

● General Description

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

● Features

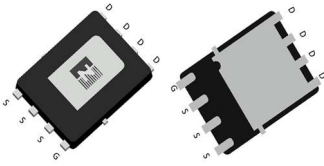
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low thermal resistance
- AEC-Q101 qualified

● Application

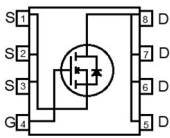
- BLDC motor driver
- DC-DC
- Load switch



● Product Summary



DSCQFN5*6



$V_{DS}=60V$

$R_{DS(ON)}=1.25m\Omega$

$I_D=223A$



● Ordering Information

Part NO.	ZMSA012N06HNCD
Marking	ZMS012N06H
Packing information	REEL TAPE
Basic ordering unit (pcs)	3000

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-source voltage	V_{DS}		-	60	V
Gate-source voltage ^①	V_{GS}		-20	20	V
Continuous drain current	I_D	$V_{GS}=10V, T_C=25^\circ C$	-	223	A
	I_D	$V_{GS}=10V, T_C=75^\circ C$	-	184	A
	I_D	$V_{GS}=10V, T_C=100^\circ C$	-	160	A
Pulsed drain current	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_C = 25^\circ C$;	-	669	A
Diode continuous current	I_S	$V_{GS}=0V, T_C=25^\circ C$	-	135	A
Diode pulse current	$I_{S,pulse}$	$V_{GS}=0V$, Pulsed, $t_p \leq 10 \mu s$, $T_C = 25^\circ C$	-	540	A
Total power dissipation	P_D	$T_C=25^\circ C$	-	176	W
Total power dissipation	P_D	$T_A=25^\circ C$	-	3.3	W
Operating junction temperature	T_J		-55	175	$^\circ C$
Storage temperature	T_{STG}		-55	175	$^\circ C$
Single pulse avalanche energy	E_{AS}	$L=0.1mH, V_{GS}=10V, R_g=25\Omega$,	-	320	mJ

		L=0.5mH, V _{GS} =10V, R _g =25Ω,	-	672	mJ
ESD level (HBM)			CLASS 2		

● Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R _{thJC}	-	-	0.85	°C/W
Thermal resistance, junction - ambient	R _{thJA} ^②	-	-	45	°C/W
Soldering temperature	T _{sold}	-	-	260	°C

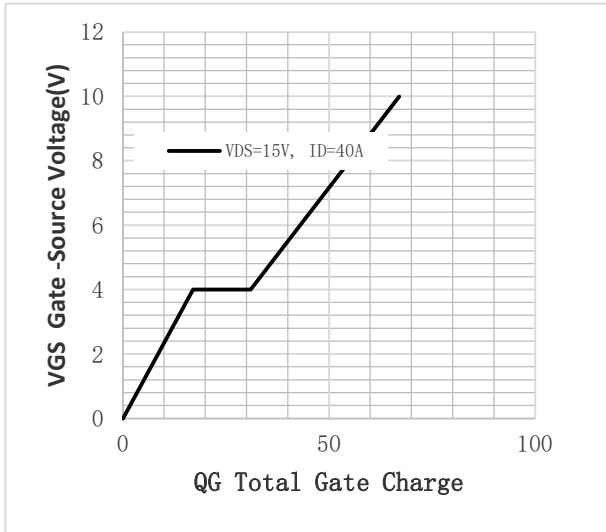
● Electronic Characteristics (T_j=25°C, unless otherwise specified)

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 =40A, T _j =25°C	-	1.25	1.65	mΩ
Forward transconductance	g _{FS}	V _{DS} =5V, I _{SD} = 10A	-	15	-	S
Diode forward voltage	V _{FSD}	V _{GS} =0V, I _{SD} = 40A	-	-	1.3	V

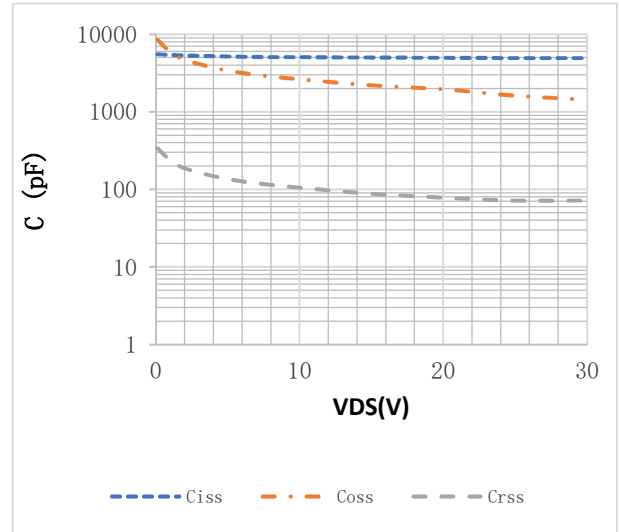
● Dynamic characteristics (T_j=25°C, unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C _{iss}	f = 1MHz, V _{DS} =25V, V _{GS} =0V	-	4950	-	pF
Output capacitance	C _{oss}		-	1800	-	pF
Reverse transfer capacitance	C _{rss}		-	72	-	pF
Gate resistance	R _g	f = 1MHz	-	1.6	-	Ω
Total gate charge	Q _g	V _{DD} = 15V, I _D = 20A, V _{GS} = 10V	-	67	-	nC
Gate-source charge	Q _{gs}		-	17	-	nC
Gate-drain charge	Q _{gd}		-	14	-	nC
Turn-on delay time	t _{D(on)}	V _{GS} =10V, V _{DS} =15V, R _G =3.3Ω, I _D =20A	-	15	-	ns
Turn-on rise time	t _r		-	10	-	ns
Turn-off delay time	t _{D(off)}		-	26	-	ns
Turn-off fall time	t _f		-	17	-	ns
Reverse recovery time	t _{rr}	V _{DD} =20V, dI _S /dt = 100A/us, I _S =50A	-	48	-	ns
Reverse recovery charge	Q _{rr}		-	47	-	nC

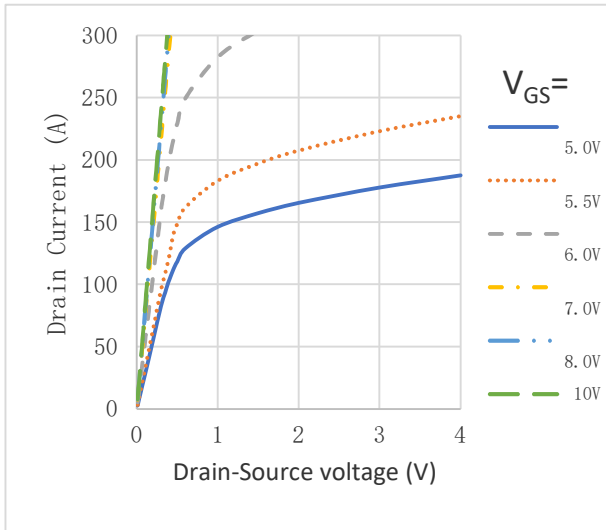
● Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$



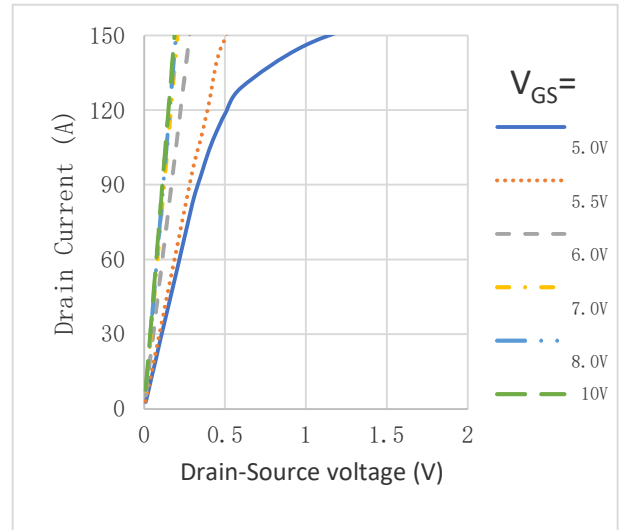
● Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$



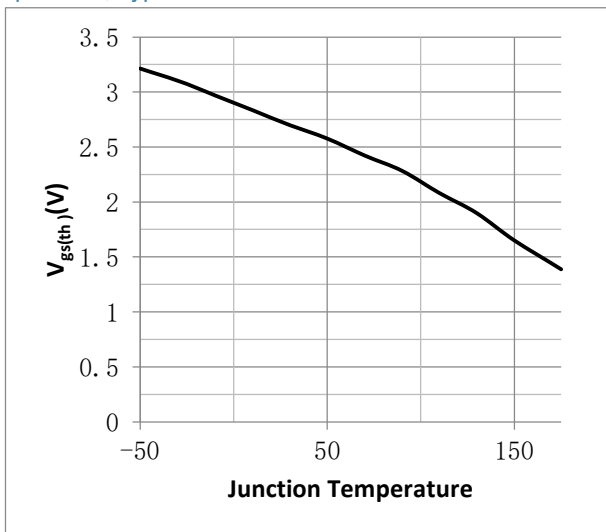
● Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$



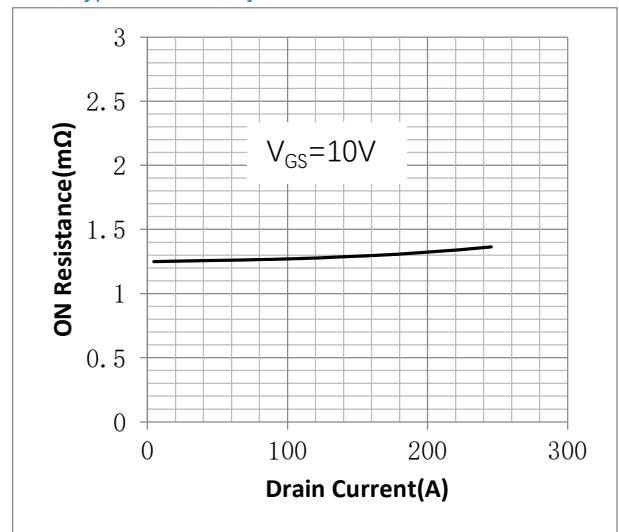
● Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$



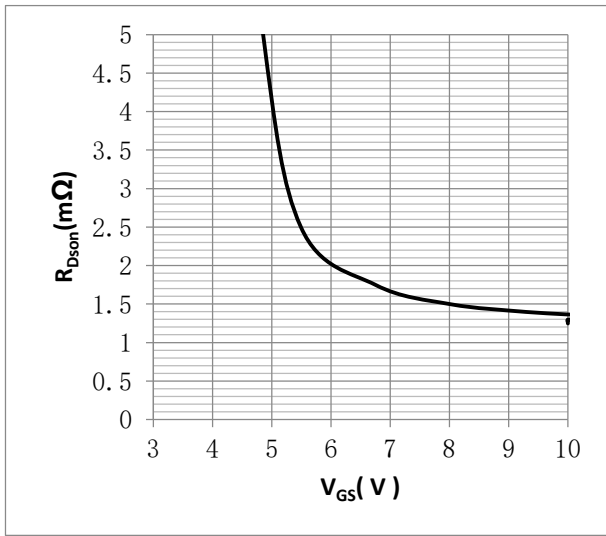
● Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values



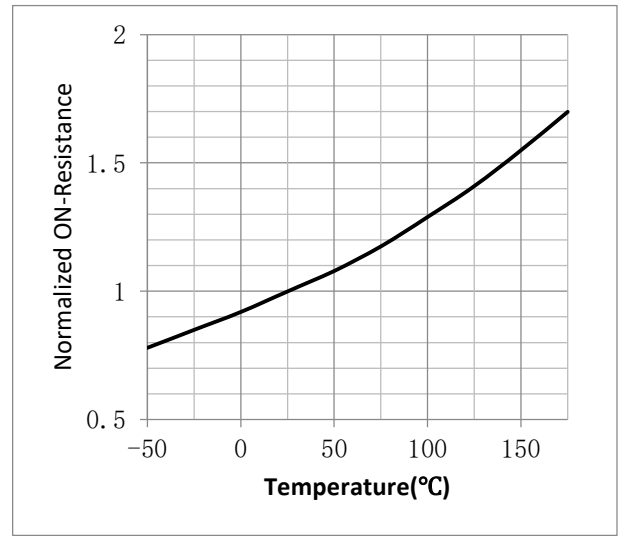
● Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$



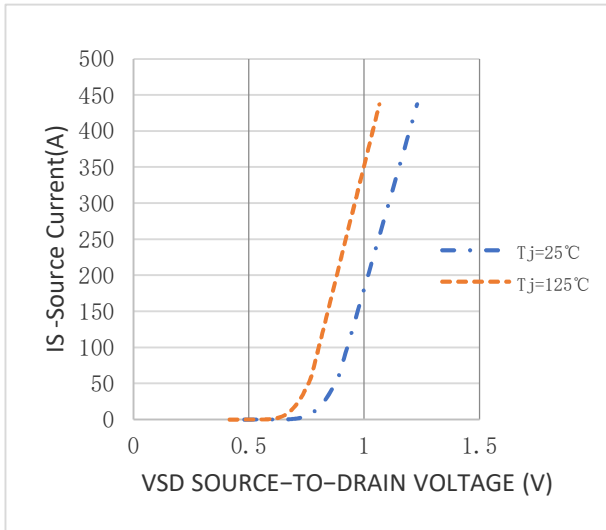
● Fig.7 Drain-source on-state resistance as a function of gate-source voltage; Typical values



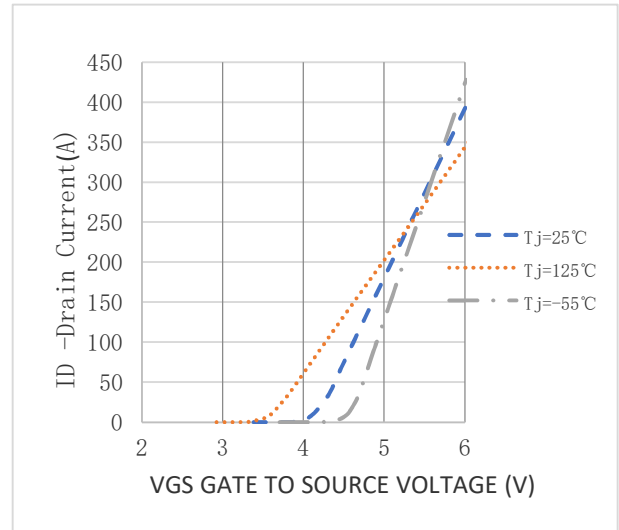
● Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance= $R_{Dson}/R_{Dson}(25^\circ C)$



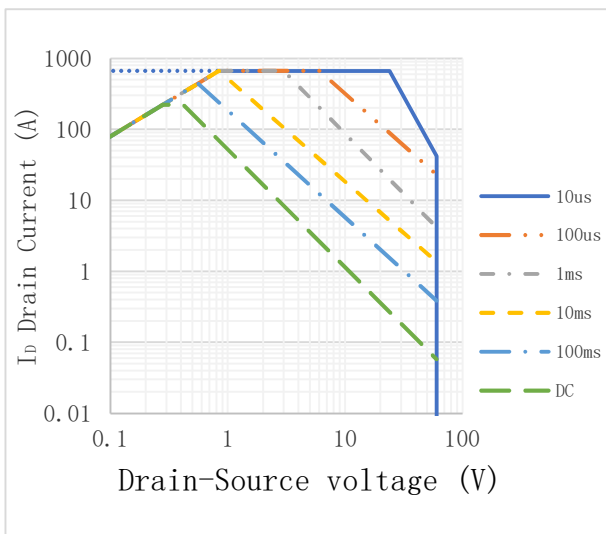
● Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values



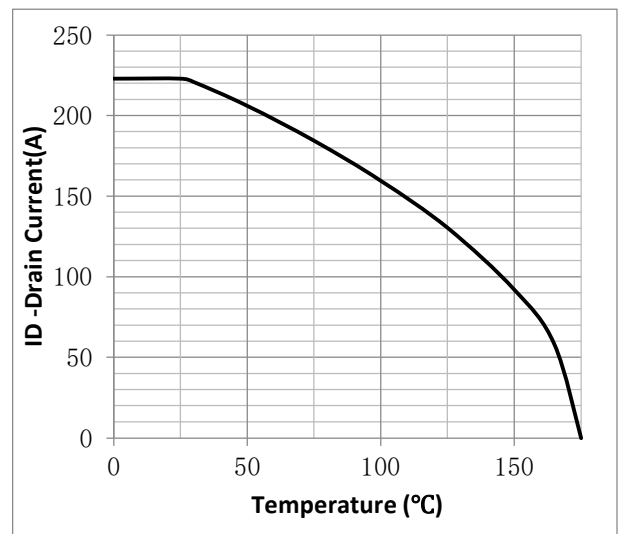
● Figure 10. Transfer characteristics: drain current as a function of gate-source voltage; Typical values



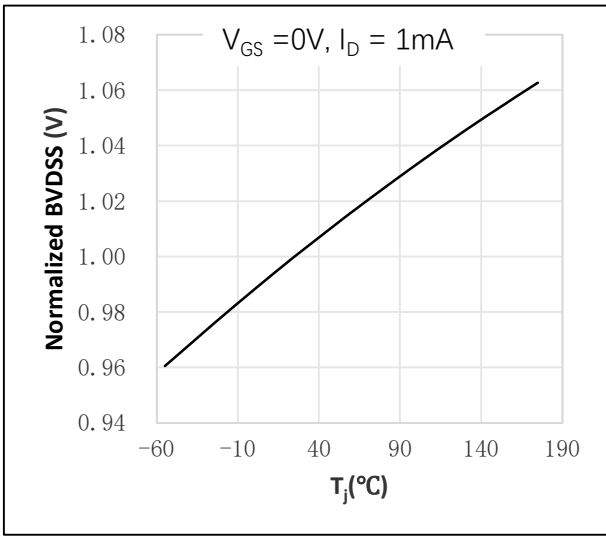
● Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



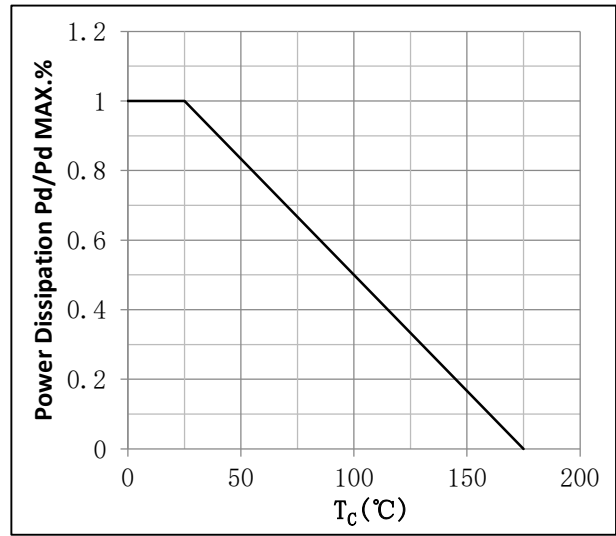
● Fig.12 Continuous drain current as a function of case temperature; Calculative values



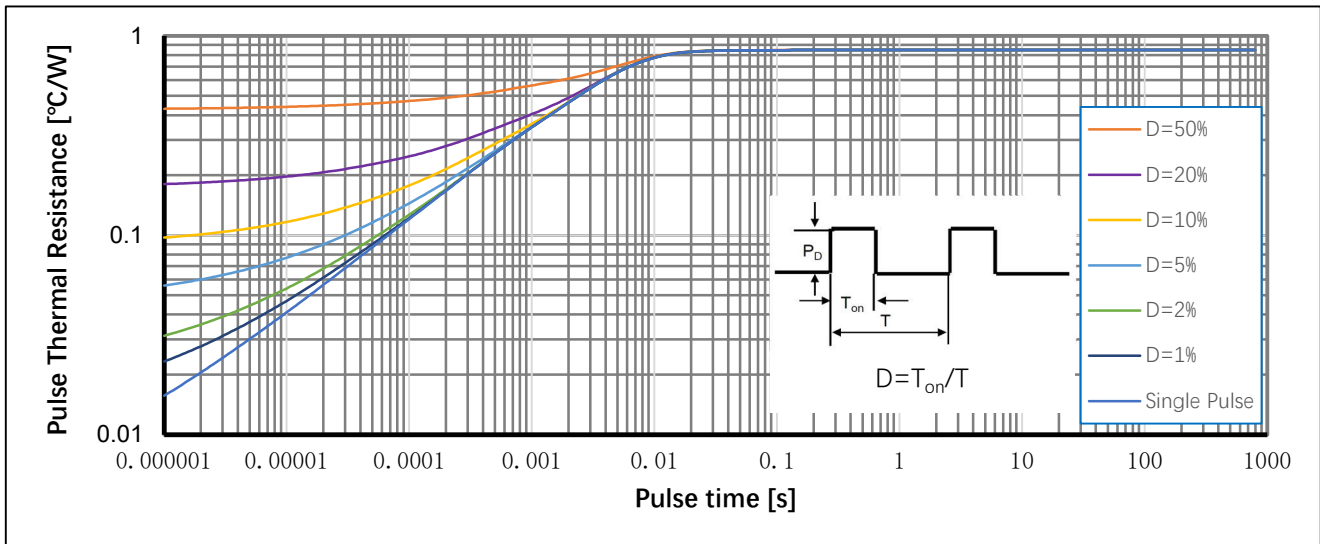
● Fig.13 Drain-source breakdown voltage as a function of junction temperature; Typical values Normalized $BV_{DSS} = BV_{DSS} / BV_{DSS}(25^{\circ}C)$



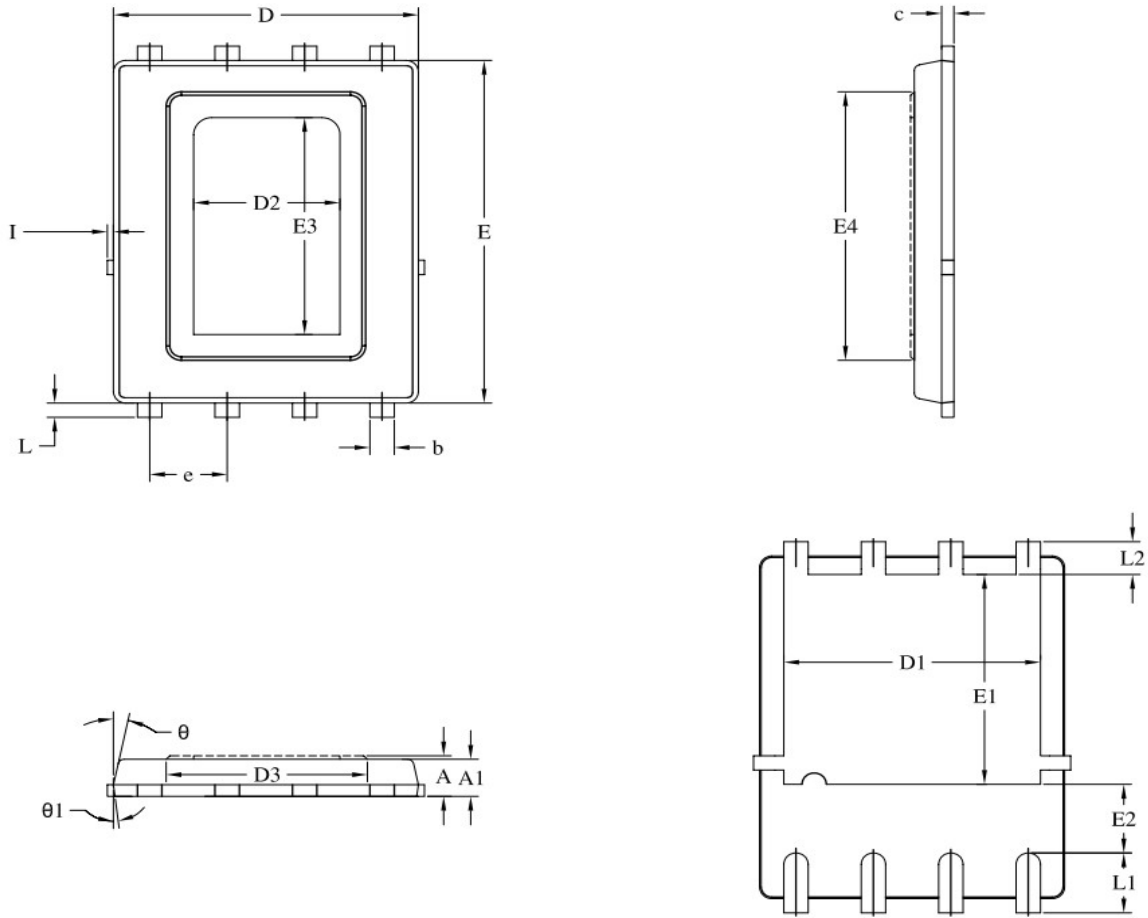
● Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation $= P_d / P_d(25^{\circ}C)$



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



● Package Outline



SYMBOL	COMMON		
	MIN.	Nom.	MAX.
A	0.660	0.710	0.760
A1	0.600	-----	0.750
b	0.330	0.430	0.530
c	0.150	0.203	0.300
D	5.00 Bsc.		
D1	4.060	4.210	4.360
D2	2.400 Bsc.		
D3	2.800	3.300	3.800
E	6.00 Bsc.		
E1	3.525	3.675	3.825
E2	1.050	1.200	1.350
E3	3.800 Bsc.		
E4	4.200	4.700	5.200
e	1.270 Bsc.		
I	-----	-----	0.150
L	0.150	0.250	0.350
L1	0.925	1.050	1.175
L2	0.450	0.575	0.700
θ	12° Bsc.		
$\theta 1$	7° Bsc.		

● Note

- ① Pulse : $V_{GS}=+20V/-20V$, Duty cycle=50%, $T_j=175^{\circ}C$, $t=1000$ hours; For DC , the following test conditions can be passed: $V_{GS}=+20V/-10V$, $T_j=175^{\circ}C$, $t=1000$ hours;
- ② Device mounted on 1 square inch FR-4 substrate PCB, 1oz copper, minimum footprint, tested in a still air environment with $T_A=25^{\circ}C$;
- ③ Practically 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	2023/8/12	New
B	2024/2/29	Correct ciss,Qg
C	2025/10/15	Apply new datasheet format.