●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.

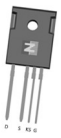
●Features

- ■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

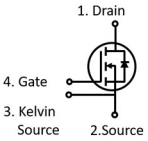
●Application

- ■Motor drives
- ■Solar PV inverters
- ■DC-DC
- ■UPS

●Product Summary



TO-247-4 LP



V_{DS}=750V

$R_{DS(ON)}$ =36mR

I_D=55A

RoHS REACH COMPLIANT HF

●Ordering Information

Part NO.	ZMCS040R075CA
Marking	ZMCS040R075
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}		-	750	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℃	-	55	A
	I_D	V_{GS}=18V, T_C=75℃	-	45	A
	I_D	V_{GS}=18V, T_C=100℃	-	39	A
Pulsed drain current	I_{DM}	Pulsed, t_p ≤ 10 μs, T_C = 25 °C	-	220	A

Diode continuous current	I_S	V_{GS}=-4V, T_C=25℃	-	30	A
Diode pulsed current	$I_{S,pulse}$	V_{GS}=-4V, Pulsed, $t_p \le 10$ μs, T_C = 25 °C	-	120	A
Total power dissipation	P_D	T_C=25℃	-	167	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,	-	456	mJ

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.9	°C/W
Thermal resistance, junction - ambient	R_{thJA}①	-	-	40	°C/W
Soldering temperature	T_{sold}	-	-	260	°C

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

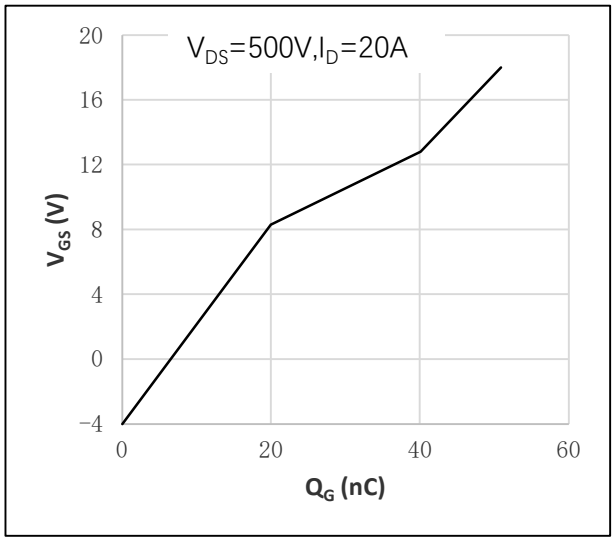
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	V_{GS} =0V, I_D =250uA	750	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=5mA	2	3	4	V
Drain-source leakage current	I_{DSS}	V_{GS}=0V, V_{DS}=750V	-	-	10	uA
Gate- source leakage current	I_{GSS}	V_{GS}=-10V, 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℃	-	36	43.2	mΩ
		V_{GS}=18V, I_D=20A, T_j=175℃	-	46.7	-	mΩ
		V_{GS}=15V, I_D=20A, T_j=25℃	-	47.7	-	mΩ
Forward transconductance	g_{FS}	V_{DS} =20V, I_D = 20A	-	18	-	S
Diode forward voltage	V_{FSD}	V_{GS} =-4V, I_{SD} = 20A	-	4	5.5	V

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

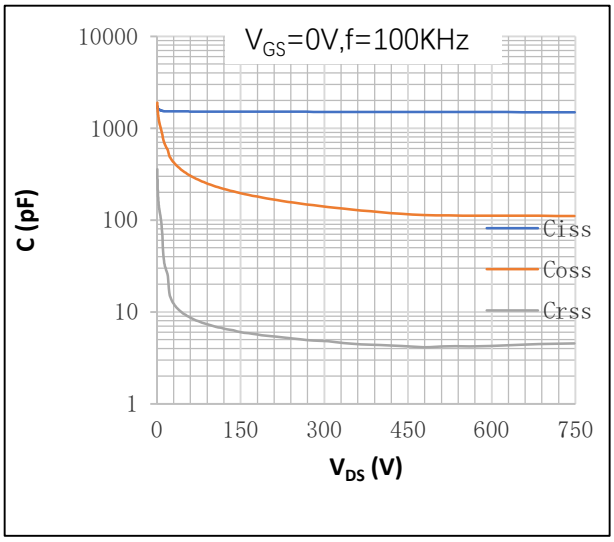
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	f = 100KHz, V_{DS}=500V, V_{GS}=0V	-	1505	-	pF
Output capacitance	C_{oss}		-	113	-	pF
Reverse transfer capacitance	C_{rss}		-	4.2	-	pF
Output charge	Q_{oss}	f = 100KHz, V_{GS}=0V, V_{DS}=0V to 500V	-	104.1	-	nC
Coss stored energy	E_{oss}		-	18.2	-	uJ

Effective output capacitance, energy related	$C_{o(er)}$②	V_{GS}=0V, V_{DS}=0...500V	-	145	-	pF
Effective output capacitance, time related	$C_{o(tr)}$③	I_D=constant, V_{GS}=0V, V_{DS}=0...500V	-	208	-	pF
Gate resistance	R_g	f = 1MHz	-	3.9	-	Ω
Total gate charge	Q_g	V_{DD} = 500V, I_D = 20A, V_{GS} = -4V/18V	-	50.9	-	nC
Gate-source charge	Q_{gs}		-	20	-	nC
Gate-drain charge	Q_{gd}		-	20.1	-	nC
Turn-on delay time	$t_{D(on)}$	V_{GS}=-4V/18V, V_{DS}=500V, R_G =10Ω, I_D =20A, L=100uH	-	27	-	ns
Turn-on rise time	t_r		-	20	-	ns
Turn-off delay time	$t_{D(off)}$		-	34	-	ns
Turn-off fall time	t_f		-	11	-	ns
Turn-on energy	E_{on}		-	50	-	uJ
Turn-off energy	E_{off}		-	179	-	uJ
Reverse recovery time	t_{rr}	V_{DD}=500V, dI_S/dt = 1000A/us, I_S=20A	-	12	-	ns
Reverse recovery peak current	I_{rrm}		-	15.3	-	A
Reverse recovery charge	Q_{rr}		-	103	-	nC

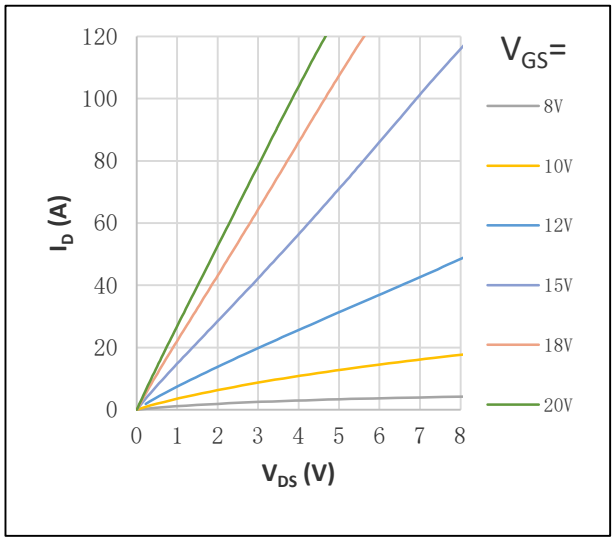
●Fig.1 Gate-source voltage as a function of gate charge; Typical values; T_j=25℃



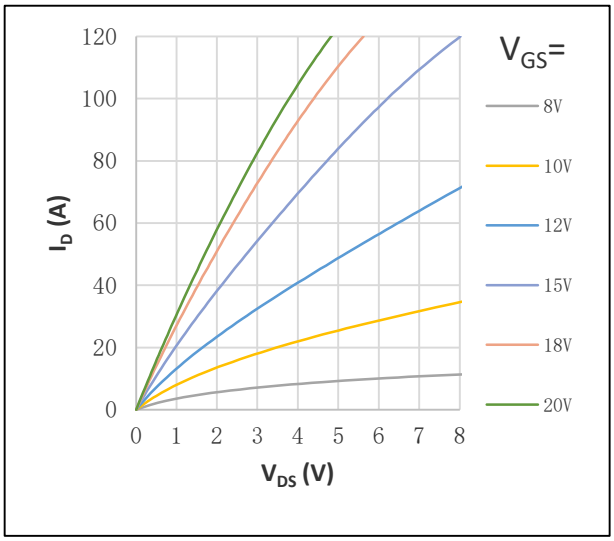
●Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; T_j=25℃



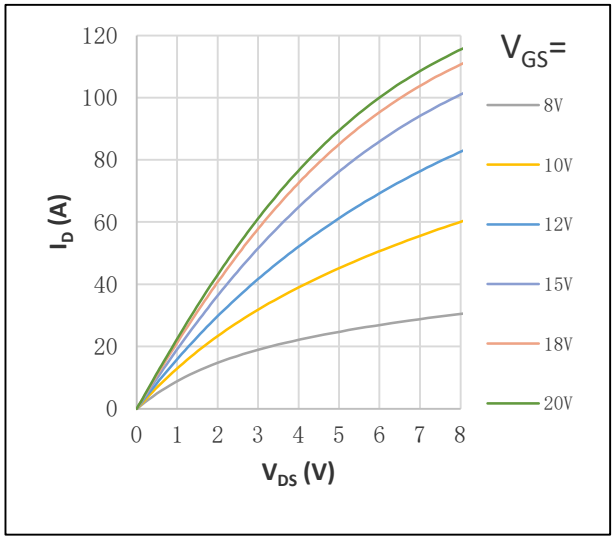
●Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; T_j=-55℃



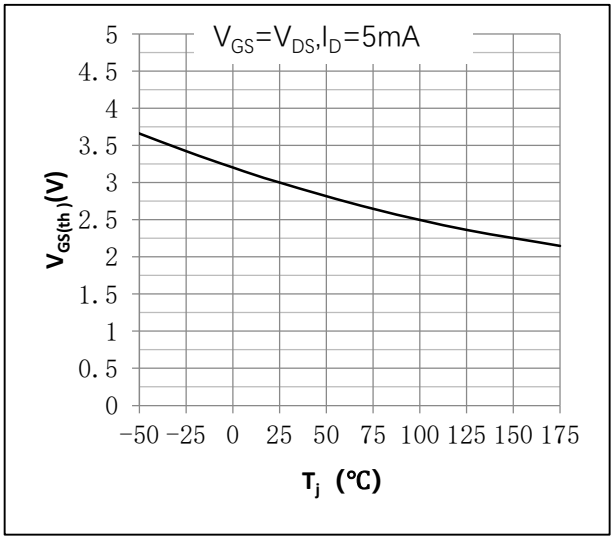
●Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: T_j=25℃



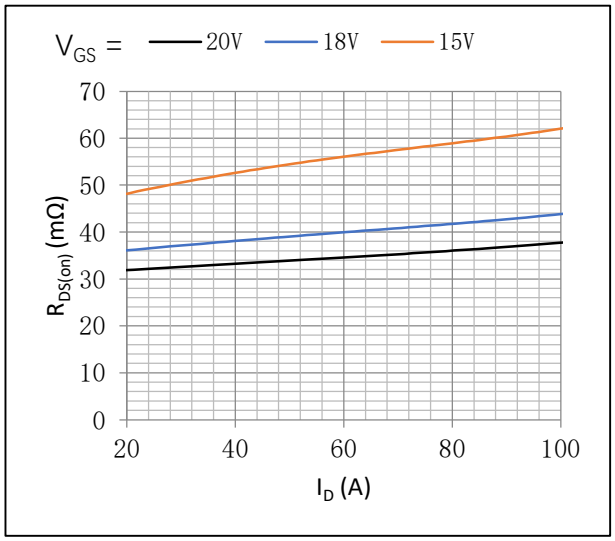
●Fig.5 Output characteristics: drain current as a function of drain-source voltage; Typical values: T_j=175℃



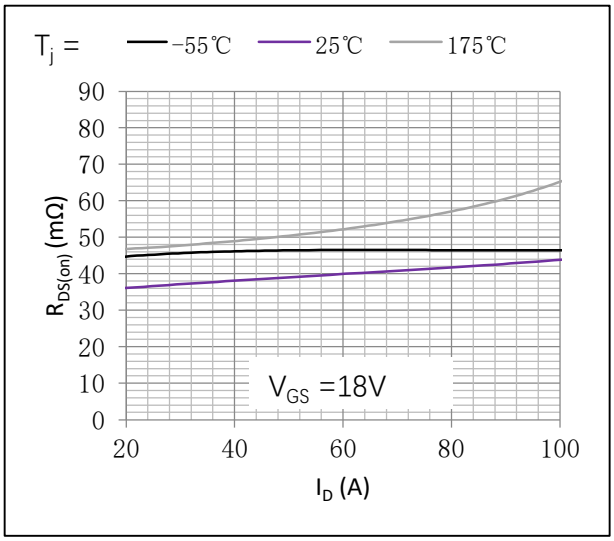
●Fig.6 Gate-source threshold voltage as a function of junction temperature; Typical values



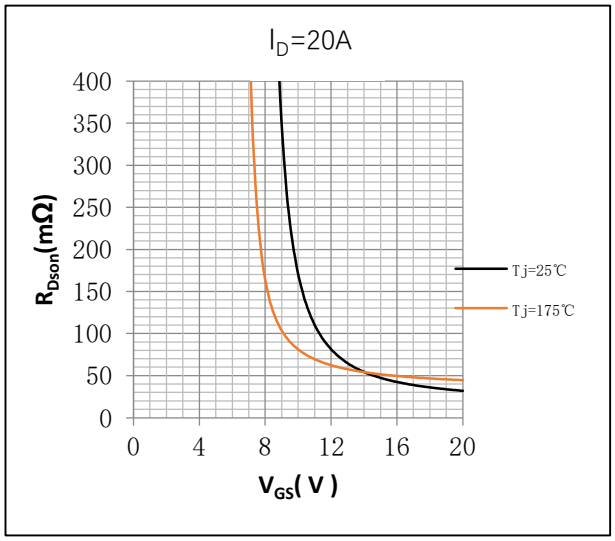
●Fig.7 Drain-source on-state resistance as a function of drain current; Typical values; Tj=25℃



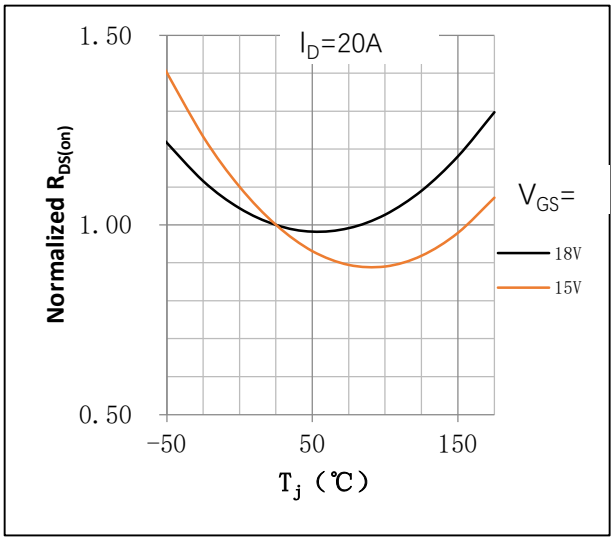
●Fig.8 Drain-source on-state resistance as a function of drain current; Typical values;



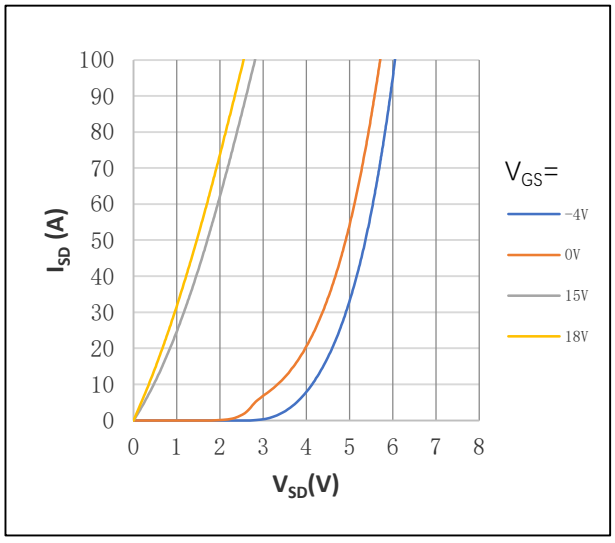
●Fig.9 Drain-source on-state resistance as a function of gate-source voltage; Typical values



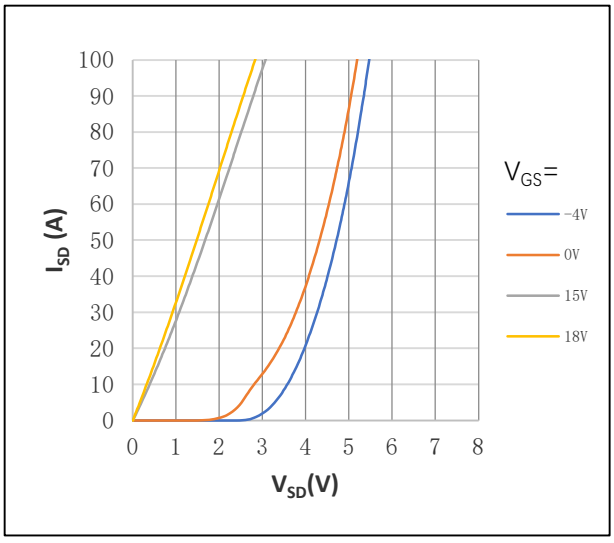
●Fig.10 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values; Normalized On-Resistance=R_{DSon}/R_{DSon}(25℃)



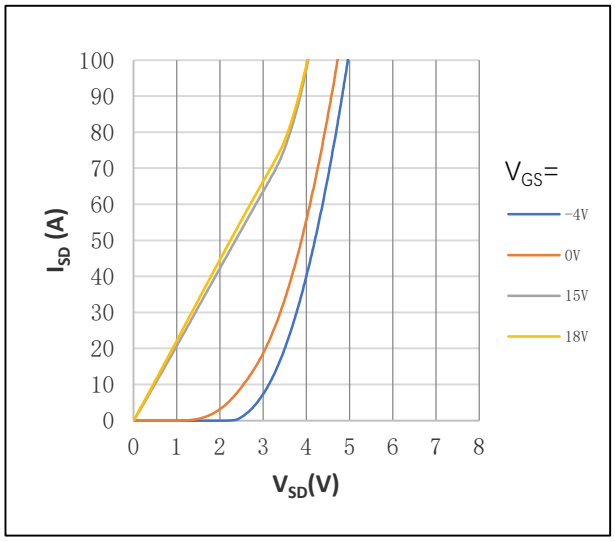
●Figure.11 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; Tj=-55℃



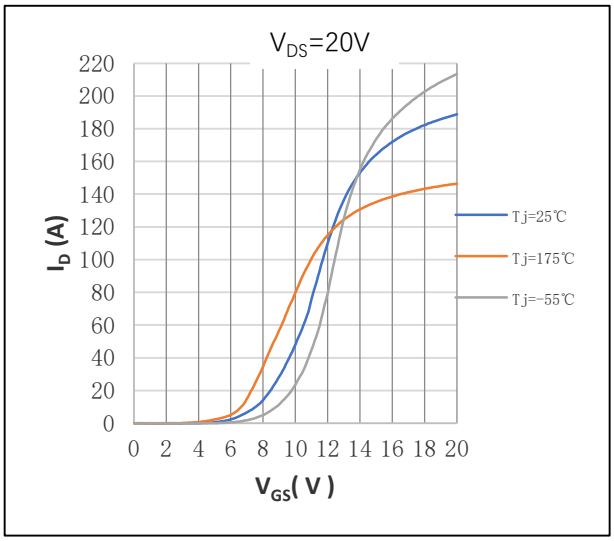
●Figure.12 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; Tj=25℃



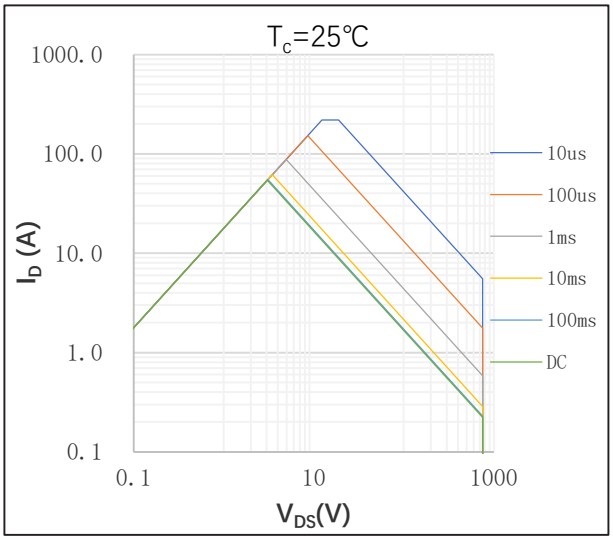
●Figure.13 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values; Tj=175℃



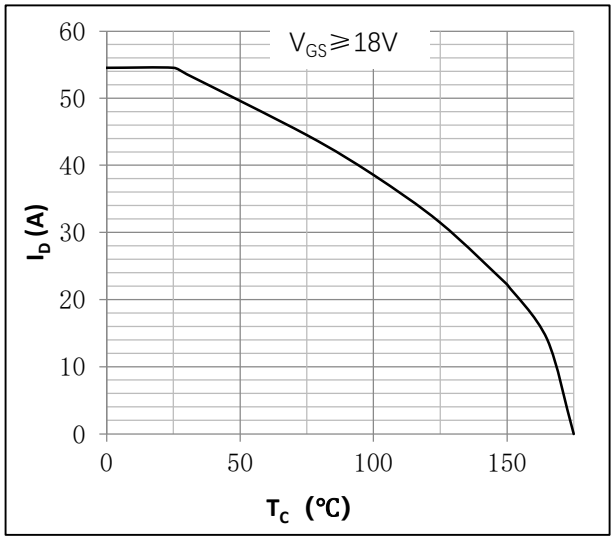
●Figure.14 Transfer characteristics: drain current as a function of gate-source voltage; Typical values



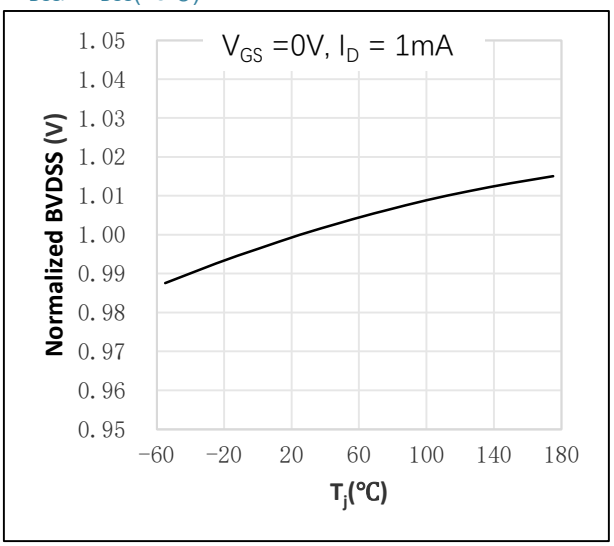
●Fig.15 Safe operating area: continuous and peak drain currents as a function of drain-source voltage; Calculative values



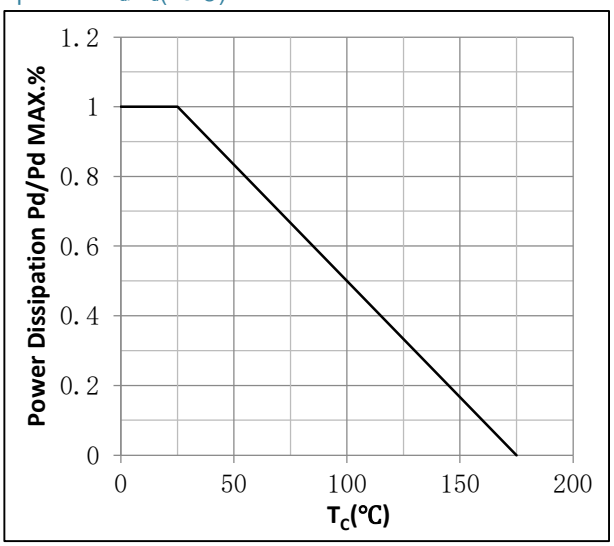
●Fig.16 Continuous drain current as a function of case temperature④;Calculative values



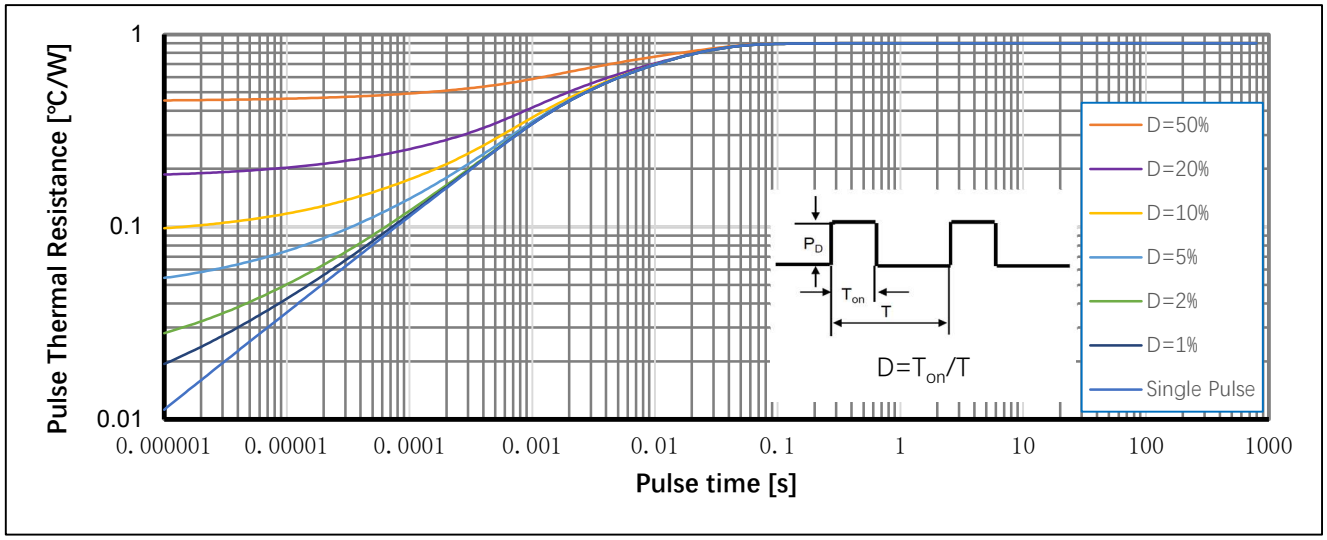
●Fig.17 Drain-source breakdown voltage as a function of junction temperature; Typical values Normalized BV_{DSS} =BV_{DSS}/BV_{DSS}(25℃)



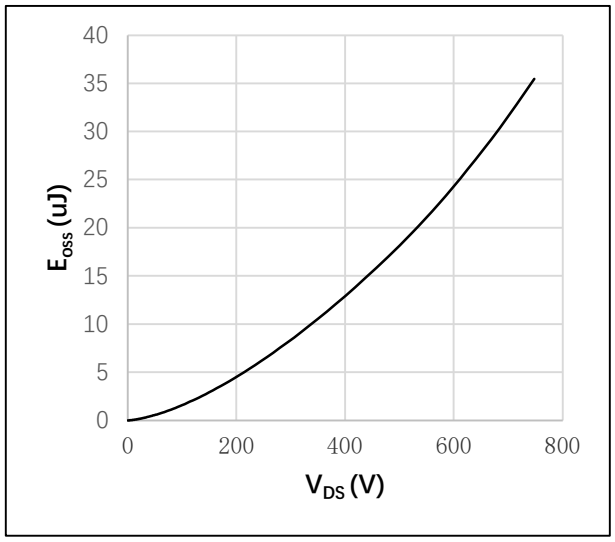
●Fig.18 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation =P_d/P_d(25℃)



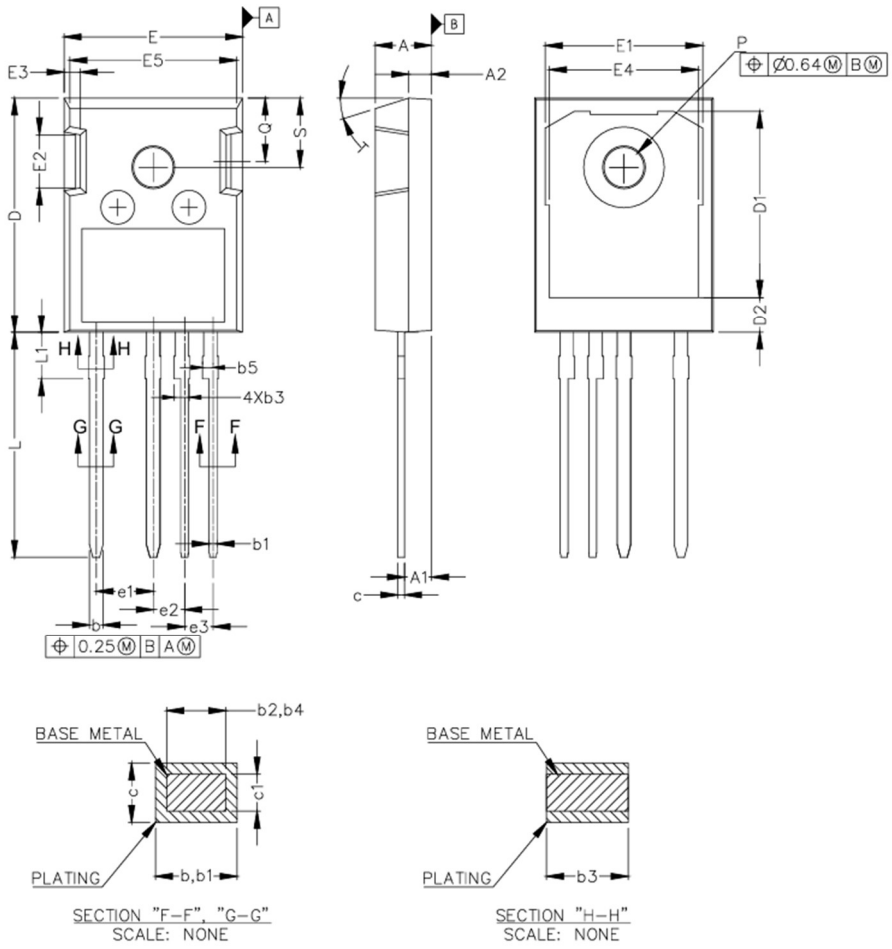
●Fig.19 Transient thermal impedance from junction to case as a function of pulse duration; max values



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



Package Outline



SYM	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.10	1.30
b1	0.65	0.79
b2	1.10	1.25
b3	1.34	1.44
b4	0.65	0.74
b5	0.74	1.14
c	0.55	0.68
c1	0.55	0.65
D	20.80	21.10
D1	16.25	17.65
D2	2.95	3.35
E	15.75	16.13
E1	13.10	14.15
E2	4.32	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	14.65	15.05
e1	5.08 BSC	
e2	2.79 BSC	
e3	2.54 BSC	
L	19.72	20.32
L1	3.97	4.37
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	

●Note

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

②$C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 500V.

③$C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 500V.

④Practically 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	2025/9/3	New