

• 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

• Application

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

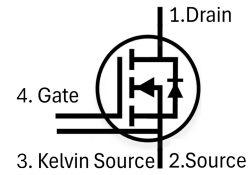
• Ordering Information:

Part NO.	ZMC060N120C4
Marking	ZMC060N120
Packing Information	BULK TUBE
Basic ordering unit (pcs)	600

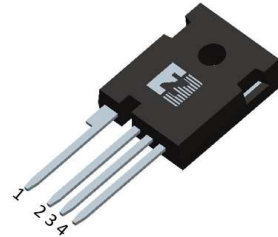
• Absolute Maximum Ratings ($T_C=25^\circ C$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		1200	V
Gate-Source Voltage	V_{GS}	Transient voltage	-10V/20V	V
	V_{GS}	Static voltage	-4V/18V	V
Recommended turn on gate voltage	$V_{GS(on)}$		15 to 18V	V
Recommended turn off gate voltage	$V_{GS(off)}$		-4V to 0V	V
Continuous Drain Current	I_D	$T_C=25^\circ C$	35	A
	I_D	$T_C=75^\circ C$	29	A
	I_D	$T_C=100^\circ C$	25	A

• Product Summary



$V_{DS} = 1200V$
 $R_{DS(ON)} = 53m\Omega$
 $I_D = 35A$



TO-247-4



Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25 \text{ }^\circ\text{C}$;	140	A
Total Power Dissipation	P_D	$T_C = 25 \text{ }^\circ\text{C}$	197	W
Total Power Dissipation	P_D	$T_A = 25 \text{ }^\circ\text{C}$	3.8	W
Operating Junction Temperature	T_J		-55 to +175	$^\circ\text{C}$
Storage Temperature	T_{STG}		-55 to +175	$^\circ\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L = 0.5\text{mH}$, $V_{GS} = 18\text{V}$, $R_g = 25\Omega$	361	mJ
ESD Level (HBM)			Class2	

●Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.76	$^\circ\text{C/W}$
Thermal resistance, junction-ambient	R_{thJA} ②	-	-	40	$^\circ\text{C/W}$
Soldering temperature(total time<10s)	T_{sold}	-	-	260	$^\circ\text{C}$

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$	1200	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 5\text{mA}$	2	2.8	4	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS} = 0\text{V}$, $V_{DS} = 1200\text{V}$	-	-	10	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS} = -10\text{V}$, $V_{DS} = 0\text{V}$	-	-	-100	nA
		$V_{GS} = 20\text{V}$, $V_{DS} = 0\text{V}$	-	-	100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$T_J = 25 \text{ }^\circ\text{C}$, $V_{GS} = 18\text{V}$, $I_D = 20\text{A}$	-	53	65	m Ω
		$T_J = 175 \text{ }^\circ\text{C}$, $V_{GS} = 18\text{V}$, $I_D = 20\text{A}$	-	87	-	m Ω
		$T_J = 25 \text{ }^\circ\text{C}$, $V_{GS} = 15\text{V}$, $I_D = 20\text{A}$	-	63	-	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 10\text{V}$, $I_{SD} = 20\text{A}$	-	8.5	-	S
Diode Forward Voltage	V_{FSD}	$V_{GS} = -4\text{V}$, $I_{SD} = 20\text{A}$	-	4.3	5	V

●Dynamic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f = 100\text{KHz}$, $V_{DS} = 800\text{V}$	-	1690	-	pF
Output capacitance	C_{oss}		-	67	-	
Reverse transfer capacitance	C_{rss}		-	3	-	
Output charge	Q_{oss}	$f = 100\text{KHz}$, $V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V to } 800\text{V}$	-	90	-	nC
Coss stored energy	E_{oss}		-	25	-	μJ
Gate Resistance	R_g	$f = 1\text{MHz}$	-	1.7	-	Ω
Total gate charge	Q_g	$V_{DD} = 800\text{V}$, $I_D = 20\text{A}$, $V_{GS} = -4\text{V}/18\text{V}$	-	69	-	nC
Gate - Source charge	Q_{gs}		-	23	-	
Gate - Drain charge	Q_{gd}		-	26	-	

Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=-4V/18V, V_{DS}=800V,$ $R_G=2\Omega, I_D=20A$	-	10	-	ns
Turn-ON Rise time	t_r		-	9	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	19	-	ns
Turn-Off Fall time	t_f		-	10	-	ns
Turn-On Energy	E_{on}		-	76	-	uJ
Turn-Off Energy	E_{off}		-	51	-	uJ
Reverse Recovery Time	t_{rr}	$V_{DD}=800V, di_S/dt =$ $100A/us, I_S=20A$	-	14	-	ns
Reverse Recovery Peak Current	I_{rrm}		-	8	-	A
Reverse Recovery Charge	Q_{rr}		-	77	-	nC

●Characteristics Diagrams

Fig.1 Gate-Charge Characteristics

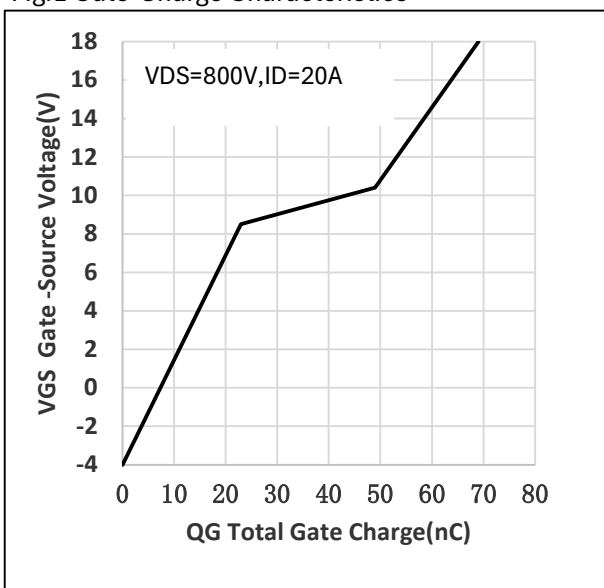


Fig.2 Capacitance Characteristics

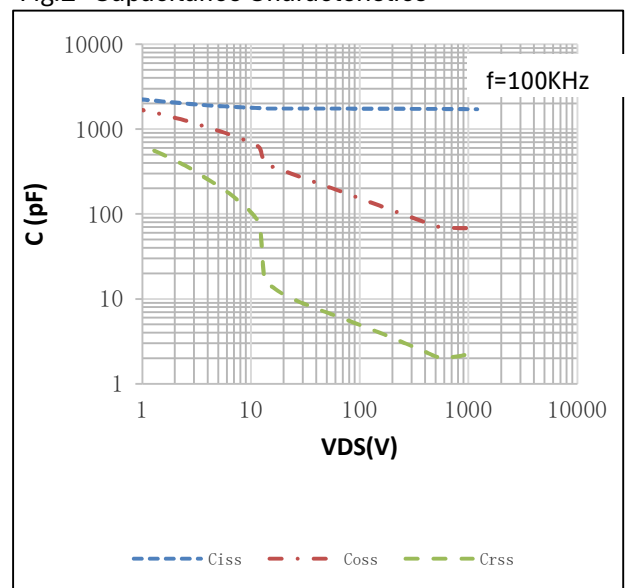


Fig.3 Power Dissipation

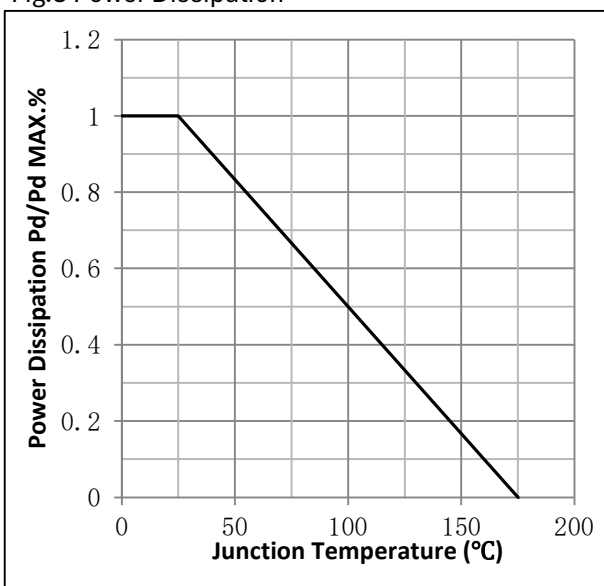


Fig.4 Typical output Characteristics

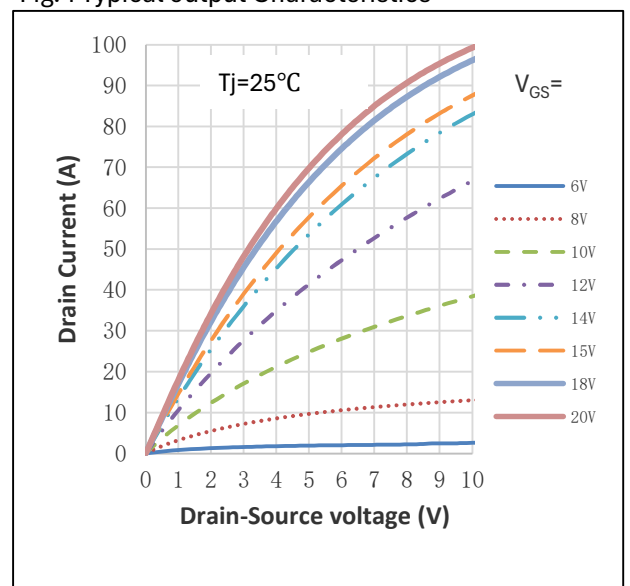


Fig.5 Threshold Voltage V.S Junction Temperature

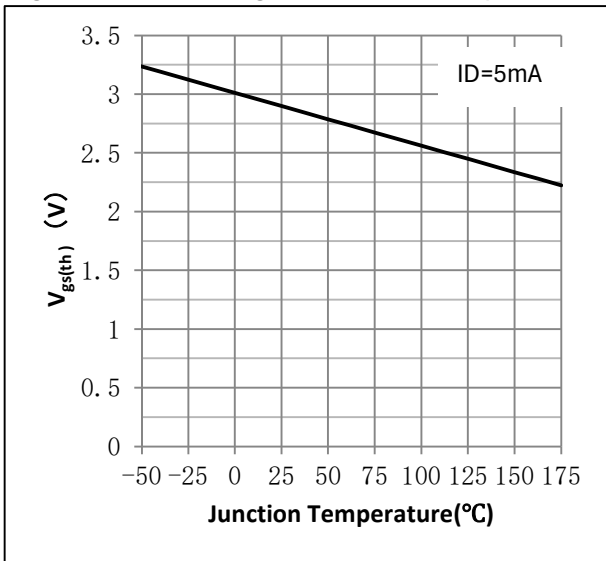


Fig.6 On-Resistance V.S Drain Current

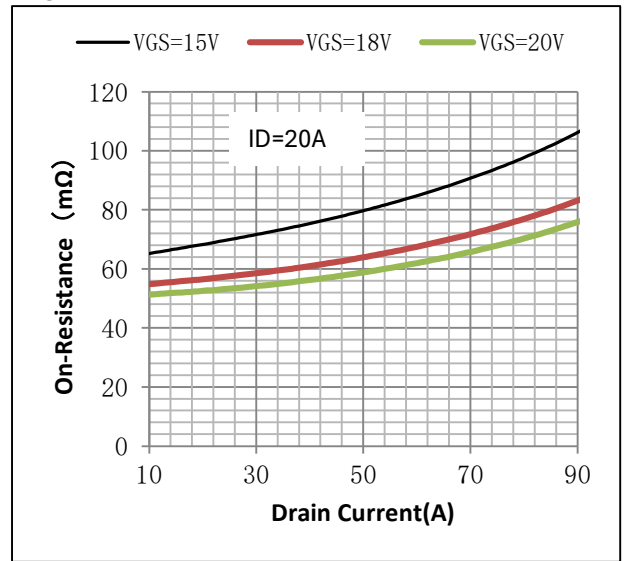


Fig.7 On-Resistance VS Gate Source Voltage

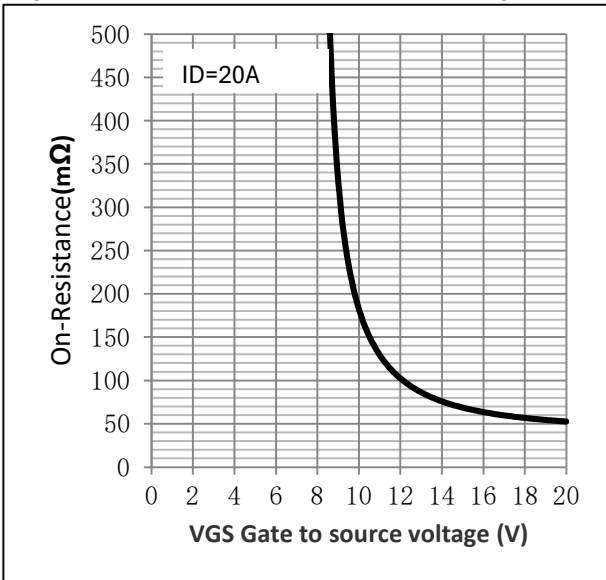


Fig.8 On-Resistance V.S Junction Temperature

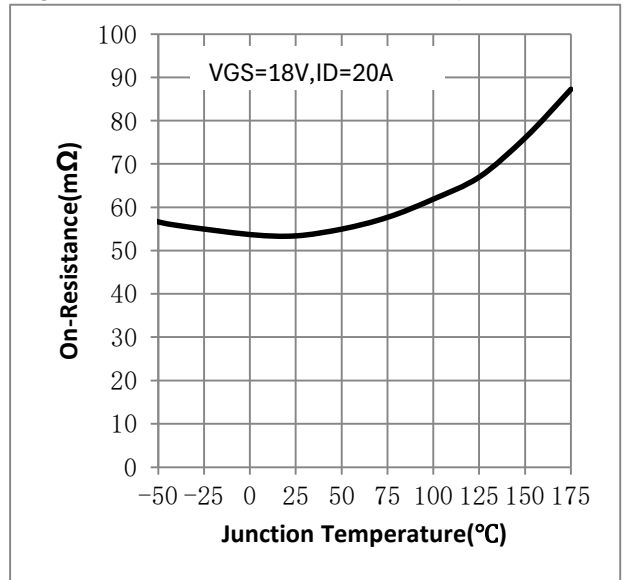


Figure 9. Diode Forward Voltage vs. Current

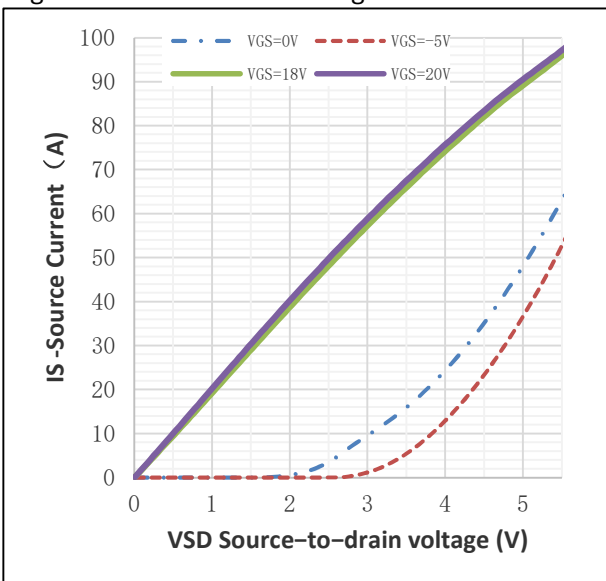


Figure 10. Transfer Characteristics

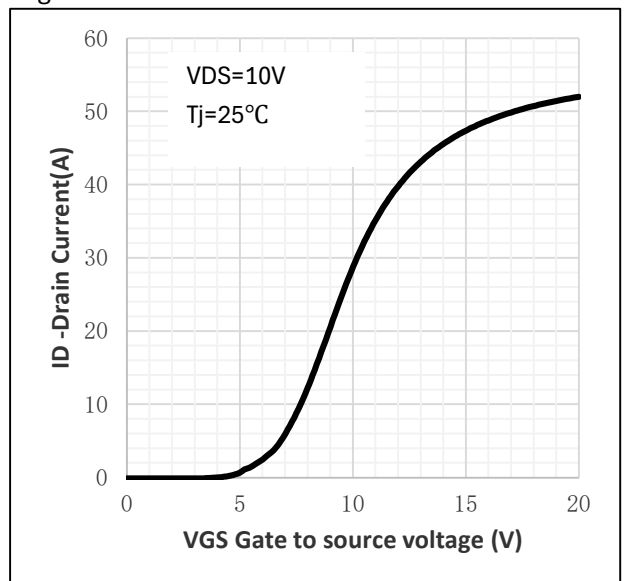


Fig.11 SOA Maximum Safe Operating Area

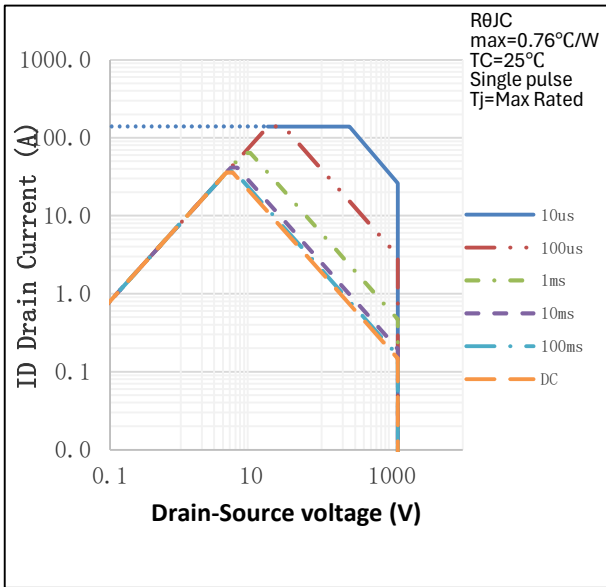


Fig.12 ID vs. Junction Temperature

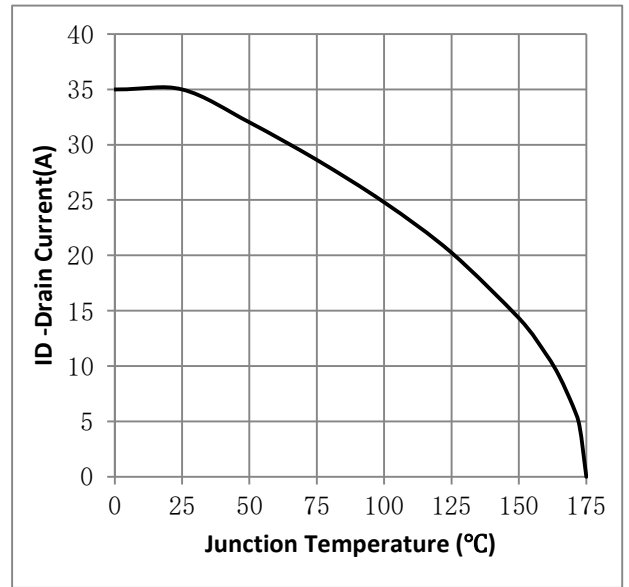


Fig.13 Output Capacitor Stored Energy

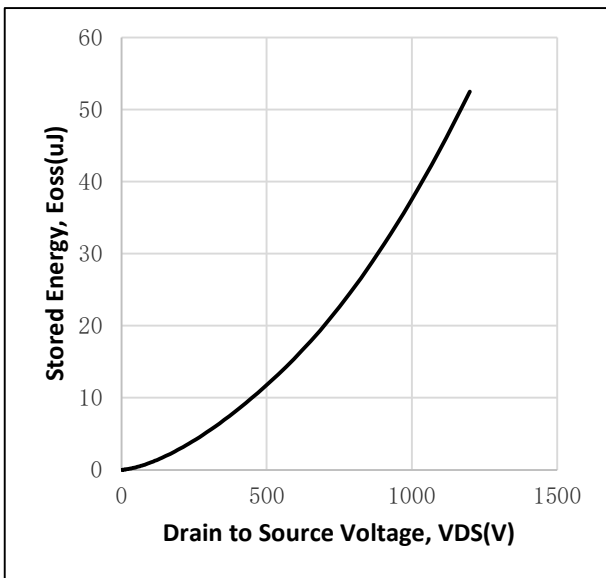
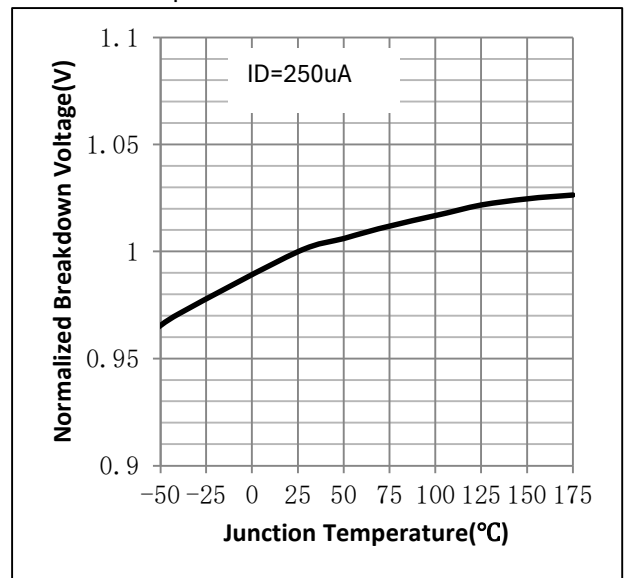
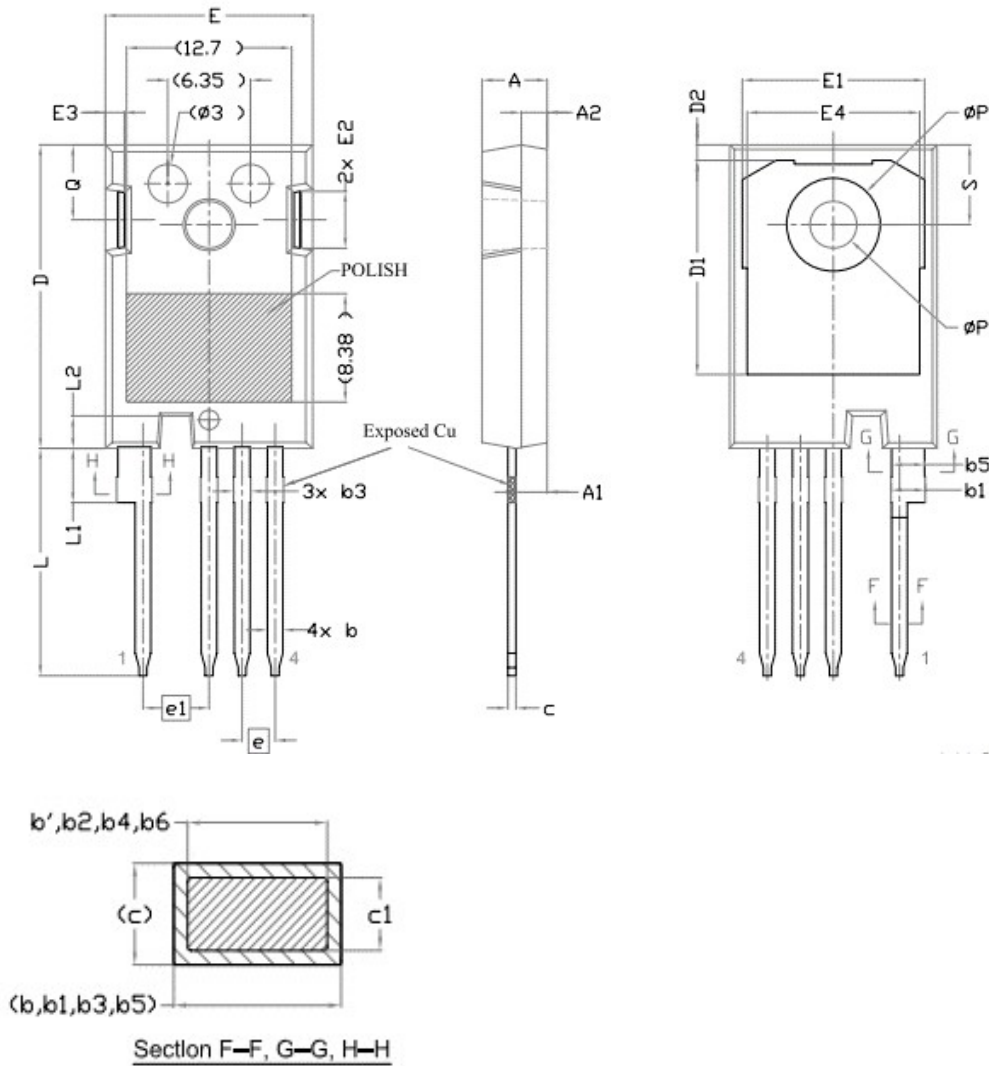


Fig.14 Normalized Breakdown Voltage vs. Junction Temperature



•TO-247-4 Package Outline



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
øP	3.51	3.61	3.65
øP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

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	2024/6/7	New