

●General Description

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

●Features

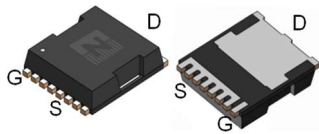
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low thermal resistance
- AEC-Q101 qualified

●Application

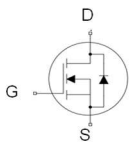
- BLDC motor driver
- DC-DC
- Load switch



●Product Summary



TOLL


 $V_{DS}=100V$
 $R_{DS(ON)}=1.4mR$
 $I_D=319A$


●Ordering Information

Part NO.	ZMSA014N10HRVG
Marking	ZMS014N10H
Packing information	REEL TAPE
Basic ordering unit (pcs)	2000

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-source voltage	V_{DS}	$25^{\circ}C \leq T_J \leq 175^{\circ}C$	-	100	V
Gate-source voltage ^①	V_{GS}	DC; $-55^{\circ}C \leq T_J \leq 175^{\circ}C$	-20	20	V
Continuous drain current	I_D	$V_{GS}=10V, T_C=25^{\circ}C$	-	319	A
	I_D	$V_{GS}=10V, T_C=75^{\circ}C$	-	261	A
	I_D	$V_{GS}=10V, T_C=100^{\circ}C$	-	226	A
Pulsed drain current	I_{DM}	Pulsed; $t_p \leq 10 \mu s; T_C = 25^{\circ}C$;	-	1276	A
Diode continuous current	I_S	$V_{GS}=0V, T_C=25^{\circ}C$	-	288	A
Diode pulse current	$I_{S,pulse}$	Pulsed; $t_p \leq 10 \mu s; T_C = 25^{\circ}C$;	-	1152	A
Total power dissipation	P_D	$V_{GS} > 6V, T_C=25^{\circ}C$	-	375	W
Total power dissipation	P_D	$V_{GS} > 6V, T_A=25^{\circ}C$	-	3.1	W
Operating junction temperature	T_J		-55	175	$^{\circ}C$
Storage temperature	T_{STG}		-55	175	$^{\circ}C$
Single pulse avalanche energy	E_{AS}	$L=0.1mH, V_{GS}=10V, R_g=25\Omega$	-	845	mJ

Single pulse avalanche energy	E_{AS}	$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$	-	1478	mJ
ESD level (HBM)	CLASS 2				

● Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.4	$^{\circ}\text{C/W}$
Thermal resistance, junction - ambient	$R_{thJA}^{(2)}$	-	-	48	$^{\circ}\text{C/W}$
Soldering temperature	T_{sold}	-	-	260	$^{\circ}\text{C}$

● Electronic Characteristics ($T_j=25^{\circ}\text{C}$, unless otherwise specified)

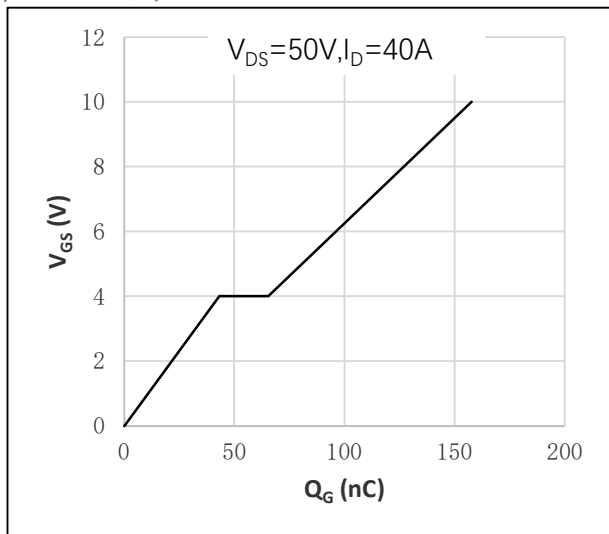
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0\text{V}$, $I_D=250\mu\text{A}$, $T_j=25^{\circ}\text{C}$	100	-	-	V
		$V_{GS}=0\text{V}$, $I_D=1\text{mA}$, $T_j=-55^{\circ}\text{C}$	96.3	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=250\mu\text{A}$, $T_j=25^{\circ}\text{C}$	2	2.6	4	V
		$V_{GS}=V_{DS}$, $I_D=1\text{mA}$, $T_j=-55^{\circ}\text{C}$	-	-	4.6	V
		$V_{GS}=V_{DS}$, $I_D=1\text{mA}$, $T_j=175^{\circ}\text{C}$	1.1	-	-	V
Drain-source leakage current	I_{DSS}	$V_{GS}=0\text{V}$, $V_{DS}=100\text{V}$, $T_j=25^{\circ}\text{C}$	-	-	1	μA
		$V_{GS}=0\text{V}$, $V_{DS}=100\text{V}$, $T_j=175^{\circ}\text{C}$	-	-	500	μA
Gate- source leakage current	I_{GSS}	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$	-	-	± 100	nA
Static drain-source on resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=40\text{A}$, $T_j=25^{\circ}\text{C}$	-	1.4	1.8	m Ω
		$V_{GS}=10\text{V}$, $I_D=40\text{A}$, $T_j=175^{\circ}\text{C}$	-	2.9	-	m Ω
Forward transconductance	g_{FS}	$V_{DS}=5\text{V}$, $I_{SD}=10\text{A}$	-	45	-	S
Diode forward voltage	V_{FSD}	$V_{GS}=0\text{V}$, $I_{SD}=40\text{A}$	-	0.8	1.3	V

● Dynamic characteristics ($T_j=25^{\circ}\text{C}$, unless otherwise specified)

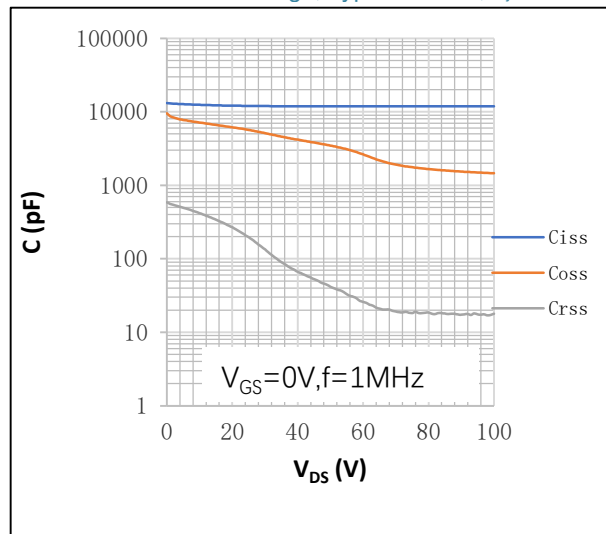
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1\text{MHz}$, $V_{DS}=50\text{V}$, $V_{GS}=0\text{V}$	-	11923	-	pF
Output capacitance	C_{oss}		-	3453	-	pF
Reverse transfer capacitance	C_{rss}		-	41	-	pF
Gate resistance	R_g	$f=1\text{MHz}$	-	1.5	-	Ω
Total gate charge	Q_g	$V_{DD}=50\text{V}$, $I_D=40\text{A}$, $V_{GS}=10\text{V}$	-	157.7	-	nC
Gate-source charge	Q_{gs}		-	43.3	-	nC
Gate-drain charge	Q_{gd}		-	22.2	-	nC

Turn-on delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=25V,$ $R_G=3.3\Omega, I_D=20A$	-	38	-	ns
Turn-on rise time	t_r		-	16	-	ns
Turn-off delay time	$t_{D(off)}$		-	97	-	ns
Turn-off fall time	t_f		-	24	-	ns
Reverse recovery time	t_{rr}	$V_{DD}=25V, di_s/dt = 100A/\mu s,$ $I_S=20A$	-	89	-	ns
Reverse recovery charge	Q_{rr}		-	211	-	nC

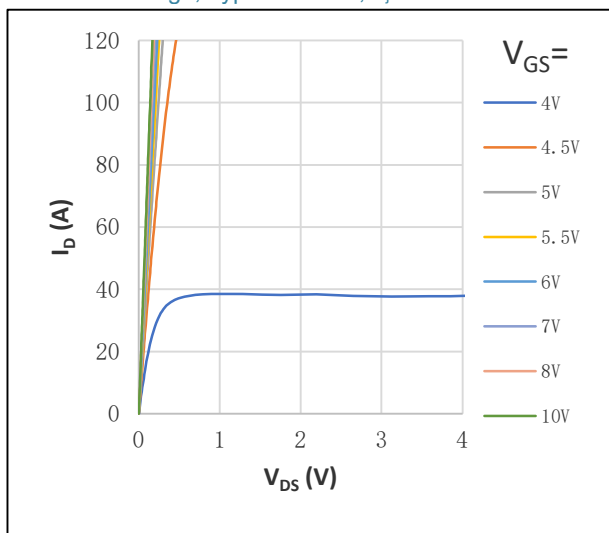
● Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$



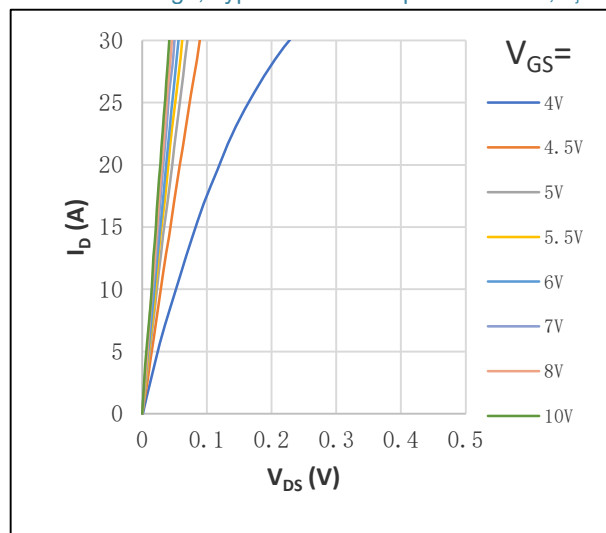
● Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$



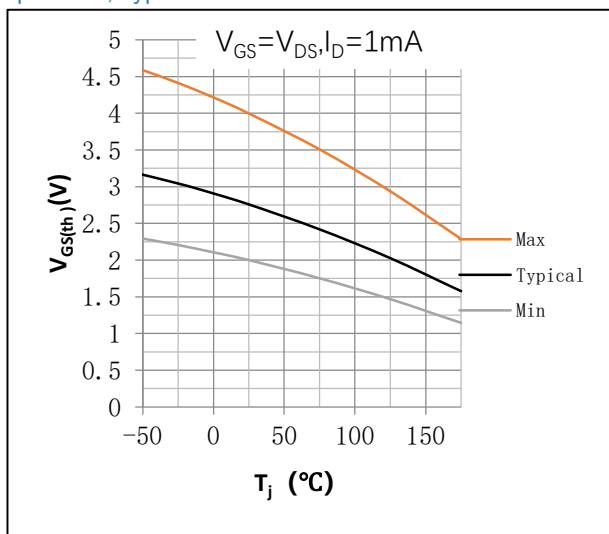
● Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$



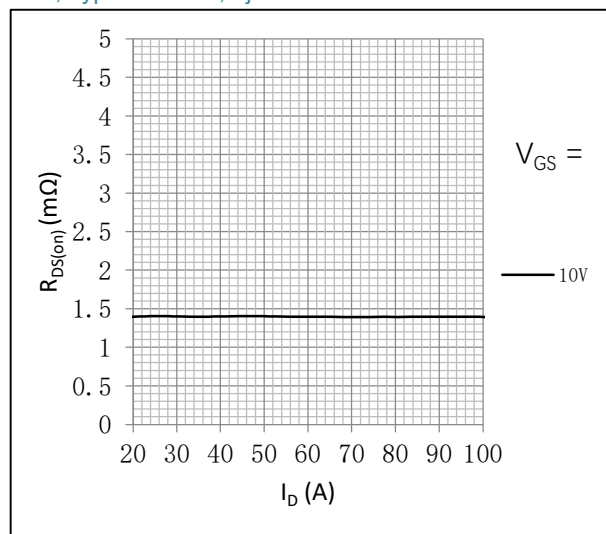
● Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$



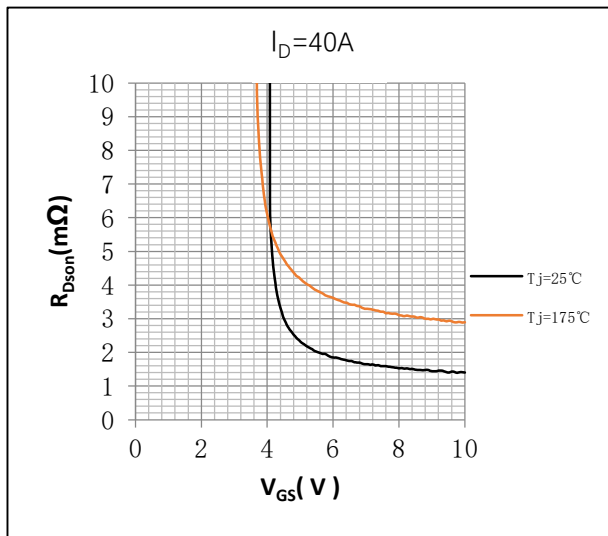
● Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical/Min/Max values



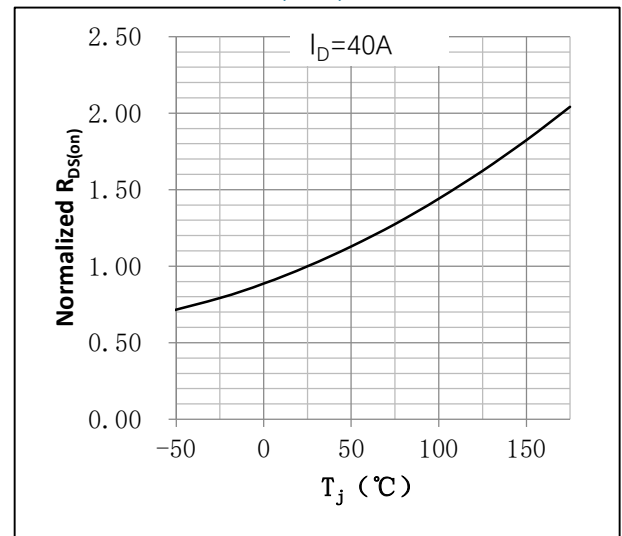
● Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$



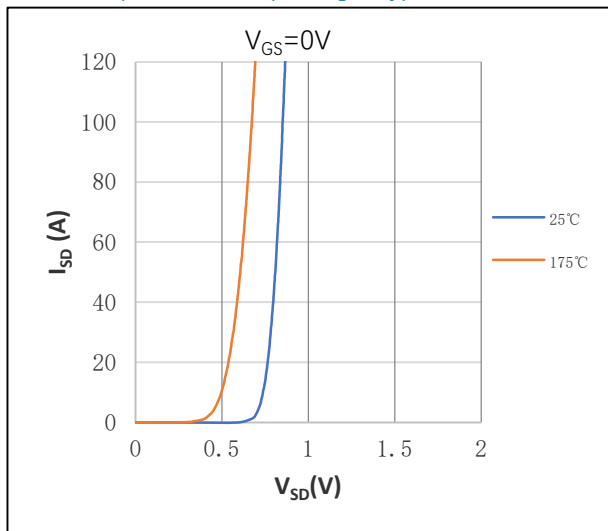
● Fig.7 Drain-source on-state resistance as a function of gate-source voltage; Typical values



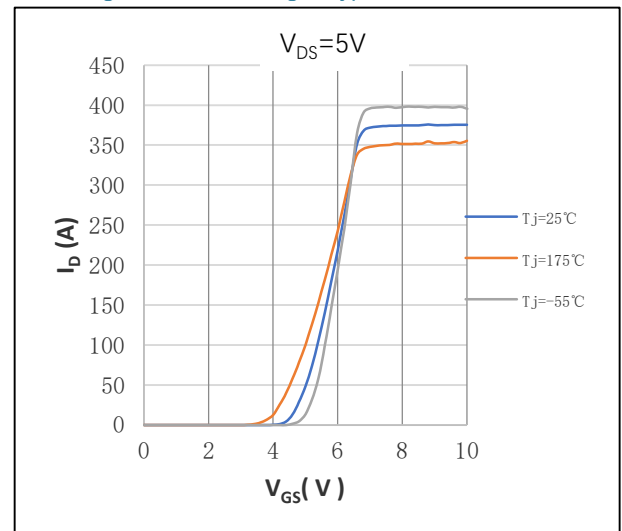
● Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance= $R_{DS(on)}/R_{DS(on)}(25^{\circ}\text{C})$



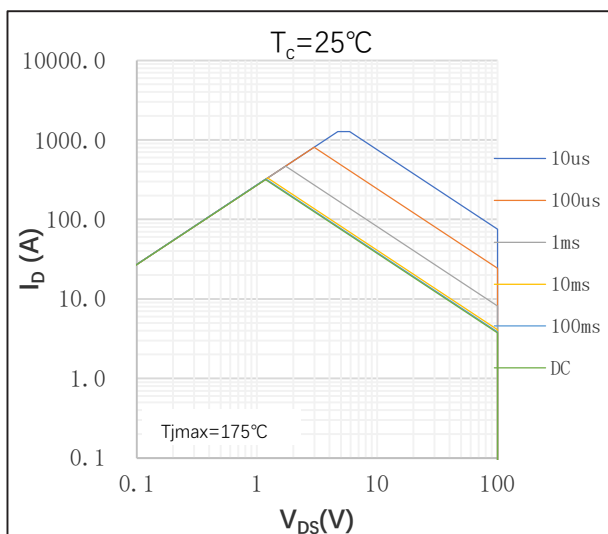
● Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values



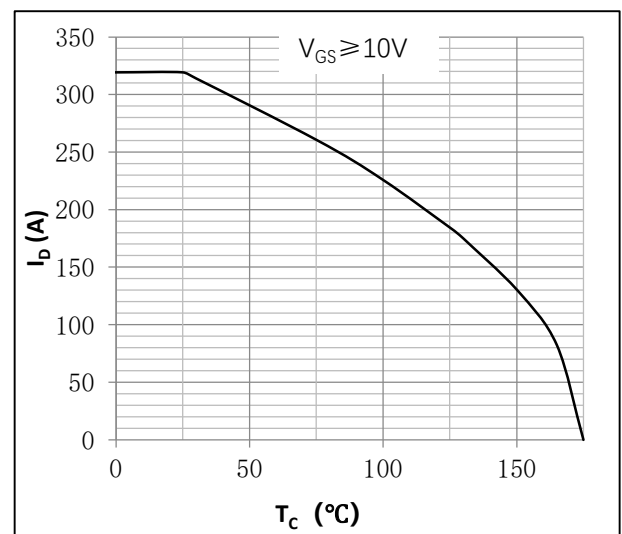
● Figure 10. Transfer characteristics: drain current as a function of gate-source voltage; Typical values



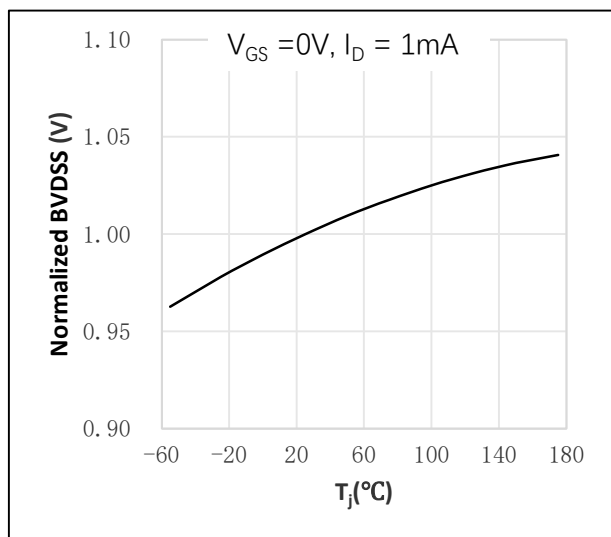
● Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



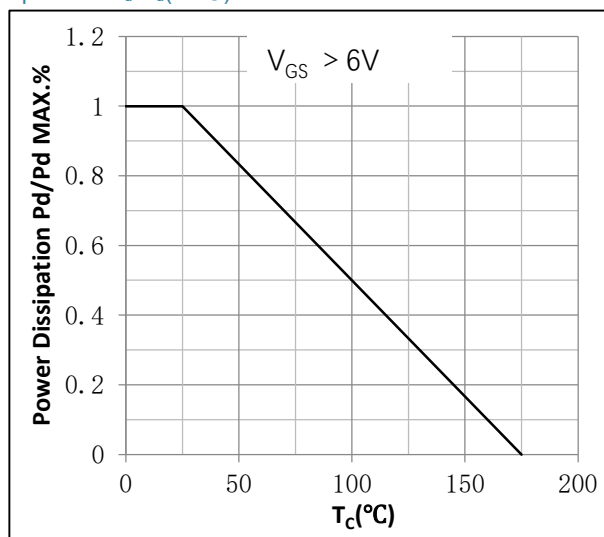
● Fig.12 Continuous drain current as a function of case temperature³; Calculative values



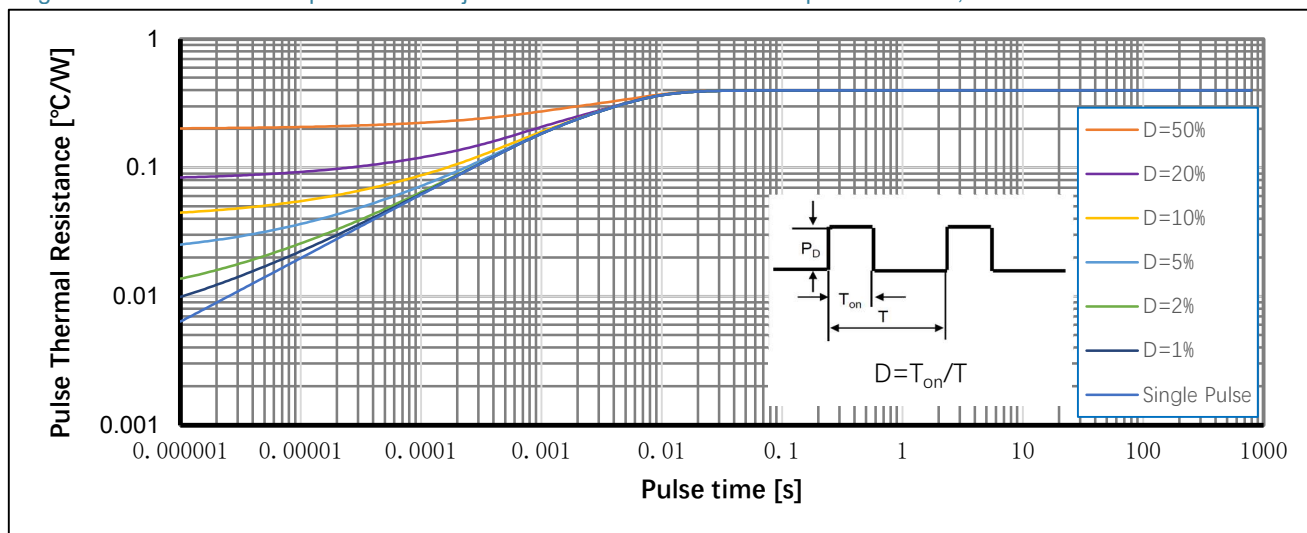
● Fig.13 Drain-source breakdown voltage as a function of junction temperature; Min values



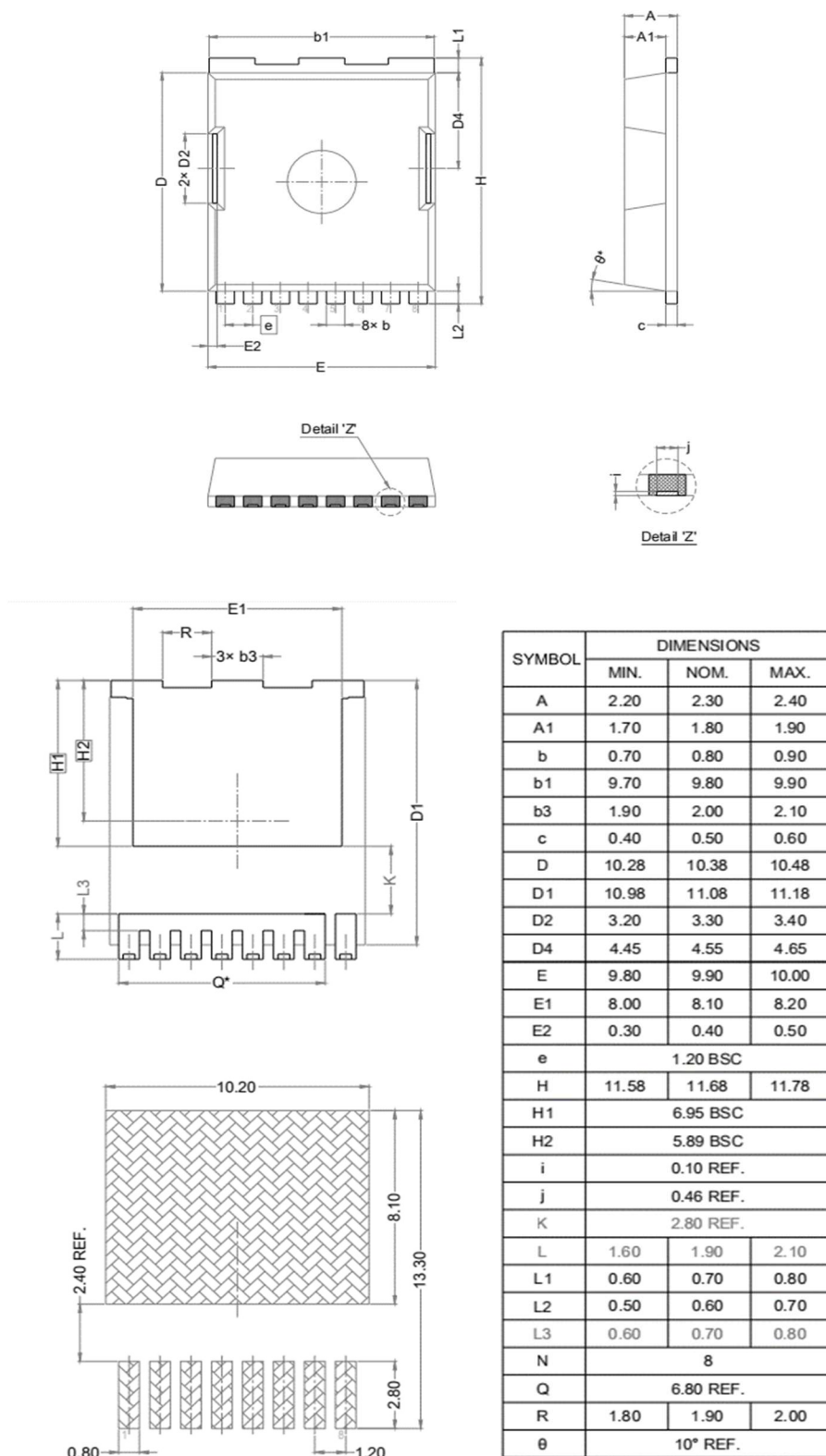
● Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation $= P_d / P_d(25^\circ C)$



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



● Package Outline



● 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 FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- 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	2026/7/16	New