

●General Description

This silicon carbide Power MOSFET device has been developed using ZMJ's advanced 1st generation SiC MOSFET technology. The device features a very low $R_{DS(on)}$ over the entire temperature range combined with low capacitances and very high switching operations. It improves application performance in frequency, energy efficiency, system size and weight reduction.

●Features

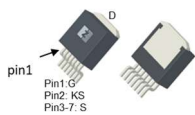
- High blocking voltage
- High speed switching with low capacitances
- Low $R_{DS(on)}$ to minimize conductive loss
- Low gate charge for fast switching
- Low thermal resistance
- AEC-Q101 qualified

●Application

- Motor drives
- On board charger
- DC-DC
- Auxiliary drives



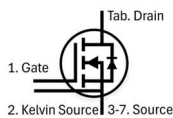
●Product Summary



TO-263-7

●Ordering Information

Part NO.	ZMCA100KR170B7
Marking	ZMC100KR170
Packing information	TAPE REEL
Basic ordering unit (pcs)	1000


 $V_{DS}=1700V$
 $R_{DS(ON)}=750mR$
 $I_D=5.9A$


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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-source voltage	V_{DS}		-	1700	V
Gate-source voltage	V_{GS}	Transient Voltage	-10	25	V
	V_{GS}	Static Voltage	-10	24	V
Recommended turn on gate voltage	$V_{GS(on)}$		15	18	V
Recommended turn off gate voltage	$V_{GS(off)}$		-4	0	V
Continuous drain current	I_D	$V_{GS}=18V, T_C=25^{\circ}C$	-	5.9	A
	I_D	$V_{GS}=18V, T_C=75^{\circ}C$	-	4.8	A
	I_D	$V_{GS}=18V, T_C=100^{\circ}C$	-	4.2	A
Pulsed drain current	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_C = 25^{\circ}C$;	-	23.6	A

Total power dissipation	P_D	$T_C=25^{\circ}\text{C}$	-	56	W
Total power dissipation	P_D	$T_A=25^{\circ}\text{C}$	-	2.4	W
Operating junction temperature	T_J		-55	175	$^{\circ}\text{C}$
Storage temperature	T_{STG}		-55	175	$^{\circ}\text{C}$

● Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	2.7	$^{\circ}\text{C/W}$
Thermal resistance, junction - ambient	$R_{thJA}^{①}$	-	-	62	$^{\circ}\text{C/W}$
Soldering temperature	T_{sld}	-	-	260	$^{\circ}\text{C}$

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

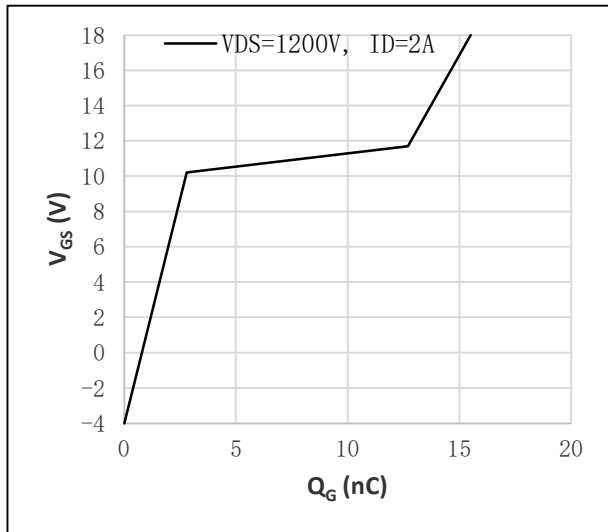
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	1700	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=1mA$	3	4	5	V
Drain-source leakage current	I_{DSS}	$V_{GS}=0V, V_{DS}=1700V$	-	-	10	μA
Gate- source leakage current	I_{GSS}	$V_{GS}=-10V, V_{DS}=0V$	-	-	-100	nA
		$V_{GS}=25V, V_{DS}=0V$	-	-	100	nA
Static drain-source on resistance	$R_{DS(ON)}$	$V_{GS}=18V, I_D=2A, T_J=25^{\circ}\text{C}$	-	750	900	m Ω
		$V_{GS}=15V, I_D=1A, T_J=25^{\circ}\text{C}$	-	980	-	m Ω
		$V_{GS}=18V, I_D=2A, T_J=175^{\circ}\text{C}$	-	1327	-	m Ω
Forward transconductance	g_{FS}	$V_{DS}=20V, I_{SD}=2A$	-	1.3	-	S
Diode forward voltage	V_{FSD}	$V_{GS}=-4V, I_{SD}=2A$	-	3.9	5	V

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

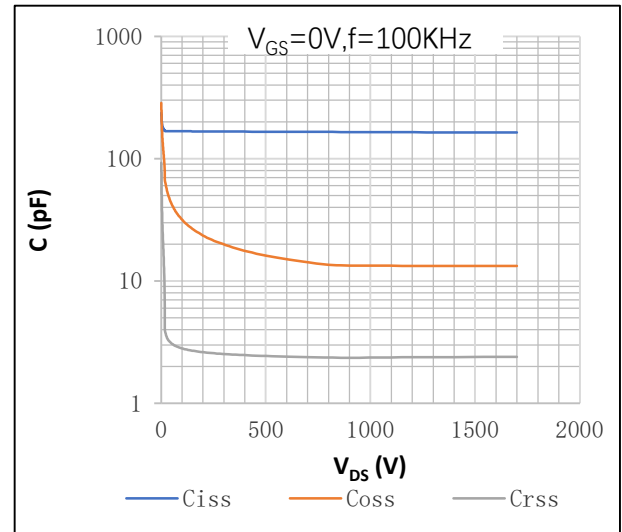
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=100\text{KHz}, V_{DS}=1000V, V_{GS}=0V$	-	165	-	pF
Output capacitance	C_{oss}		-	13.4	-	pF
Reverse transfer capacitance	C_{rss}		-	2.4	-	pF
Output charge	Q_{oss}	$f=100\text{KHz}, V_{GS}=0V, V_{DS}=0V \text{ to } 1000V$	-	21.4	-	nC
Coss stored energy	E_{oss}		-	7.8	-	μJ
Gate resistance	R_g	$f=1\text{MHz}$	-	25	-	Ω
Total gate charge	Q_g	$V_{DD}=1200V,$	-	15.5	-	nC
Gate-source charge	Q_{gs}		-	2.8	-	nC

Gate-drain charge	Q_{gd}	$I_D = 2A$, $V_{GS} = -4V/18V$	-	9.9	-	nC
Turn-on delay time	$t_{D(on)}$	$V_{GS} = -4V/18V$, $V_{DS} = 1200V$, $R_G = 10\Omega$, $I_D = 2A$	-	5	-	ns
Turn-on rise time	t_r		-	18	-	ns
Turn-off delay time	$t_{D(off)}$		-	13	-	ns
Turn-off fall time	t_f		-	59	-	ns
Turn-on energy	E_{on}		-	83	-	uJ
Turn-off energy	E_{off}		-	13	-	uJ
Reverse recovery time	t_{rr}	$V_{DD} = 1200V$, $dI_S/dt =$	-	28	-	ns
Reverse recovery charge	Q_{rr}	1000A/us, $I_S = 2A$	-	29	-	nC

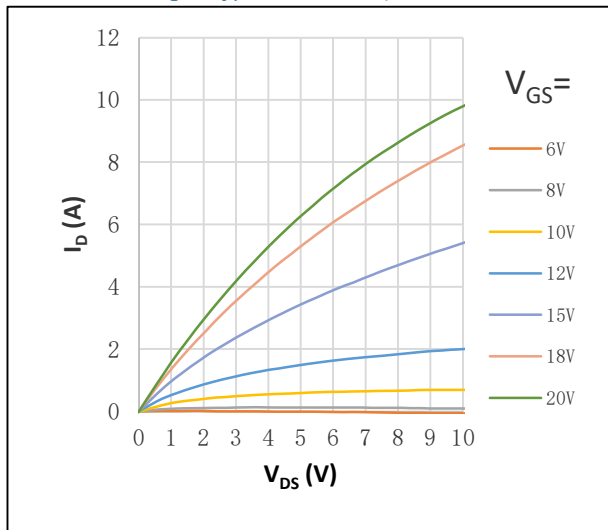
● Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$



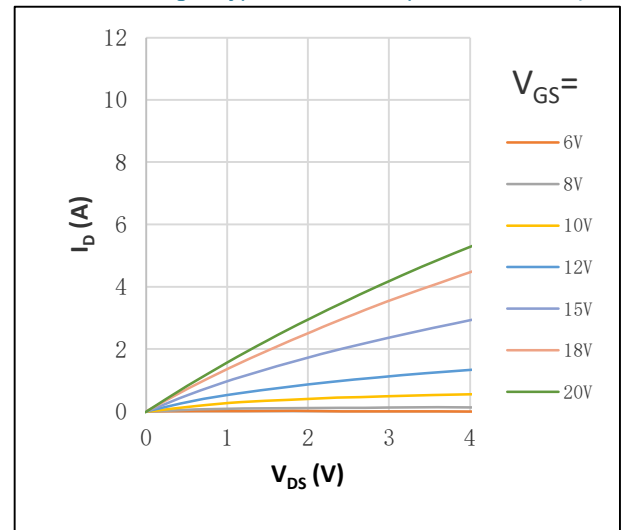
● Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$



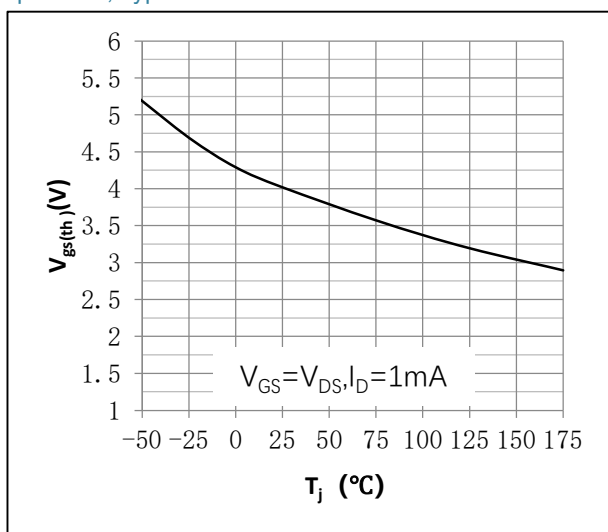
● Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$



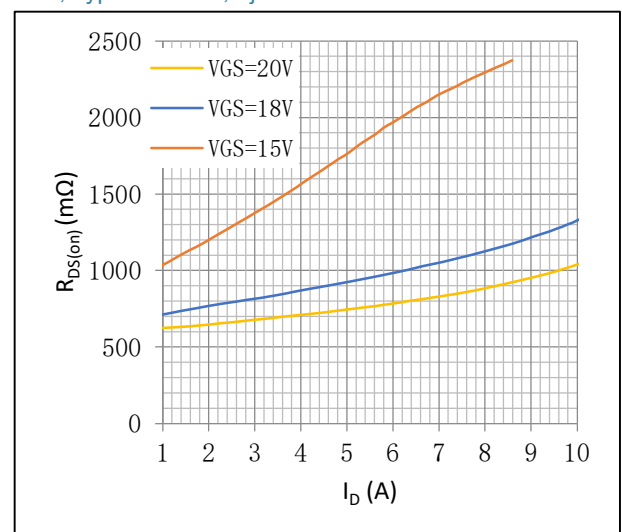
● Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$



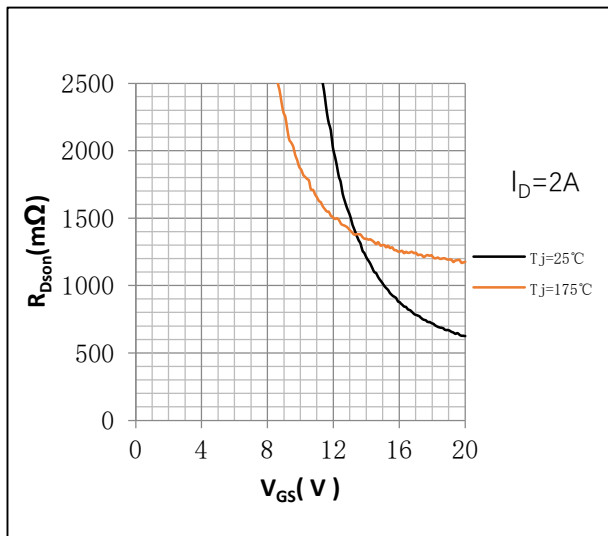
● Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values



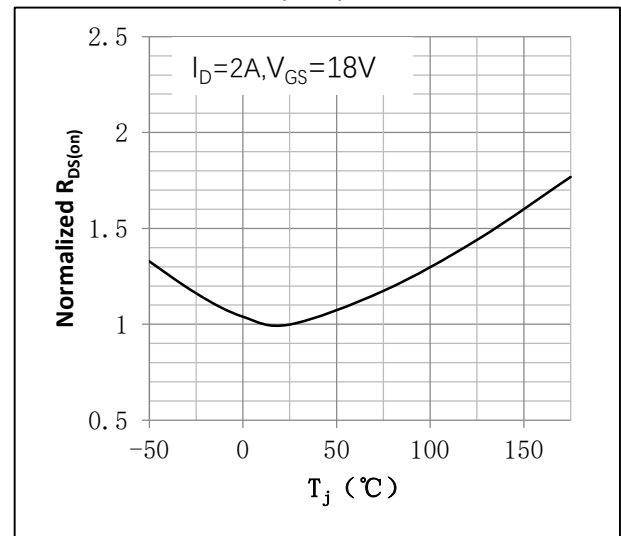
● Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$



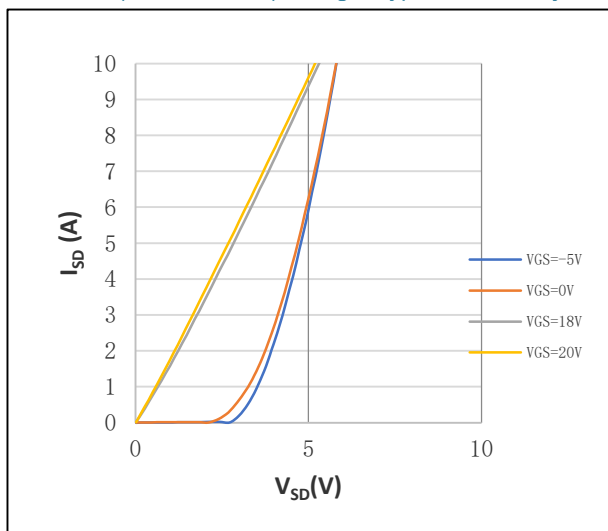
● Fig.7 Drain-source on-state resistance as a function of gate-source voltage; Typical values



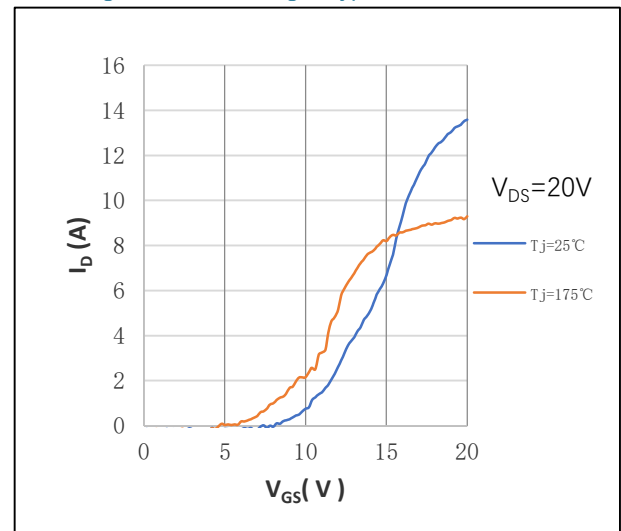
● Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance = $R_{DS(on)}/R_{DS(on)}(25^{\circ}\text{C})$



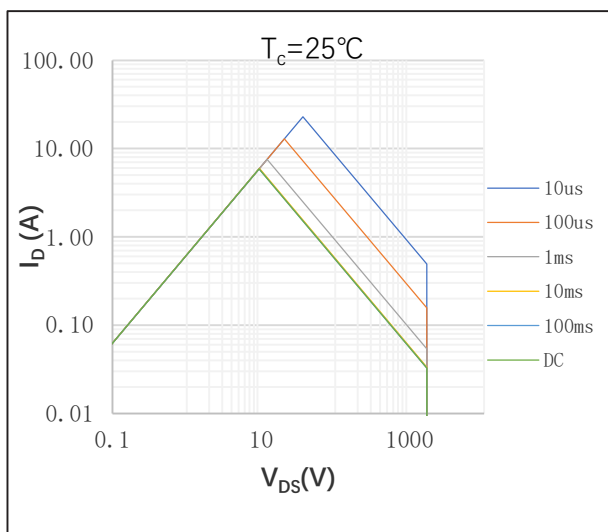
● Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; $T_J = 25^{\circ}\text{C}$



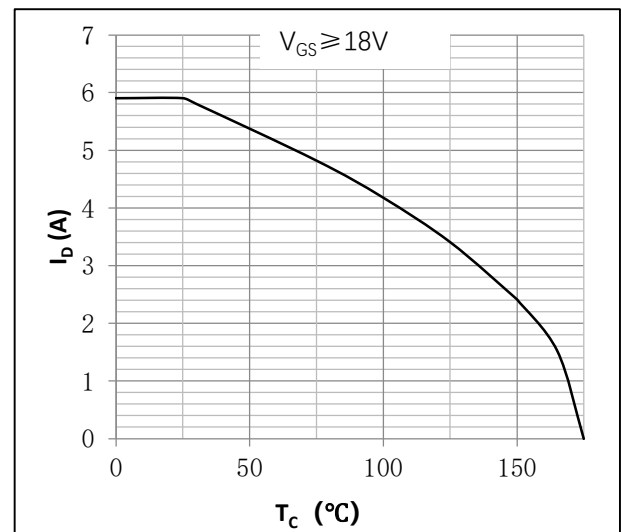
● Figure 10. Transfer characteristics: drain current as a function of gate-source voltage; Typical values



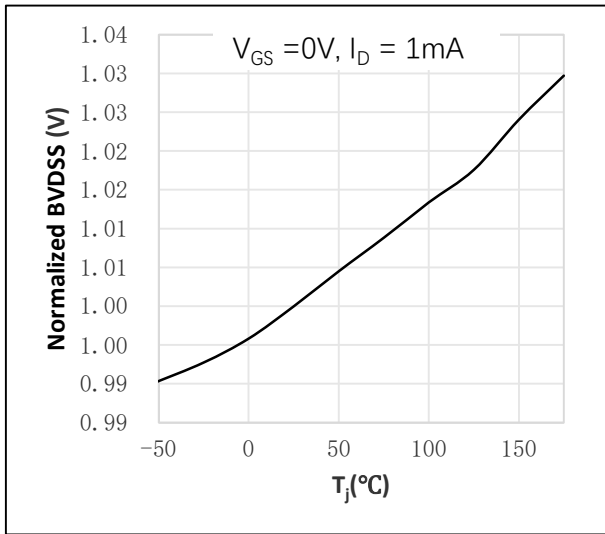
● Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



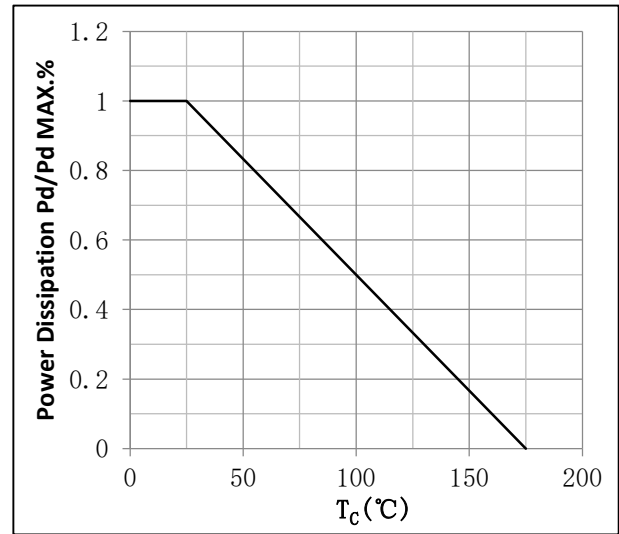
● Fig.12 Continuous drain current as a function of case temperature²; Calculative values



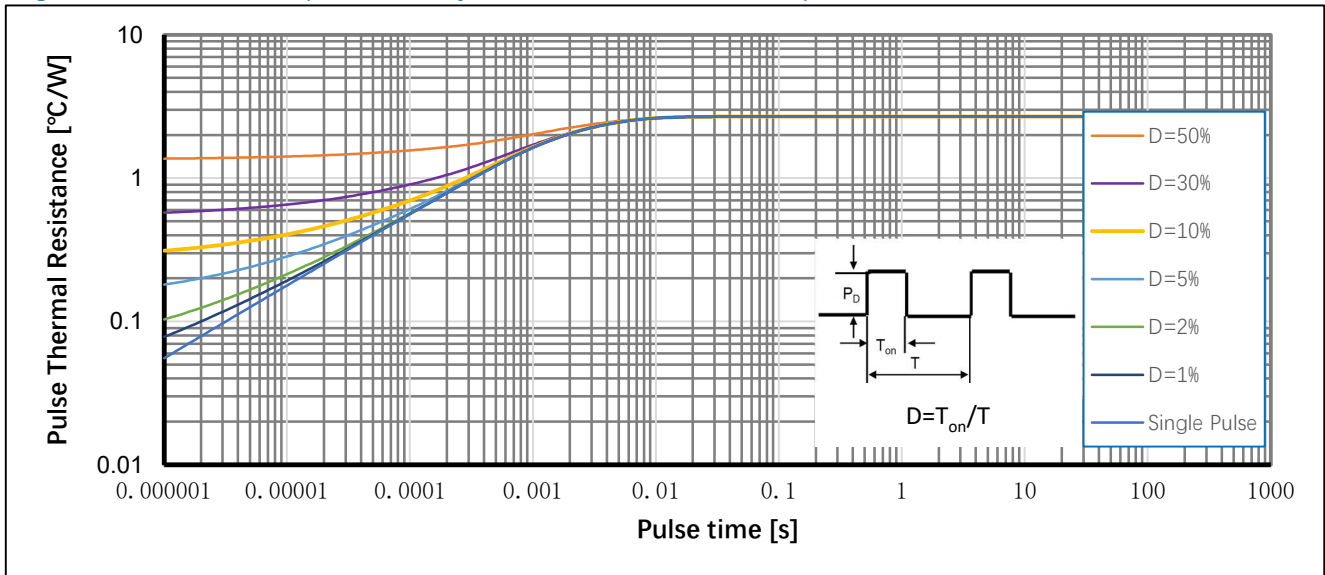
● Fig.13 Drain-source breakdown voltage as a function of junction temperature; Typical values Normalized $BV_{DSS} = BV_{DSS}/BV_{DSS}(25^{\circ}\text{C})$



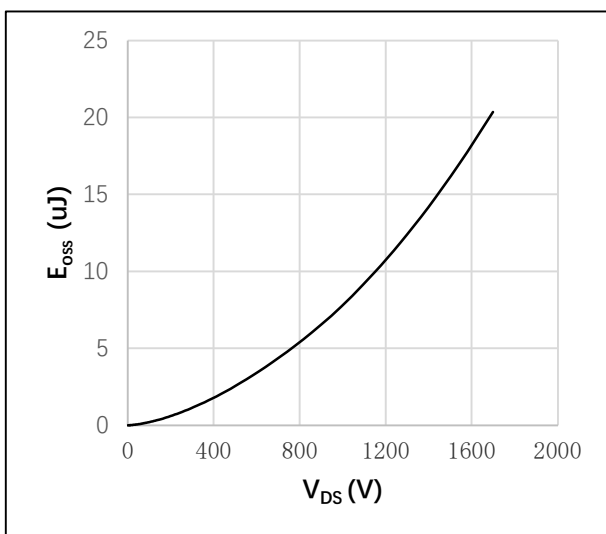
● Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation $= P_d/P_d(25^{\circ}\text{C})$



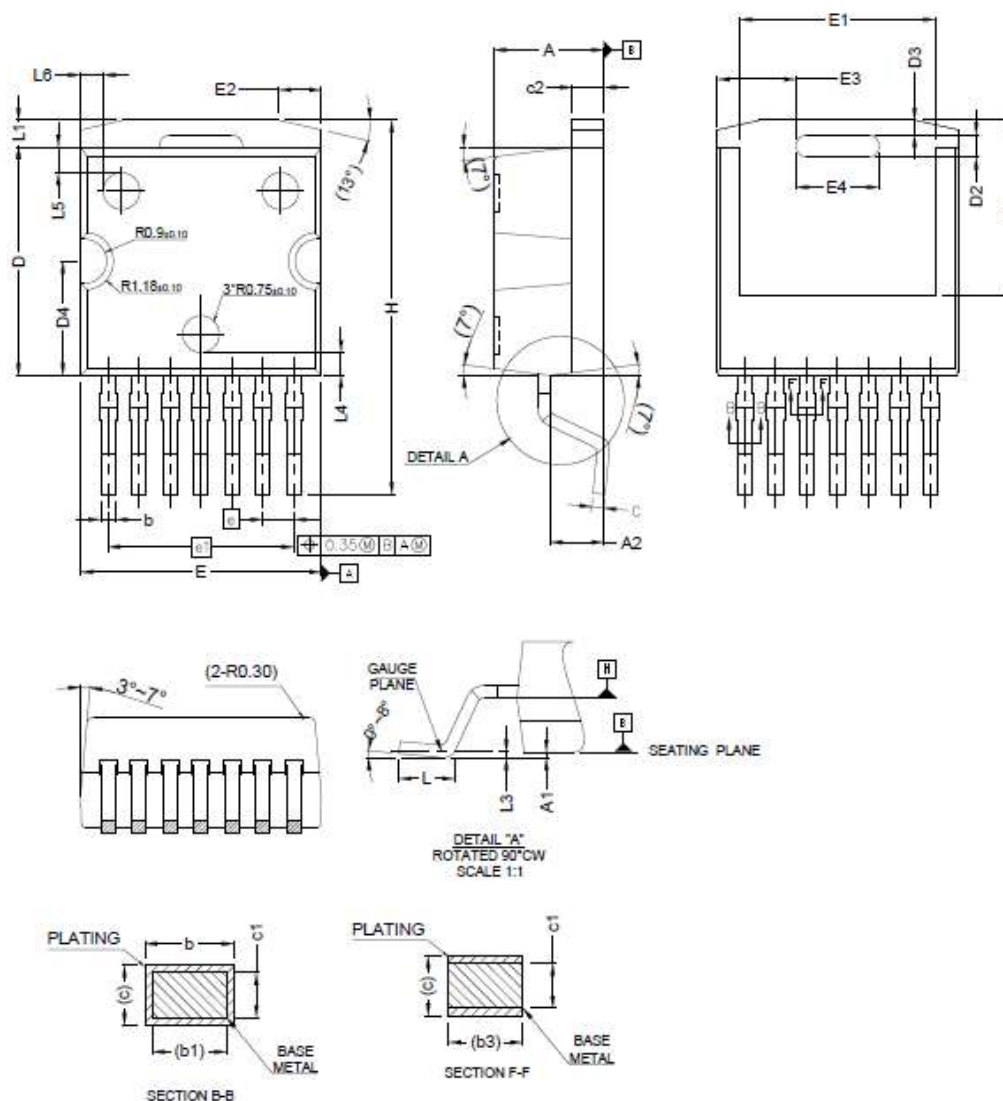
● Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



● Fig.16 Output capacitor stored energy as a function of drain-source voltage; Typical values; $T_j = 25^{\circ}\text{C}$



● Package Outline



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	4.30	4.70	L	1.78	2.79
A1	-	0.25	L1	-	1.60
A2	2.02	2.42	L3	0.25BSC	
b	0.50	0.70	L4	0.93BSC	
b1	0.50	0.65	L5	1.04BSC	
b3	0.60	0.75	L6	0.93BSC	
c	0.45	0.60	H	14.61	15.88
c1	0.45	0.55			
c2	1.25	1.40			
D	9.10	9.50			
D1	6.86	7.42			
D2	0.72	1.12			
D3	0.40	0.80			
D4	4.45	4.85			
E	9.68	10.08			
E1	7.70	8.30			
E2	1.55	1.95			
E3	3.04	3.44			
E4	3.21	3.61			
e	1.27 BSC				
e1	7.62 BSC				

● Note

- ① The value of $R_{\theta JA}$ is measured with the device in a still environment with $T_A=25^{\circ}\text{C}$;
- ② Practically the current will be limited by PCB, thermal design and operating temperature. $V_{GS}=18\text{V}$.

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● Revision History

Version	Date	Change
A	2024/5/19	New
B	2025/9/23	Apply new datasheet format.