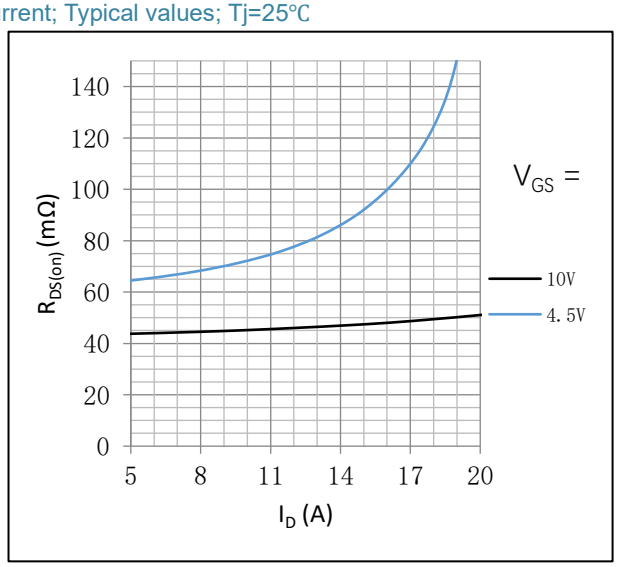
●Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; T_j=25℃



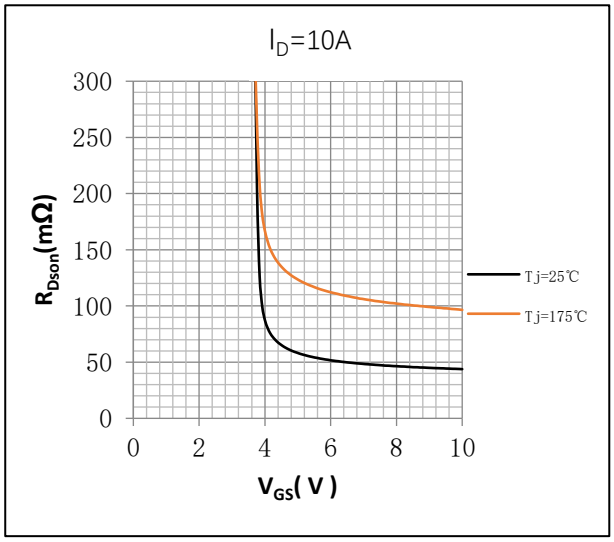
●Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical/Min/Max values



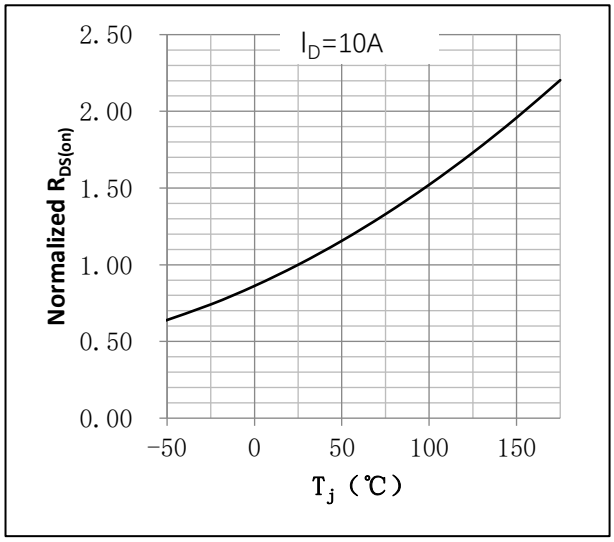
●Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; Tj=25℃



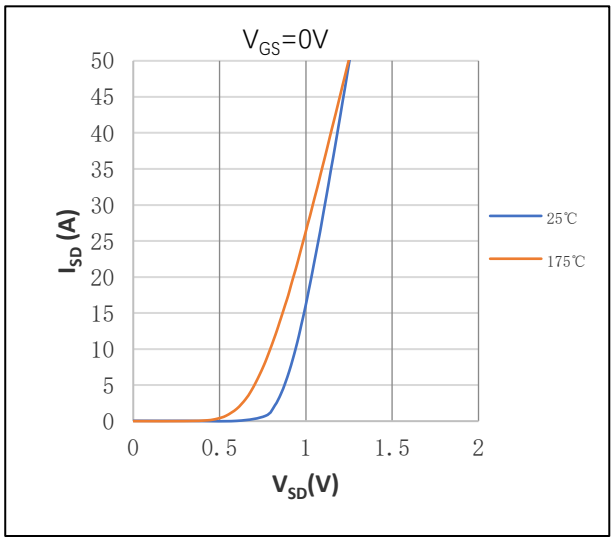
●Fig.7 Drain-source on-state resistance as a function of gate-source voltage; Typical values



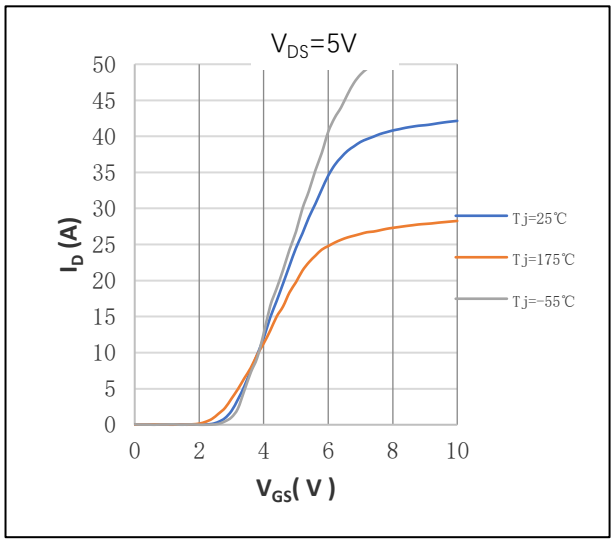
●Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance=R_{DSon}/R_{DSon}(25℃)



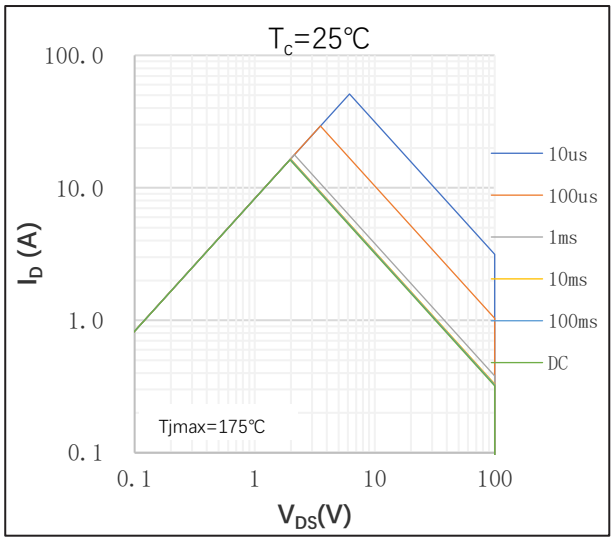
●Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values



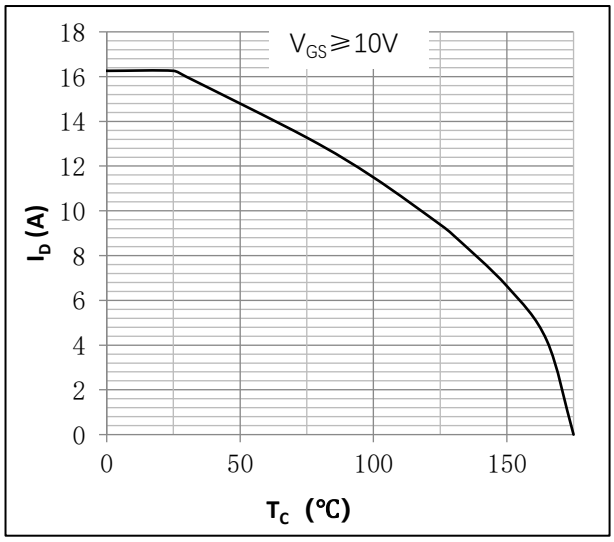
●Figure 10. Transfer characteristics: drain current as a function of gate-source voltage; Typical values



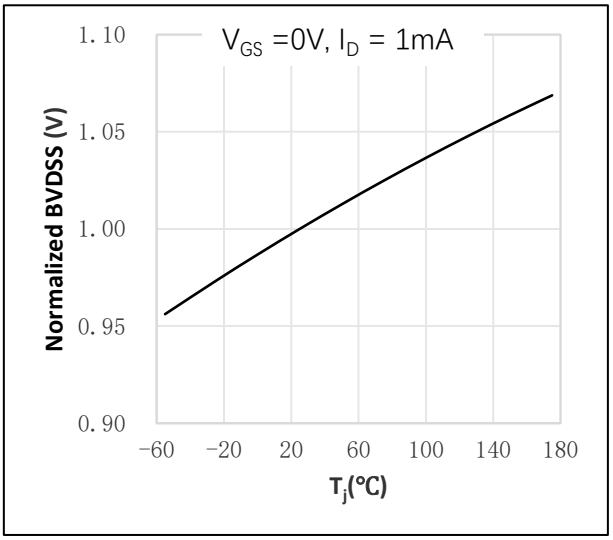
●Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



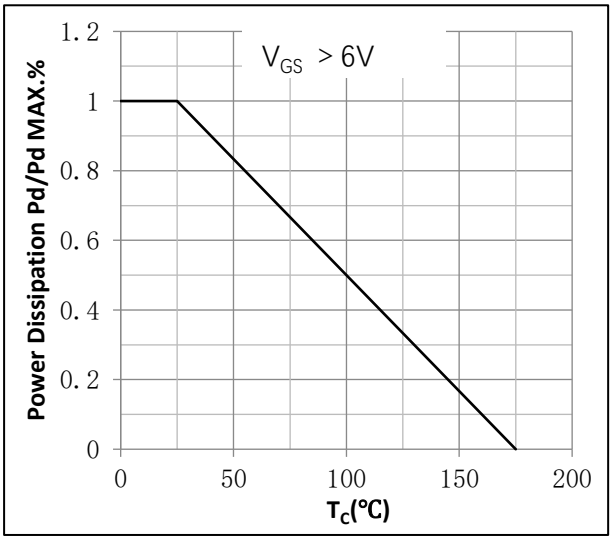
●Fig.12 Continuous drain current as a function of case temperature[③];Calculative values



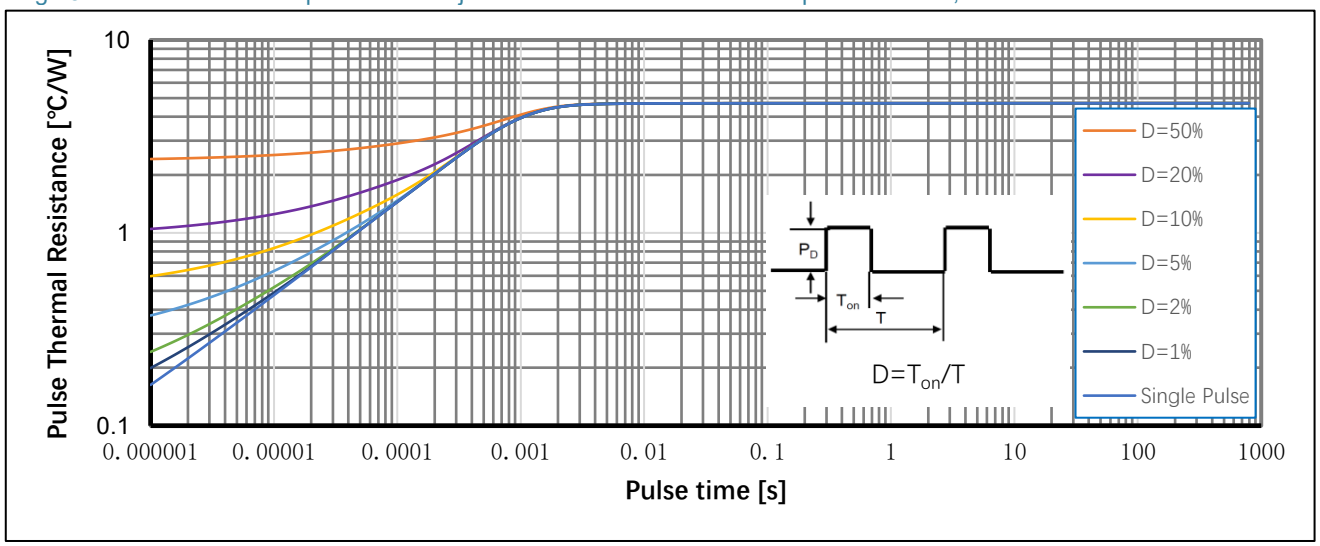
●Fig.13 Drain-source breakdown voltage as a function of junction temperature; Normalized values



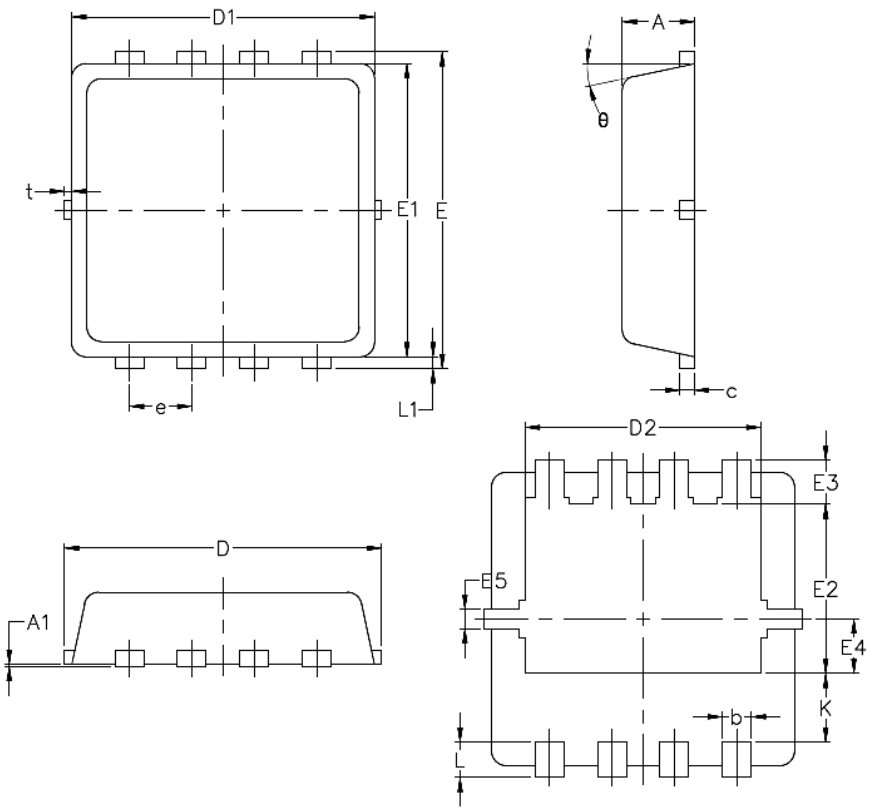
●Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation =P_d/P_d(25℃)



●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
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	1.56	1.76	1.96
E3	0.305	0.455	0.625
E4	0.365	0.565	0.765
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.62	0.72	0.92
L	0.265	0.365	0.465
L1	0.06	0.125	0.20
t	0	0.075	0.13
θ	10°	12°	14°

Note:

1. Refer to JEDEC MO-240.

●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 FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;

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	2021/12/10	New
B	2022/10/20	1.Add Reach, HF figure; 2.Fig1~12 modified; 3.Add “It is suitable for automotive application”; 4.Add dynamic characteristics.
C	2026/8/24	Apply new datasheet format.