

● General Description

Through advanced trench and field stop technology to provide very low $V_{CE(sat)}$, low gate charge, and excellent switching performance.

● Features

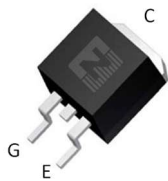
- Very low $V_{CE(sat)}$
- Low switching power loss
- Low switching surge and noise
- Low thermal resistance

● Application

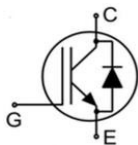
- Motor drives



● Product Summary



TO-263



$V_{CE}=650V$

$V_{CE(sat)}=1.47V$

$I_C=30A$



● Ordering Information

Part NO.	ZMBG30N065TD1AB
Marking	BG30N065TD1A
Packing information	REEL TAPE
Basic ordering unit (pcs)	800

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Collector-emitter voltage	V_{CE}		-	650	V
Gate-emitter voltage	V_{GE}		-20	20	V
Continuous collector current	I_C	$V_{GE}=15V, T_C=25^{\circ}C$	-	60	A
	I_C	$V_{GE}=15V, T_C=100^{\circ}C$	-	30	A
Pulsed collector current	I_{CM}	Pulsed; $t_p \leq 10 \mu s; T_C = 25^{\circ}C$	-	120	A
Diode forward current	I_F	$V_{GE}=0V, T_C=25^{\circ}C$	-	60	A
		$V_{GE}=0V, T_C=100^{\circ}C$	-	30	A
Pulsed diode forward current	$I_{F,pulse}$	Pulsed; $t_p \leq 10 \mu s; T_C = 25^{\circ}C$	-	120	A
Total power dissipation	P_D	$T_C=25^{\circ}C$	-	417	W
Total power dissipation	P_D	$T_A=25^{\circ}C$	-	3.8	W
Operating junction temperature	T_J		-55	175	$^{\circ}C$
Storage temperature	T_{STG}		-55	175	$^{\circ}C$

● Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case IGBT	R_{thJC}	-	-	0.36	°C/W
Thermal resistance, junction - case diode	R_{thJC}	-	-	0.88	°C/W
Thermal resistance, junction - ambient	$R_{thJA}^{①}$	-	-	40	°C/W
Soldering temperature (total time<10s)	T_{sold}	-	-	260	°C

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

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage	BV_{CES}	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1mA$	4	5.3	6	V
Zero gate voltage collector current	I_{CES}	$V_{GE}=0V, V_{CE}=650V, T_J=25^{\circ}\text{C}$	-	-	10	μA
		$V_{GE}=0V, V_{CE}=650V, T_J=175^{\circ}\text{C}$	-	-	10	mA
Gate-emitter leakage current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	100	nA
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=30A, T_J=25^{\circ}\text{C}$	-	1.47	1.75	V
		$V_{GE}=15V, I_D=30A, T_J=175^{\circ}\text{C}$	-	1.87	-	V
Forward transconductance	g_{FS}	$V_{CE}=20V, I_C=30A$	-	22	-	S
Diode forward voltage	V_F	$I_F=30A, T_C=25^{\circ}\text{C}$	-	1.4	1.8	V
		$I_F=30A, T_C=175^{\circ}\text{C}$	-	1.1	1.5	V

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

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{ies}	$f=100\text{KHz}, V_{CE}=400V, V_{GE}=0V$	-	2521	-	pF
Output capacitance	C_{oes}		-	44	-	pF
Reverse transfer capacitance	C_{res}		-	6.5	-	pF
Gate resistance	R_g	$f=1\text{MHz}$	-	1.6	-	Ω
Total gate charge	Q_g	$V_{CC}=400V, I_C=30A, V_{GE}=15V$	-	78.4	-	nC
Gate-emitter charge	Q_{ge}		-	20.5	-	nC
Gate-collector charge	Q_{gc}		-	29.3	-	nC

● Switching characteristics ($T_j=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Turn-on delay time	$t_{d(on)}$	$T_j=25^{\circ}\text{C}$ $V_{GE}=15/-15\text{V}$, $V_{CE}=400\text{V}$, $R_G=10\Omega$, $I_C=30\text{A}$, $L=105\mu\text{H}$	-	20	-	ns
Turn-on rise time	t_r		-	20	-	ns
Turn-off delay time	$t_{d(off)}$		-	70	-	ns
Turn-off fall time	t_f		-	65	-	ns
Turn-on energy	E_{on}		-	0.95	-	mJ
Turn-off energy	E_{off}		-	0.48	-	mJ
Total switching energy	E_{ts}		-	1.43	-	mJ

● Switching characteristics ($T_j=150^{\circ}\text{C}$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Turn-on delay time	$t_{d(on)}$	$T_j=150^{\circ}\text{C}$ $V_{GE}=15/-15\text{V}$, $V_{CE}=400\text{V}$, $R_G=10\Omega$, $I_C=30\text{A}$, $L=105\mu\text{H}$	-	19	-	ns
Turn-on rise time	t_r		-	18	-	ns
Turn-off delay time	$t_{d(off)}$		-	81	-	ns
Turn-off fall time	t_f		-	90	-	ns
Turn-on energy	E_{on}		-	1.03	-	mJ
Turn-off energy	E_{off}		-	0.63	-	mJ
Total switching energy	E_{ts}		-	1.66	-	mJ

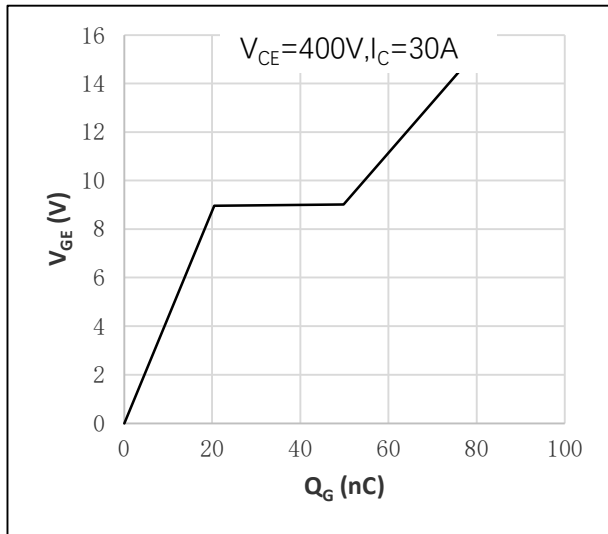
● Diode switching characteristics ($T_j=25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse recovery time	t_{rr}	$T_j=25^{\circ}\text{C}$ $V_R=400\text{V}$, $I_F=30\text{A}$, $di_F/dt=1000\text{A}/\mu\text{s}$,	-	28	-	ns
Reverse recovery charge	Q_{rr}		-	189	-	nC
Reverse recovery	I_{rrm}		-	11.8	-	A
Reverse recovery energy	E_{rr}		-	78	-	uJ

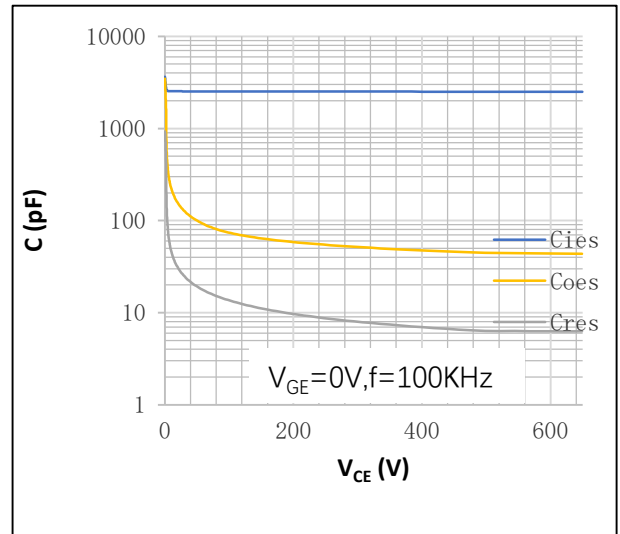
● Switching characteristics ($T_j=150^{\circ}\text{C}$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse recovery time	t_{rr}	$T_j=150^{\circ}\text{C}$ $V_R=400\text{V}$, $I_F=30\text{A}$, $di_F/dt=1000\text{A}/\mu\text{s}$,	-	139	-	ns
Reverse recovery charge	Q_{rr}		-	1160	-	nC
Reverse recovery	I_{rrm}		-	16.8	-	A
Reverse recovery energy	E_{rr}		-	167	-	uJ

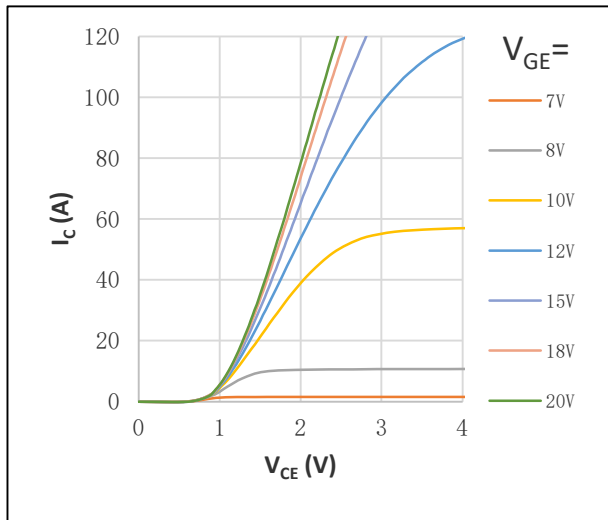
● Fig.1 Gate-emitter voltage as a function of gate charge;
Typical values; $T_j=25^\circ\text{C}$



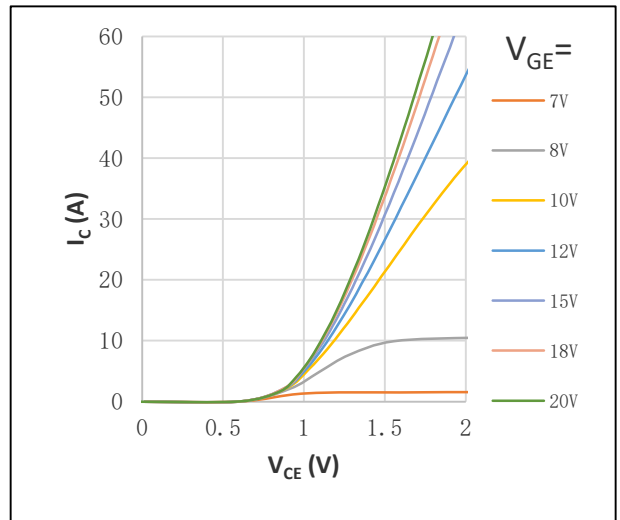
● Fig.2 Input, output and reverse transfer capacitances as a function of collector-emitter voltage; Typical values; $T_j=25^\circ\text{C}$



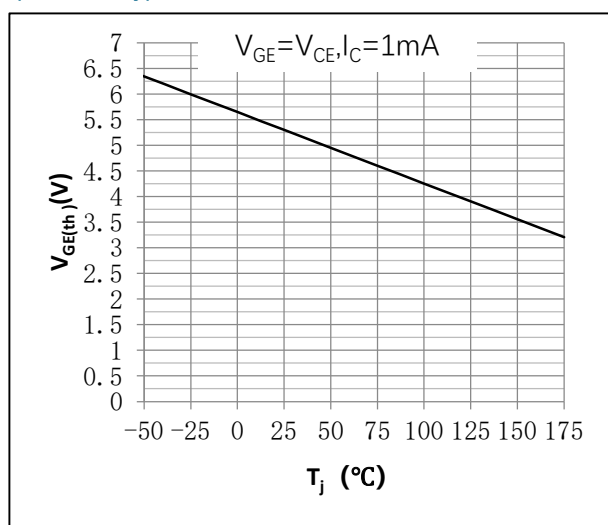
● Fig.3 Output characteristics: collector current as a function of collector-emitter voltage; Typical values; $T_j=25^\circ\text{C}$



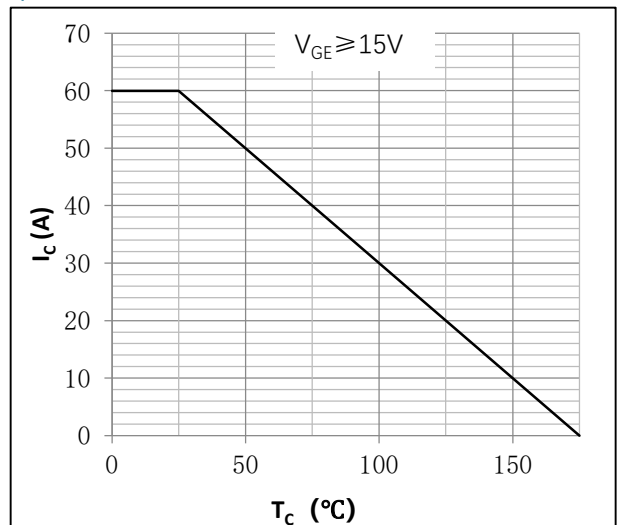
● Fig.4 Output characteristics: collector current as a function of collector-emitter voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$



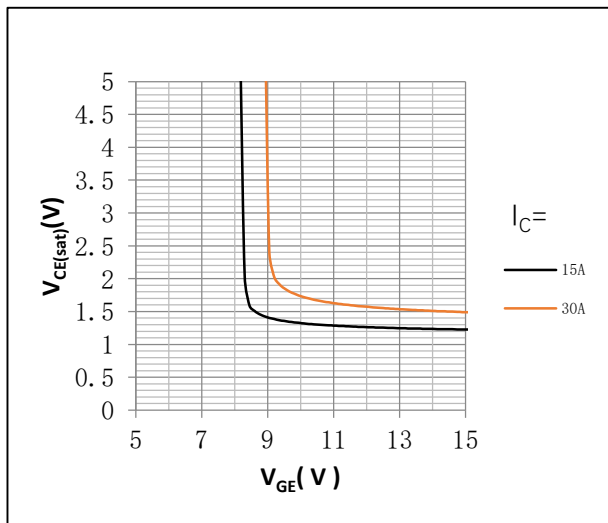
● Fig.5 Gate-emitter threshold voltage as a function of junction temperature; Typical values



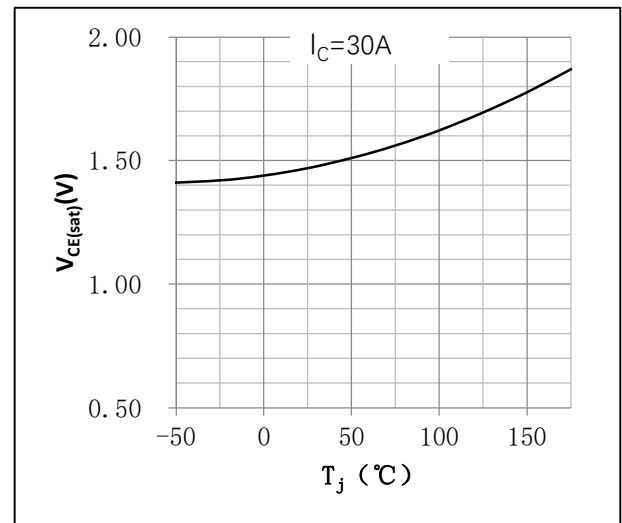
● Fig.6 Continuous collector current as a function of case temperature²; Calculative values



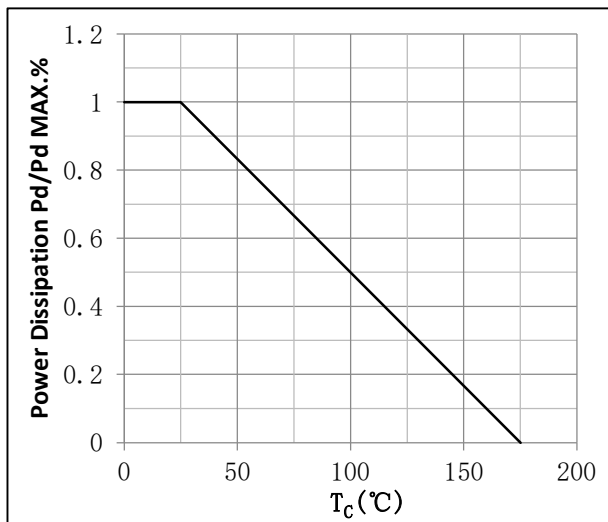
● Fig.7 Collector-emitter saturation voltage as a function of gate-emitter voltage; Typical values



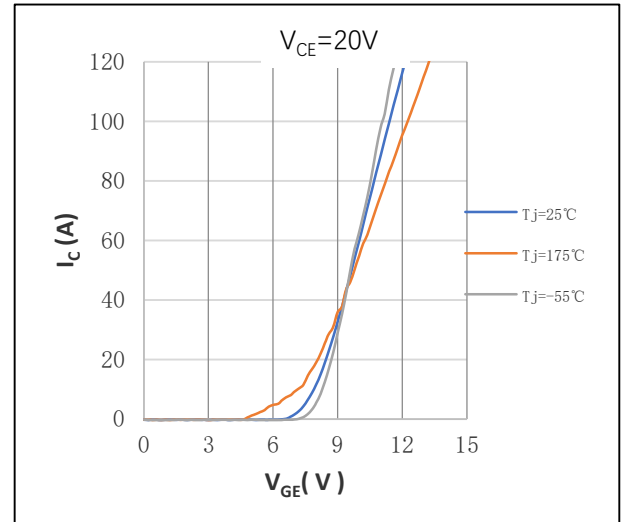
● Fig.8 Fig.6 Collector-emitter saturation voltage as a function of junction temperature; Typical values; T_j=25°C



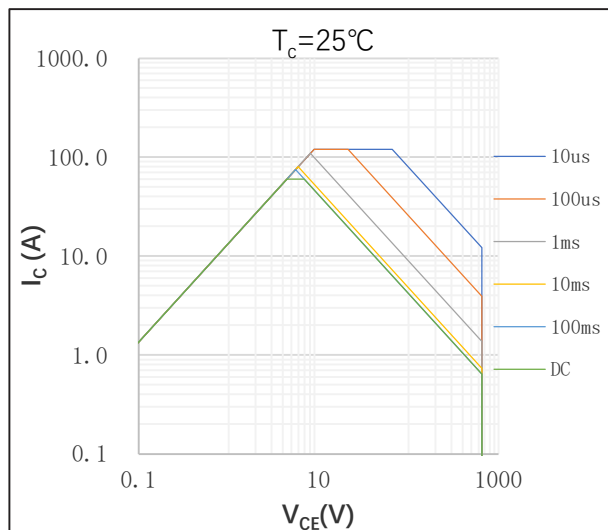
● Figure 9. Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation = P_d/P_d(25°C)



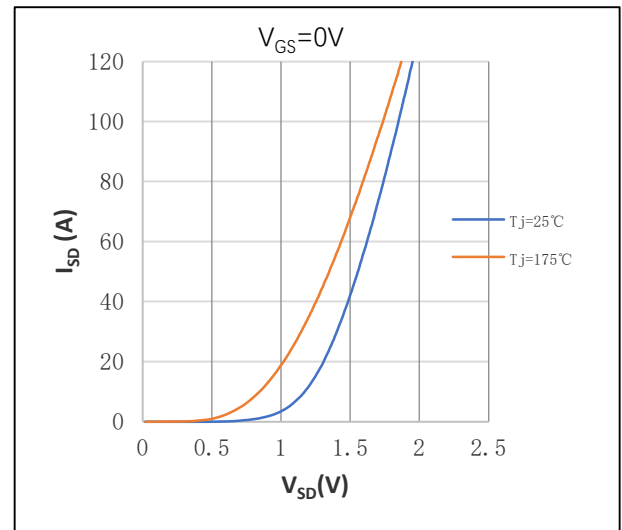
● Figure 10. Transfer characteristics: Collector current as a function of gate-emitter voltage; Typical values



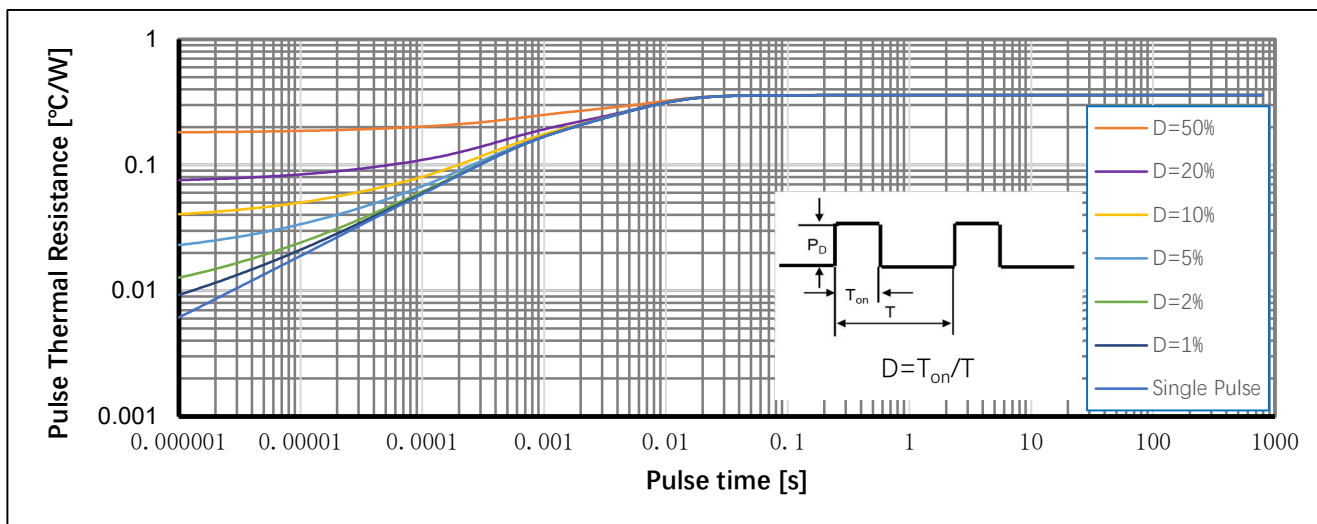
● Fig.11 Safe operating area: continuous and peak collector currents as a function of collector-emitter voltage; Calculative values



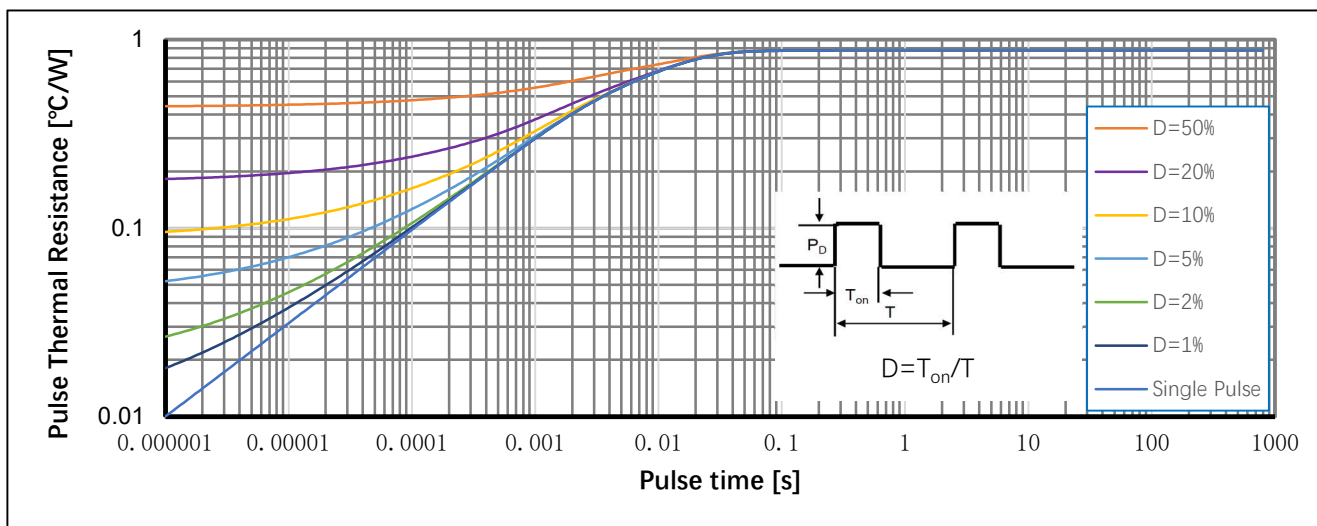
● Fig.12 Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values



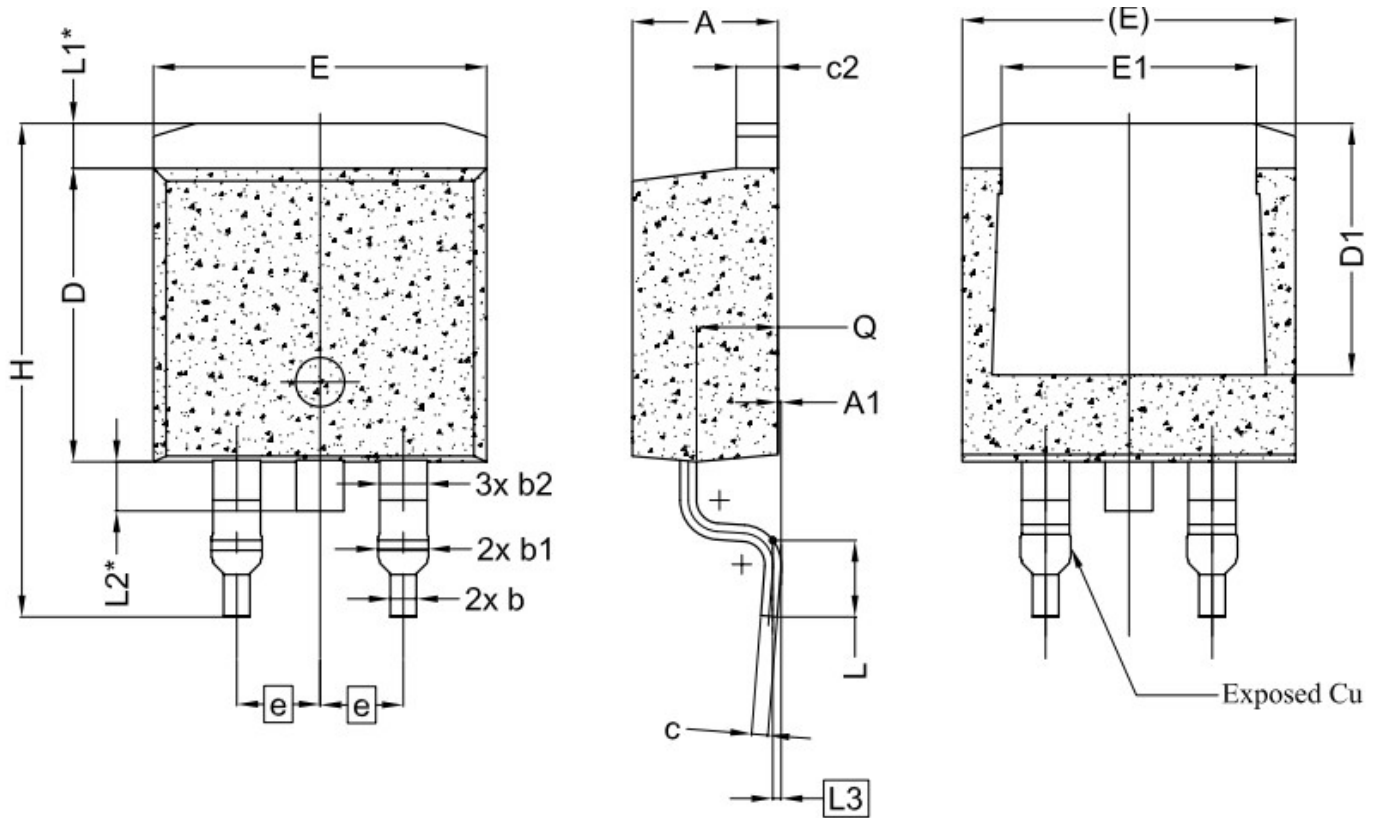
● Fig.13 Transient thermal impedance from junction to case -IGBT as a function of pulse duration; max values



● Fig.14 Transient thermal impedance from junction to case -diode as a function of pulse duration; max values



● Package Outline



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	--
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	2.54 BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.50 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70

● Note

- ① Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- ② Practically the current will be limited by PCB, thermal design and operating temperature. $V_{GE}=15V$.

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● Revision History

Version	Date	Change
A	2025/6/30	New