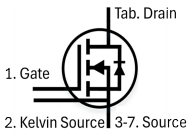
• General Description

This silicon carbide Power MOSFET device has been developed using ZMJ's advanced 2nd generation SiC MOSFET technology. The device features a very low RDS(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.

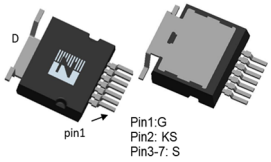
• Product Summary



V_{DS}= 1200V
$R_{DS(ON)}$ = 36mΩ
I_D= 53A

• 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



T2PAK

•Application

■Motor Drives
■On Board Charger
■DC-DC
■Auxiliary Drives

•Ordering Information:

Part NO.	ZMCA040R120T2
Marking	ZMC040R120
Packing Information	REEL TAPE
Basic ordering unit (pcs)	700

•Absolute Maximum Ratings (T_A=25°C,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°C	-	53	A
	I_D	V_{GS}=18V,T_C=75°C	-	43	A
	I_D	V_{GS}=18V,T_C=100°C	-	38	A
Pulsed Drain Current ①	I_{DM}	Pulsed; t_p ≤ 10 μs; T_C = 25 °C;	-	212	A
Total Power Dissipation	P_D	T_C=25℃	-	211	W
Total Power Dissipation	P_D	T_A=25℃	-	3.0	W
Operating Junction Temperature	T_J		-55	175	℃
Storage Temperature	T_{STG}		-55	175	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.5mH, V_{GS}=18V, Rg=25Ω,	-	529	mJ
ESD Level (HBM)	CLASS 2				

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.71	°C/W
Thermal resistance, junction-ambient	R_{thJA} ②	-	-	50	°C/W
Soldering temperature	Tsold	-	-	260	°C

•Electronic Characteristics (Tj=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	$VGS_{(TH)}$	V_{GS}=V_{DS}, I_D=5mA	2	2.7	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
	I_{GSS}	V_{GS}=25V, V_{DS} =0V	-	-	100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=18V, I_D=30A, Tj=25°C	-	36	43	mΩ
		V_{GS}=18V, I_D=30A, Tj=175°C	-	73	-	mΩ
		V_{GS}=15V, I_D=30A, Tj=25°C	-	43	-	mΩ
Forward Transconductance	g_{FS}	V_{DS} =10V, I_{SD} =30A	-	14	-	S
Diode Forward Voltage	V_{FSD}	V_{GS} =-4V,I_{SD} =30A	-	4.4	5	V

•Dynamic characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 100KHz, V_{DS}=800V, V_{GS}=0V	-	2192	-	pF
Output capacitance	Coss		-	90	-	
Reverse transfer capacitance	Crss		-	2	-	
Output Charge	Q_{oss}	f = 100KHz,V_{GS}=0V, V_{DS}=0V to 800V	-	121	-	nC
Coss Stored Energy	E_{oss}		-	33	-	uJ
Gate Risistance	Rg	f = 1MHz	-	1.5	-	Ω
Total gate charge	Qg	V_{DD} = 800V,I_D = 30A, V_{GS} = -4V/18V	-	85.9	-	nC
Gate - Source charge	Qgs		-	24.9	-	
Gate - Drain charge	Qgd		-	30.0	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=-4V/18V,V_{DS}=800V,R_G =10Ω, I_D =30A	-	18	-	ns
Turn-ON Rise time	t_r		-	36	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	48	-	ns
Turn-Off Fall time	t_f		-	71	-	ns
Turn-On Energy	Eon		-	1068	-	uJ
Turn-Off Energy	Eoff		-	1080	-	uJ
Reverse Recovery Time	t_{rr}	V_{DD}=100V, dI_S/dt = 260A/us, I_S=30A	-	24	-	ns
Reverse Recovery Charge	Q_{rr}		-	50	-	nC

Fig.1 Gate-source voltage as a function of gate charge;Typical values;Tj=25°C

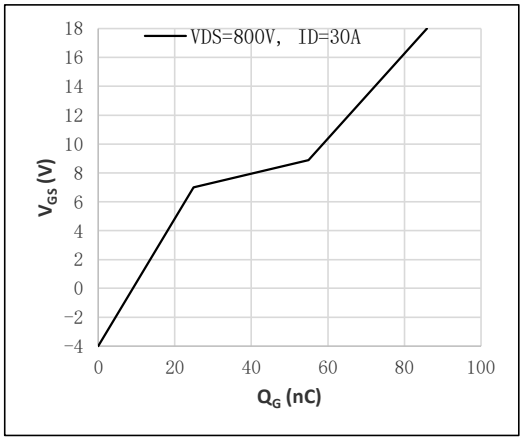


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage;Typical values;Tj=25°C

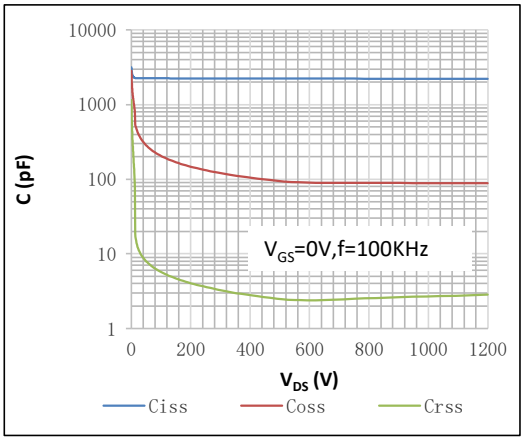


Fig.3 Output characteristics: drain current as a function of drain-source voltage;Typical values; Tj=25°C

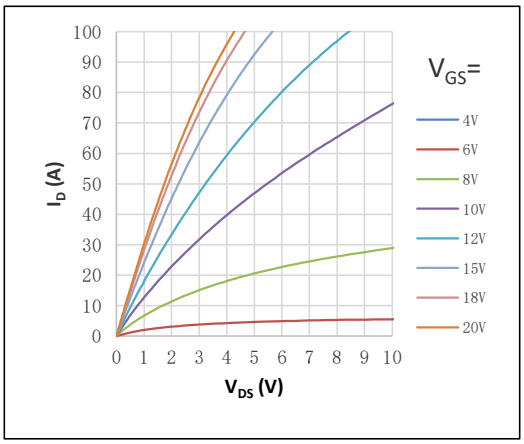


Fig.4 Output characteristics: drain current as a function of drain-source voltage;Typical values:Expanded curve;Tj=25°C

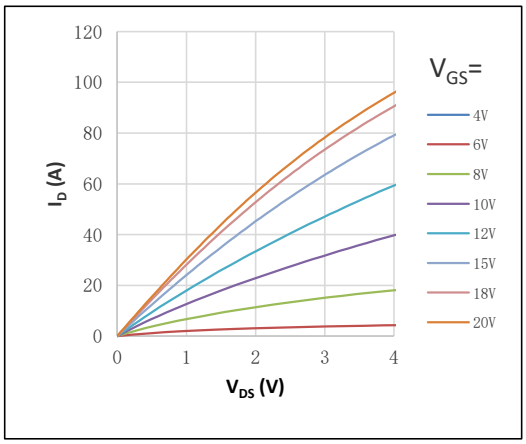


Fig.5 Gate-source threshold voltage as a function of junction temperature;Typical values

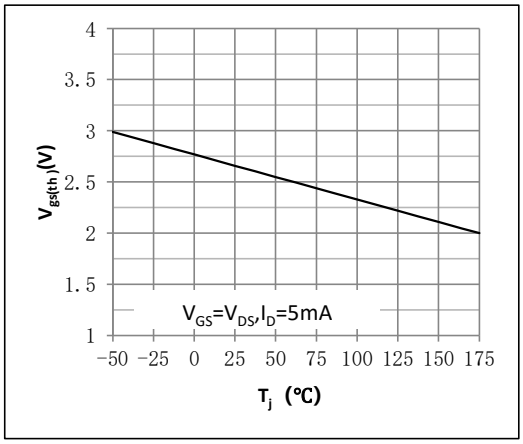


Fig.6 Drain-source on-state resistance as a function of drain current;Typical values;Tj=25°C

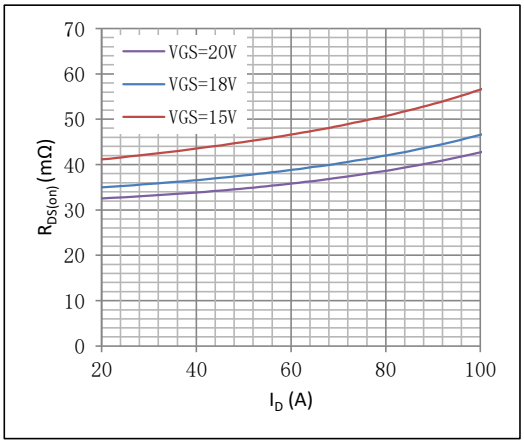


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

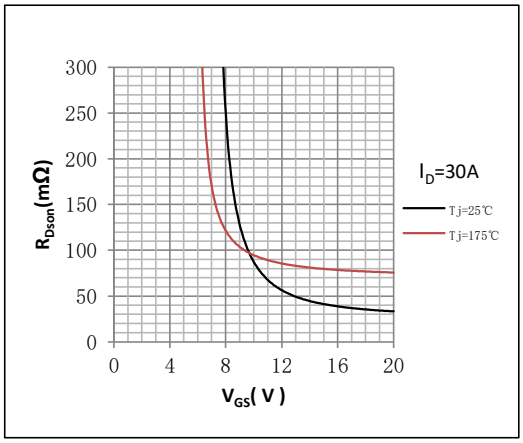


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

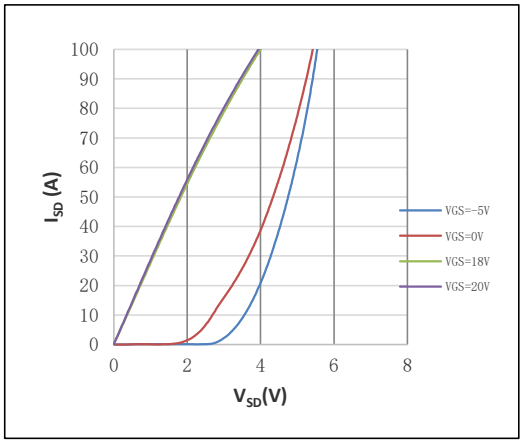


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

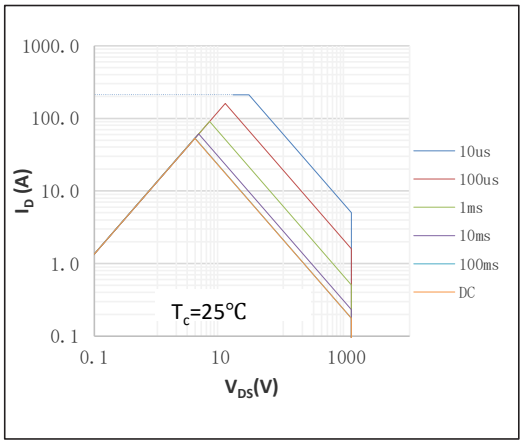


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance=RDSon/RDSon(25℃)

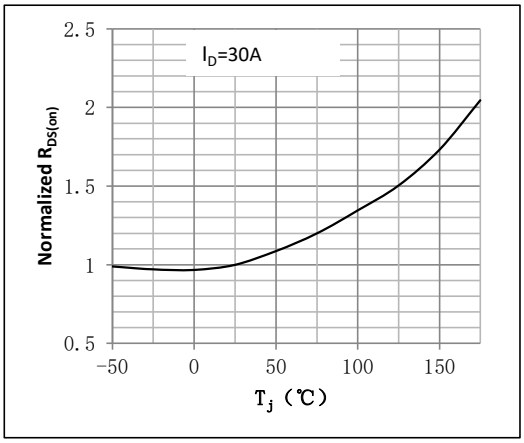


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

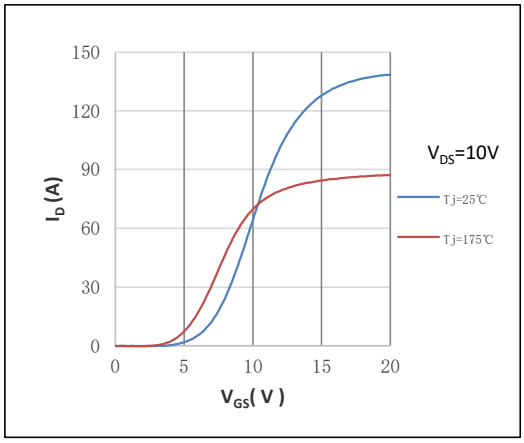


Fig.12 Continuous drain current as a function of case temperature[3];Calculative values

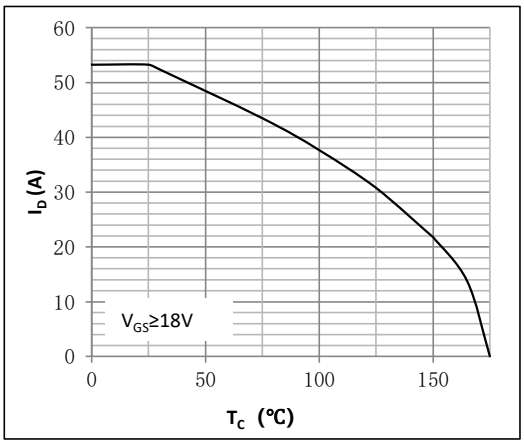


Fig.13 Drain-source breakdown voltage as a function of junction temperature;Typical values
Normalized BVDSS=BVDSS/BVDSS(25°C)

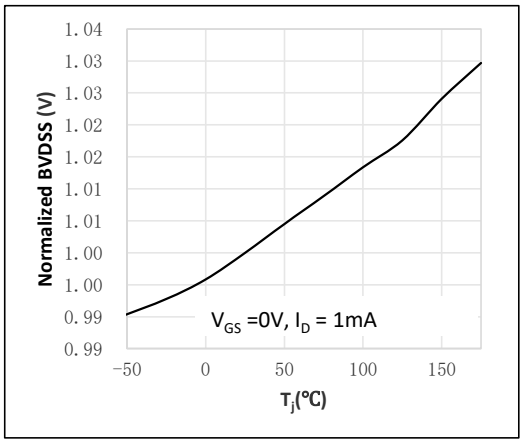


Fig.14 Normalized total power dissipation as a function of case temperature;Calculative values
Normalized Power Dissipation=Pd/Pd(25°C)

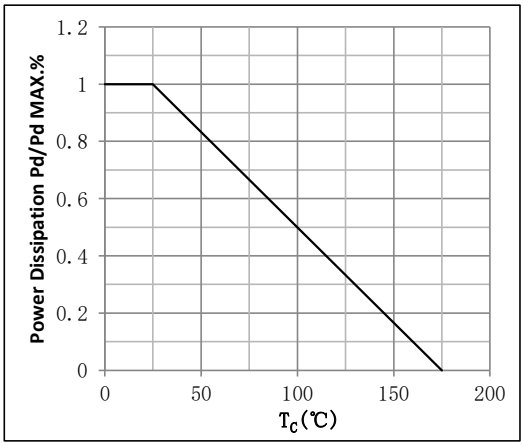


Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values

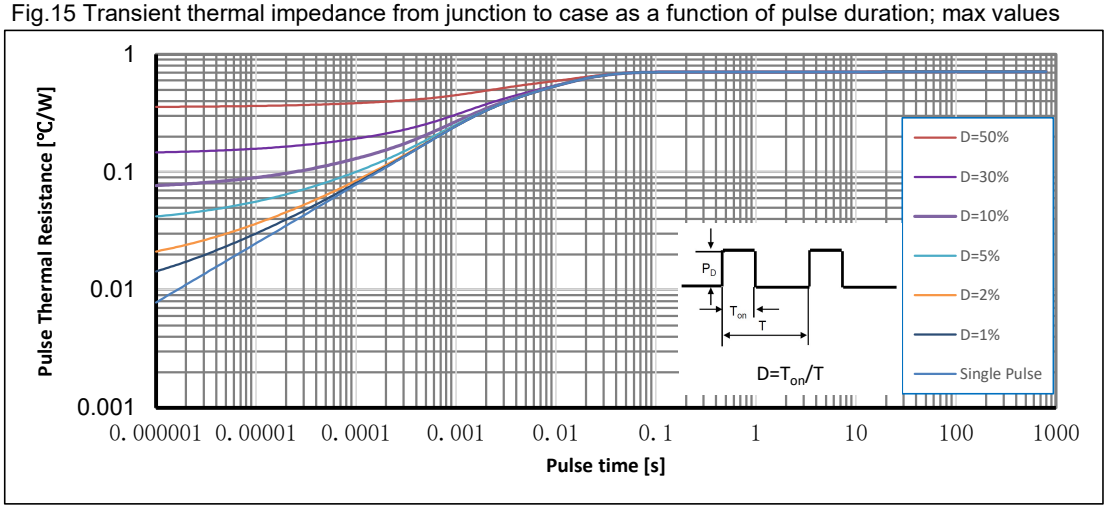
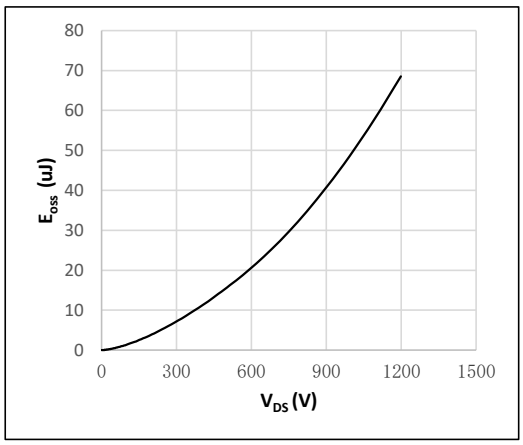
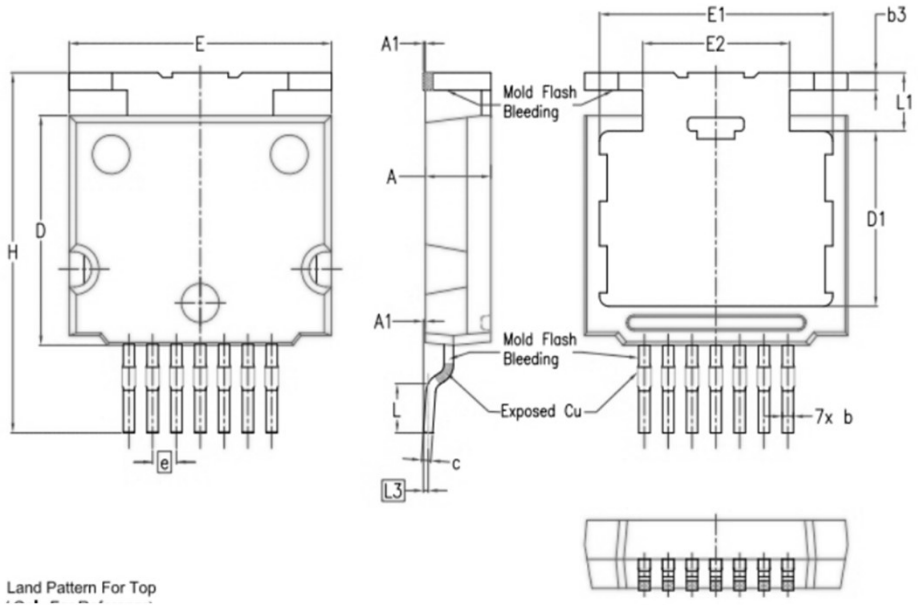


Fig.16 Output capacitor stored energy as a function of drain-source voltage;Typical values;
Tj=25°C



●T2PAK Package Outline



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SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	3.40	3.50	3.60
A1	0.00	0.10	0.25
b	0.50	0.60	0.70
b3	0.80	0.90	1.00
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	8.80	9.00	9.10
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	7.75	7.80	7.85
e	1.27 BSC		
H	18.00	18.50	19.00
L	2.30	2.50	2.75
L1	—	3.05	—
L3	—	0.26	—
L5	1.70	1.90	2.15

Note:

① The value of RθJA is measured with the device in a still environment with TA=25℃

②Practically the current will be limited by PCB, thermal design and operating temperature. VGS=18V.

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Version	Date	Change
A	2025/4/16	New