●General Description

This silicon carbide Power MOSFET device has been developed using ZMJ's advanced 2nd 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.

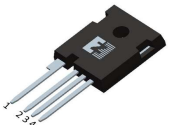
●Features

- ■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
- ■100% avalanche tested
- ■AEC-Q101 Qualified

●Application

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

●Product Summary



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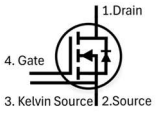


V_{DS}=1200V

$R_{DS(ON)}$ =44.5mR

I_D=41A

RoHS REACH COMPLIANT HF

●Ordering Information

Part NO.	ZMCA060R120C4
Marking	ZMC060R120
Packing information	TUBE BULK
Basic ordering unit (pcs)	450

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-source voltage	V_{DS}		-	1200	V
Gate-source voltage①	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℃	-	41	A
	I_D	V_{GS}=18V, T_C=75℃	-	33	A
	I_D	V_{GS}=18V, T_C=100℃	-	29	A
Pulsed drain current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_C = 25 °C;	-	163	A

Total power dissipation	P_D	T_C=25℃	-	192	W
Total power dissipation	P_D	T_A=25℃	-	3.8	W
Operating junction temperature	T_J		-55	175	℃
Storage temperature	T_{STG}		-55	175	℃
Single pulse avalanche energy	E_{AS}	L=0.5mH, VGS=18V, Rg=25Ω,	-	361	mJ

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.78	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	40	°C/W
Soldering temperature	T_{sold}	-	-	260	°C

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

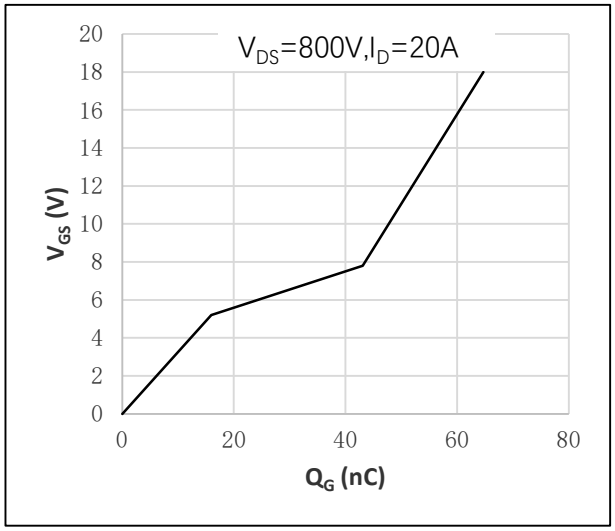
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	V_{GS} =0V, I_D =250uA	1200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=5mA	2	2.8	4	V
Drain-source leakage current	I_{DSS}	V_{GS}=0V, V_{DS}=1200V	-	-	10	uA
Gate- source leakage current	I_{GSS}	V_{GS}=-10V, 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=20A, T_j=25℃	-	44.5	53	mΩ
		V_{GS}=18V, I_D=20A, T_j=175℃	-	96.9	-	mΩ
		V_{GS}=15V, I_D=20A, T_j=25℃	-	51.8	-	mΩ
Forward transconductance	g_{FS}	V_{DS} =10V, I_{SD} = 20A	-	21	-	S
Diode forward voltage	V_{FSD}	V_{GS} =-4V, I_{SD} = 20A	-	4.2	5	V

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

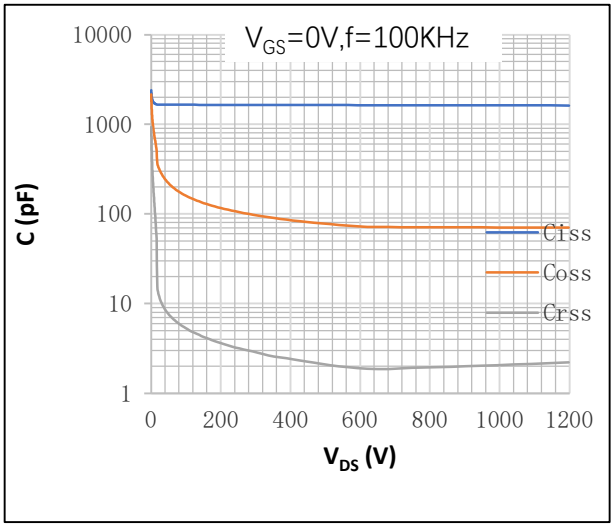
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	f = 100KHz, V_{DS}=800V, V_{GS}=0V	-	1526	-	pF
Output capacitance	C_{oss}		-	67	-	pF
Reverse transfer capacitance	C_{rss}		-	3	-	pF
Output charge	Q_{oss}	f = 100KHz, V_{GS}=0V, V_{DS}=0V to 800V	-	96.7	-	nC
Coss stored energy	E_{oss}		-	26.7	-	uJ
Gate resistance	R_g	f = 1MHz	-	1	-	Ω

Total gate charge	Q_g	V_{DD} = 800V, I_D = 20A, V_{GS} = -4V/18V	-	64.7	-	nC
Gate-source charge	Q_{gs}		-	16	-	nC
Gate-drain charge	Q_{gd}		-	27.1	-	nC
Turn-on delay time	$t_{D(on)}$	V_{GS}=-4V/18V, V_{DS}=800V, R_G =10Ω, I_D =20A, L=505uH	-	13	-	ns
Turn-on rise time	t_r		-	4.2	-	ns
Turn-off delay time	$t_{D(off)}$		-	34	-	ns
Turn-off fall time	t_f		-	15	-	ns
Turn-on energy	E_{on}		-	580	-	uJ
Turn-off energy	E_{off}		-	156	-	uJ
Reverse recovery time	t_{rr}	V_{DD}=800V, dI_S/dt = 600A/us, I_S=20A	-	24	-	ns
Reverse recovery charge	Q_{rr}		-	74	-	nC

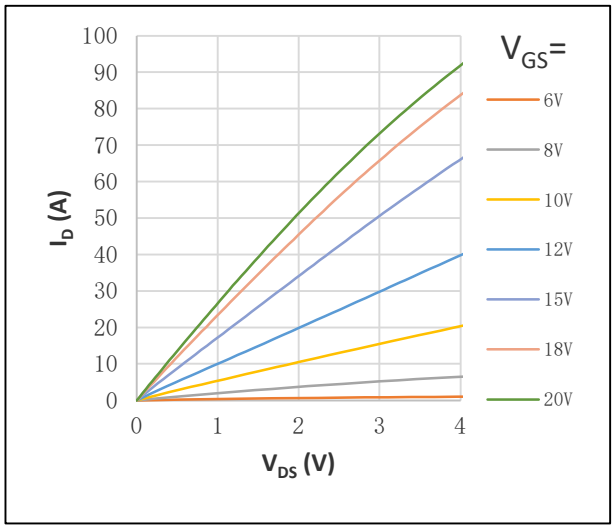
●Fig.1 Gate-source voltage as a function of gate charge; Typical values; T_j=25℃



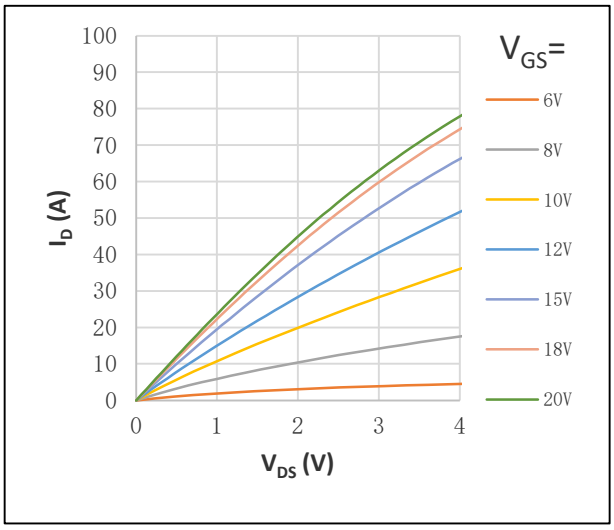
●Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; T_j=25℃



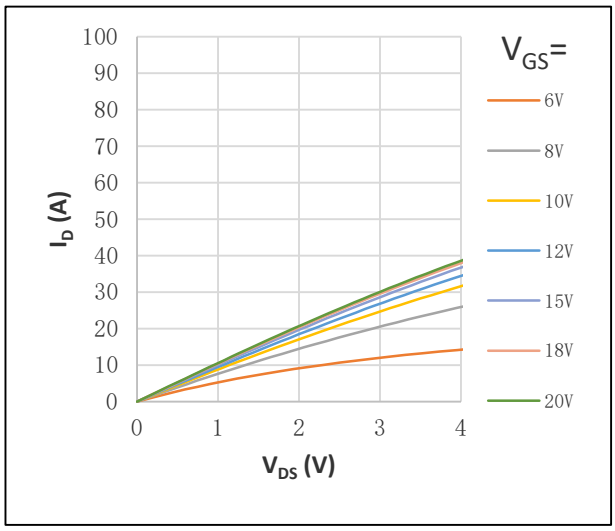
●Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; T_j=-55℃



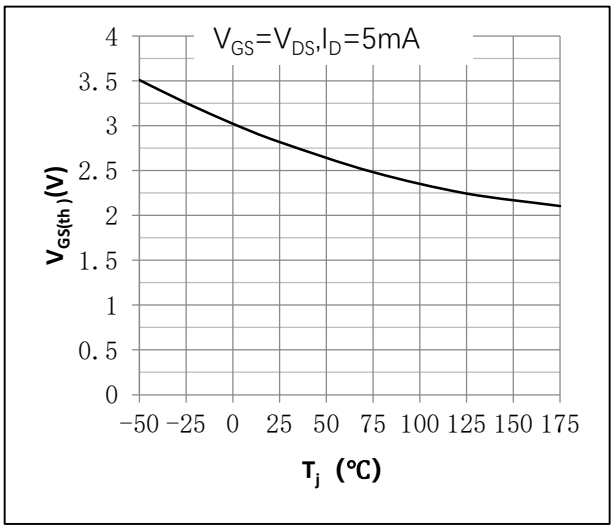
●Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: T_j=25℃



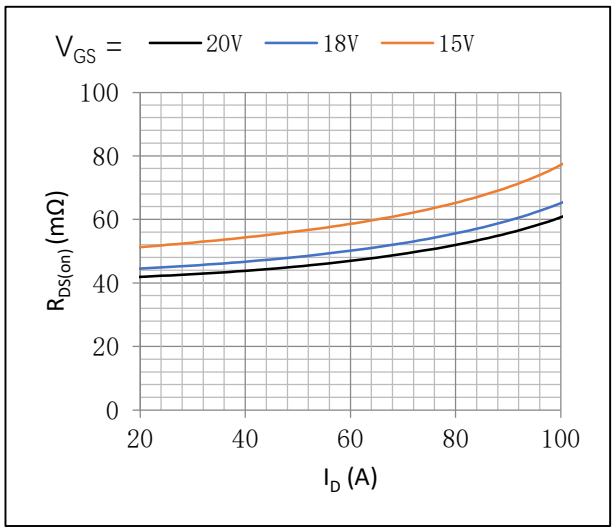
●Fig.5 Output characteristics: drain current as a function of drain-source voltage; Typical values: T_j=175℃



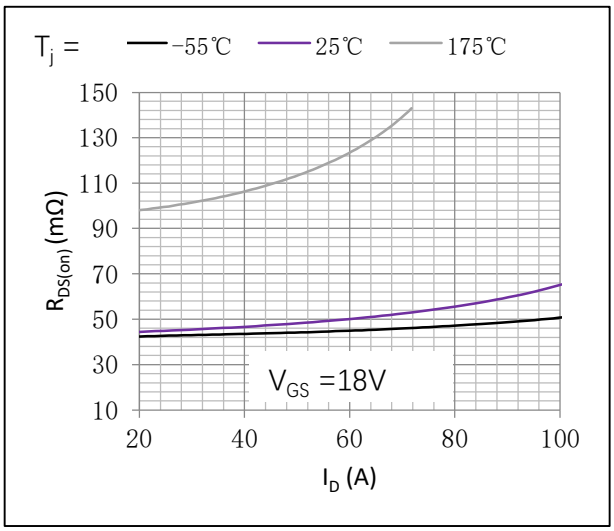
●Fig.6 Gate-source threshold voltage as a function of junction temperature; Typical values



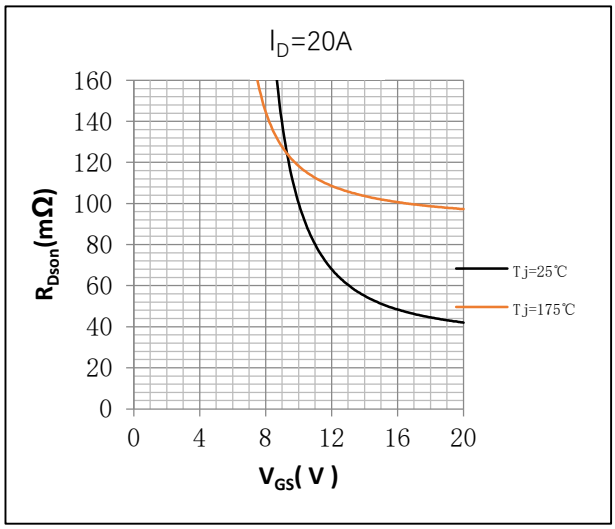
●Fig.7 Drain-source on-state resistance as a function of drain current; Typical values; Tj=25℃



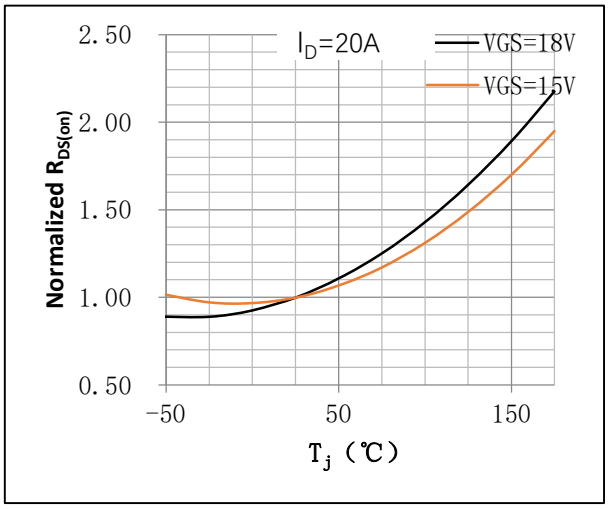
●Fig.8 Drain-source on-state resistance as a function of drain current; Typical values;



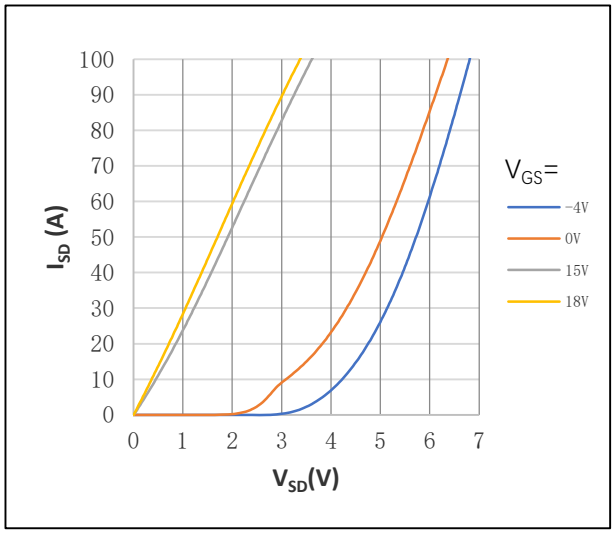
●Fig.9 Drain-source on-state resistance as a function of gate-source voltage; Typical values



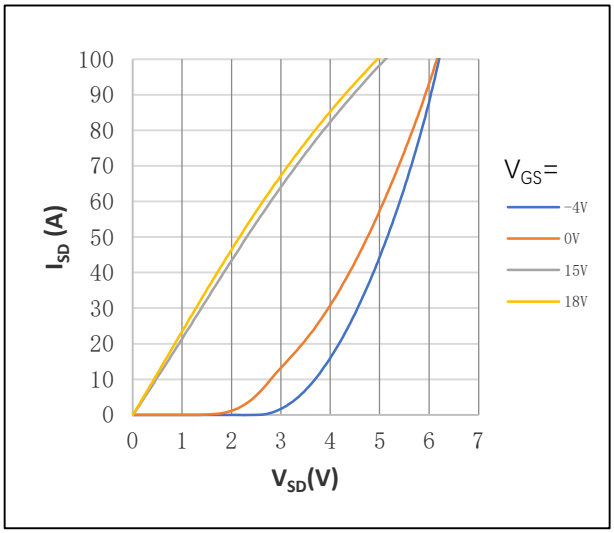
●Fig.10 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance=R_{DSon}/R_{DSon}(25℃)



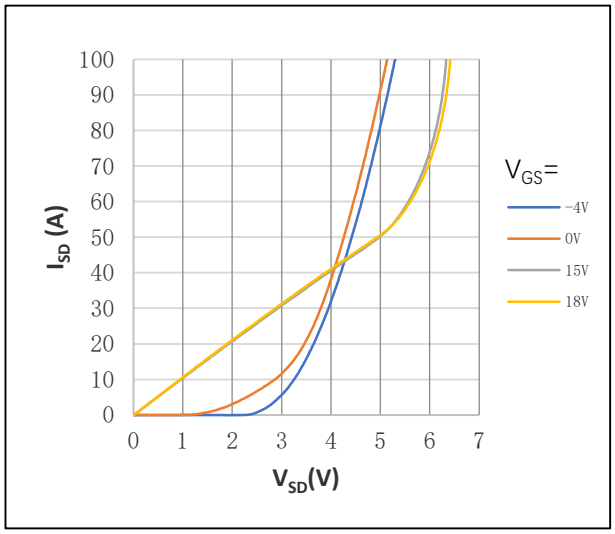
●Figure.11 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; Tj=25℃



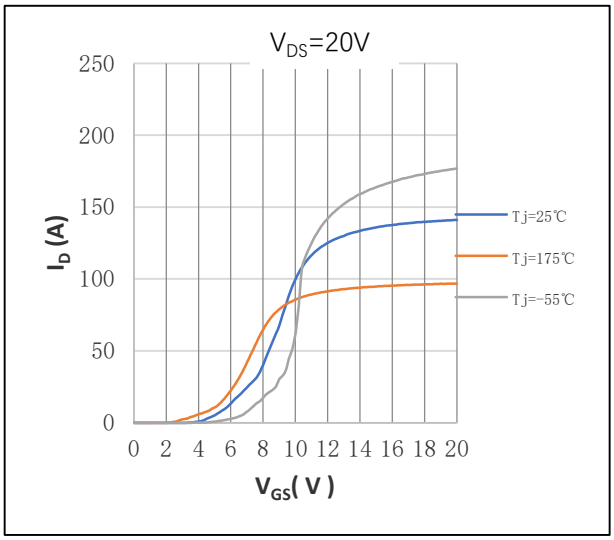
●Figure.12 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; Tj=-55℃



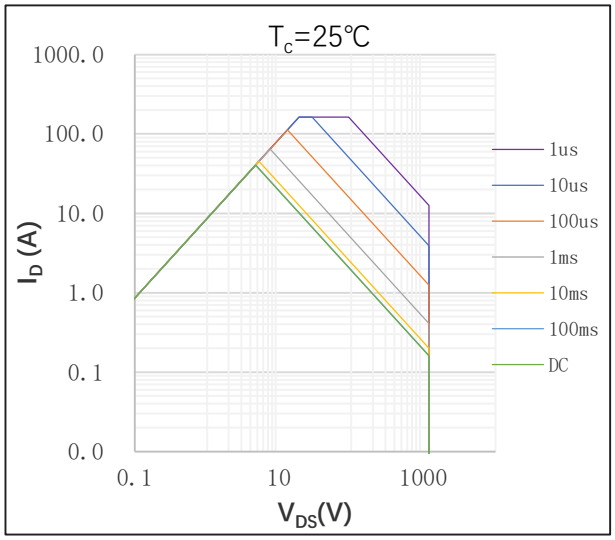
●Figure.13 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; Tj=175℃



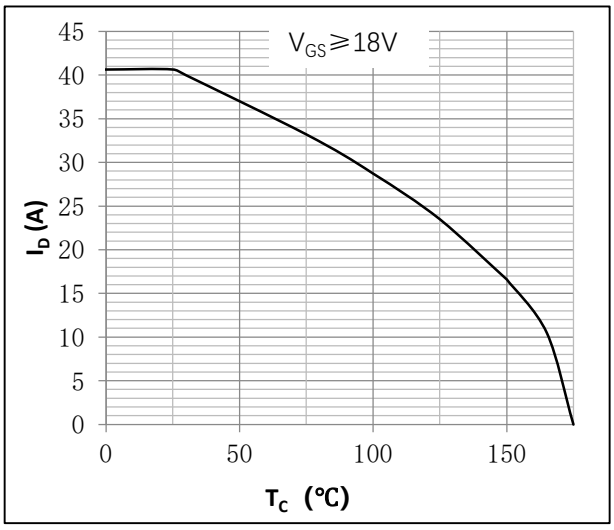
●Figure.14 Transfer characteristics: drain current as a function of gate-source voltage; Typical values



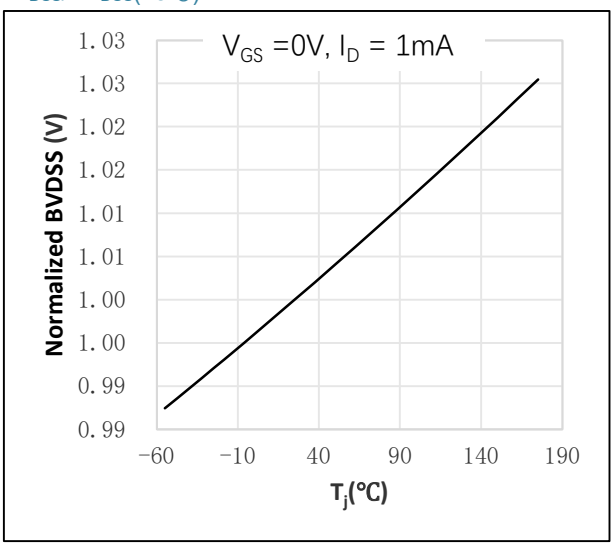
●Fig.15 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



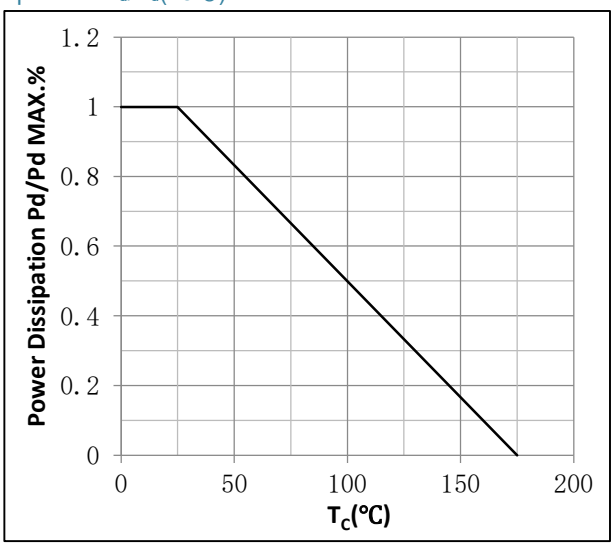
●Fig.16 Continuous drain current as a function of case temperature①;Calculative values



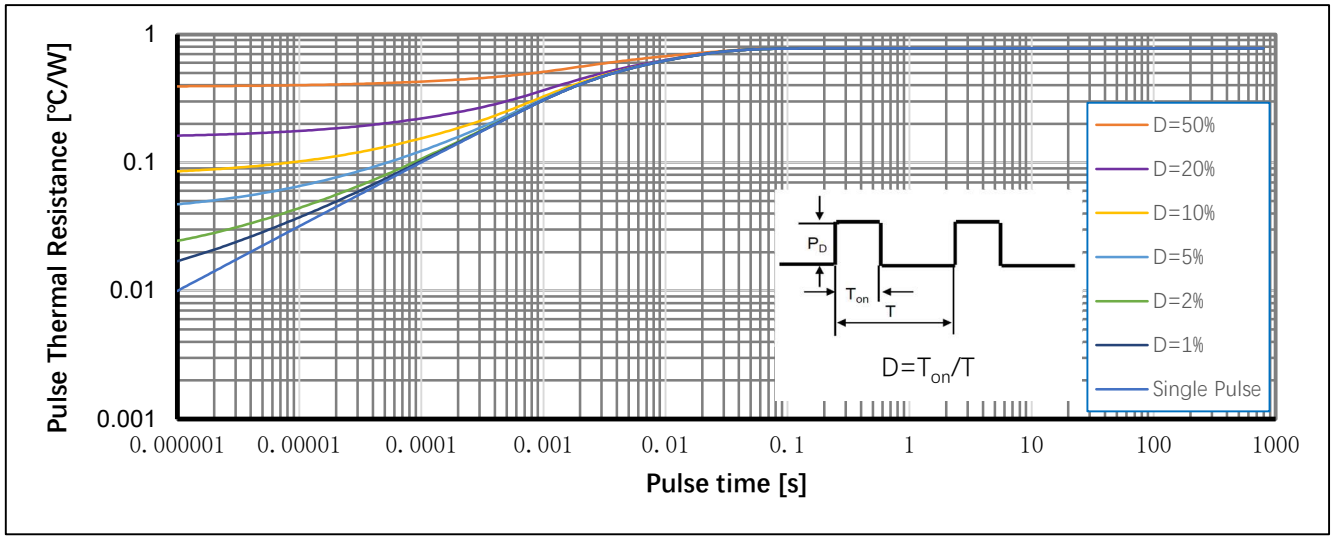
●Fig.17 Drain-source breakdown voltage as a function of junction temperature; Typical values Normalized BV_{DSS} =BV_{DSS}/BV_{DSS}(25℃)



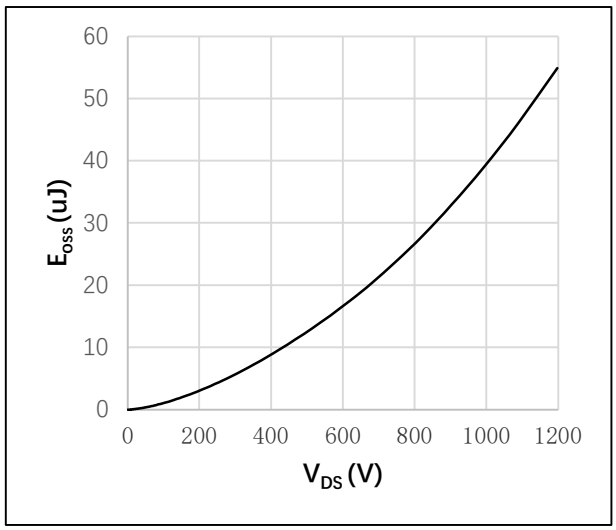
●Fig.18 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation =P_d/P_d(25℃)



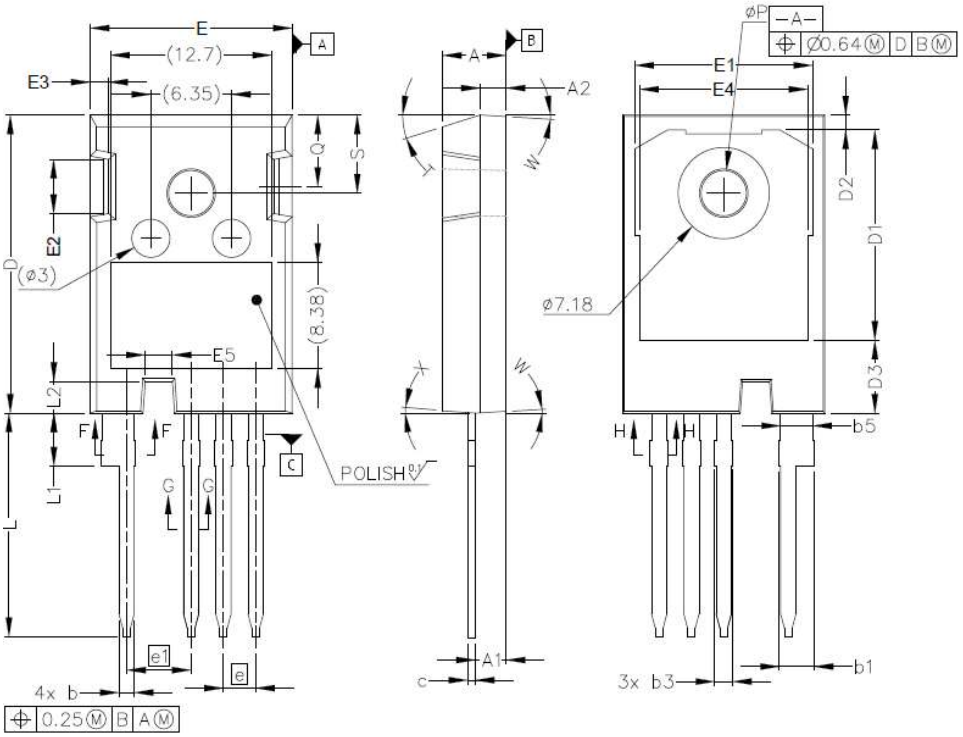
●Fig.19 Transient thermal impedance from junction to case as a function of pulse duration; max values

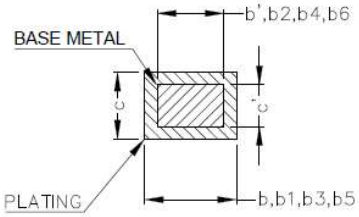


●Fig.20 Output capacitor stored energy as a function of drain-source voltage; Typical values; Tj=25℃



●Package Outline





SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

SYMBOL	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
D3	5.55	6.15
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5 ° REF.	
X	4° REF.	

Note

①Practically the current will be limited by PCB, thermal design and operating temperature. V_{GS}=18V.

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●Revision History

Version	Date	Change
A	2025/9/9	New