

• General Description

Through advanced trench and field cutoff 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
- High short circuit capability (10us)

• Application

- Energy Generation
- Industrial power supplies
- Welding

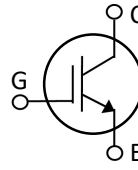
• Ordering Information:

Part NO.	ZMBG40N120S1AJ
Marking	BG40N120S1A
Packing information	TUBE BULK
Basic ordering unit (pcs)	1000

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

Parameter	Symbol	Conditions	Value	Unit
Collector-emitter voltage	V_{CE}		1200	V
Gate-emitter voltage	V_{GE}		± 30	V
Collector current	I_C	$T_C=25^{\circ}\text{C}$	80	A
	I_C	$T_C=100^{\circ}\text{C}$	40	A
Pulsed collector current	I_{CM}	$T_C=25^{\circ}\text{C}$	120	A
Total power Dissipation	P_D	$T_C=25^{\circ}\text{C}$	556	W
Total Power Dissipation	P_D	$T_A=25^{\circ}\text{C}$	3.8	W
Short Circuit Withstand Time	T_{sc}	$V_{GE}=15\text{ V}, V_{CE}=600\text{ V}, T_J=25^{\circ}\text{C}$	10	us
Operating Junction Temperature	T_J		-55 to +175	$^{\circ}\text{C}$
Storage Temperature	T_{STG}		-55 to +175	$^{\circ}\text{C}$

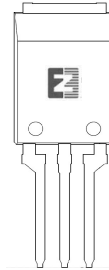
• Product Summary



$$V_{CE} = 1200\text{V}$$

$$V_{CE(sat)} = 1.55\text{V}$$

$$I_C = 40\text{A}$$



TO-273



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.27	°C/W
Thermal resistance, junction-ambient	$R_{thJA}^{②}$	-	-	40	°C/W
Soldering temperature (total time<10s)	T_{sold}	-	-	260	°C

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$	-	1.55	2.00	V
		$V_{GE}=15V, I_C=40A, T_J=175^\circ C$	-	1.9	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=1.5mA$	5.0	6.0	7.0	V
Zero gate voltage collector current	I_{CES}	$V_{GE}=0V, V_{CE}=1200V, T_J=25^\circ C$	-	-	10.0	μA
Zero gate voltage collector current	I_{CES}	$V_{GE}=0V, V_{CE}=1200V, T_J=175^\circ C$	-	-	10.0	mA
Gate-emitter leakage current	I_{GES}	$V_{GE}=\pm 30V, V_{CE}=0V$	-	-	100	nA

•Dynamic characteristics , at $T_J=25^\circ C$

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{ies}	$f=1MHz, V_{CE}=600V$	-	7093	-	pF
Output capacitance	C_{oes}		-	30	-	
Reverse transfer capacitance	C_{res}		-	12	-	
Total gate charge	Q_g	$V_{CC}=600V, I_C=40.0A, V_{GE}=15V$	-	210	-	nC
Gate-emitter charge	Q_{ge}		-	56	-	nC
Gate-collector charge	Q_{gc}		-	78	-	nC

SwitchingCharacteristic, at $T_J=25^\circ C$

Turn-on delay time	$t_{D(on)}$	$T_J=25^\circ C, V_{CC}=600V, I_C=40.0A, V_{GE}=-15.0/15.0V, R_g=6.0\Omega, L=200\mu H$	-	64	-	ns
Turn-on rise time	t_r		-	100	-	ns
Turn-off delay time	$t_{D(off)}$		-	160	-	ns
Turn-off fall time	t_f		-	312	-	ns
Turn-on energy	E_{on}		-	2.8	-	mJ
Turn-off energy	E_{off}		-	2.81	-	mJ
Total switching energy	E_{ts}		-	5.61	-	mJ

Switching Characteristic, at $T_J=25^\circ\text{C}$

Turn-on delay time	$t_{D(on)}$	$T_J=25^\circ\text{C},$ $V_{CC}=600\text{V}, I_C=40.0\text{A},$ $V_{GE}=-15.0/15.0\text{V},$ $R_g=6.0\Omega,$ $L=200\mu\text{H}$	-	64	-	ns
Turn-on rise time	t_r		-	100	-	ns
Turn-off delay time	$t_{D(off)}$		-	160	-	ns
Turn-off fall time	t_f		-	312	-	ns
Turn-on energy	E_{on}		-	2.8	-	mJ
Turn-off energy	E_{off}		-	2.81	-	mJ
Total switching energy	E_{ts}		-	5.61	-	mJ

Fig.1 Gate-Charge characteristics

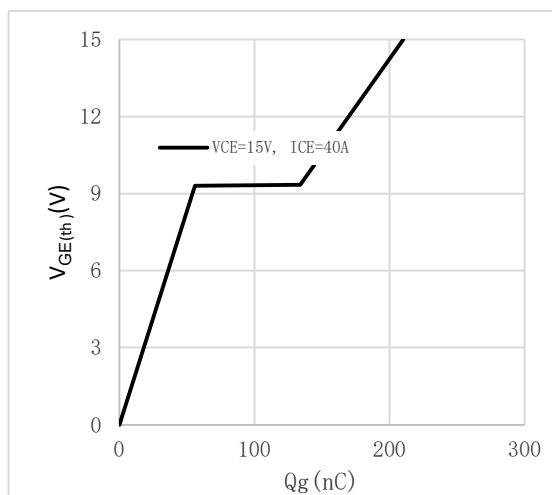


Fig.2 Capacitance characteristics

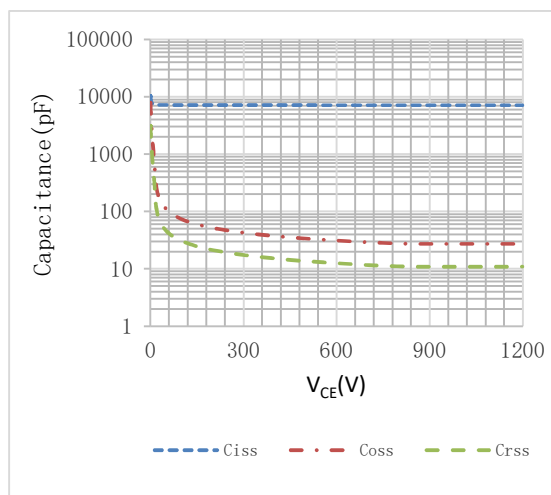


Fig.3 Power dissipation

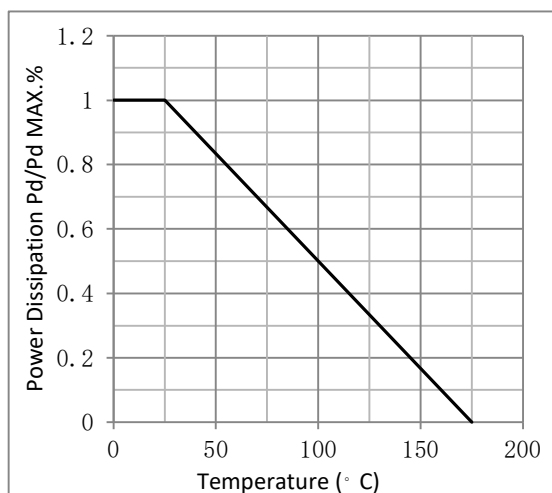


Fig.4 Typical output characteristics

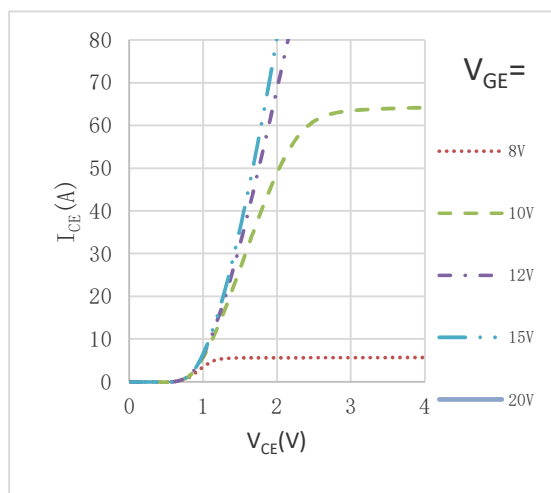


Fig.5 Threshold voltage V.S junction temperature

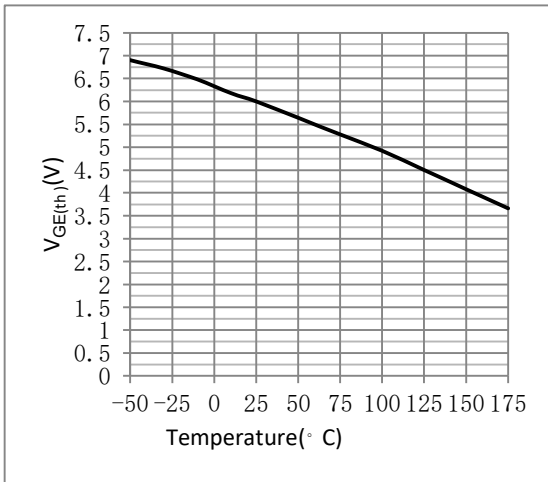
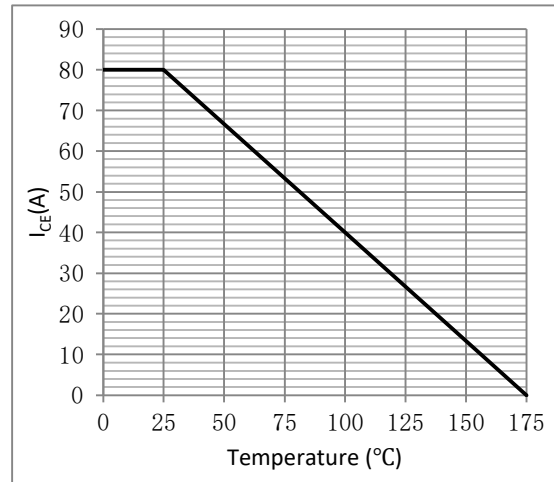
Fig.6 IC vs. Junction Temperature^③

Fig.7 Collector-Emitter VS gate source voltage

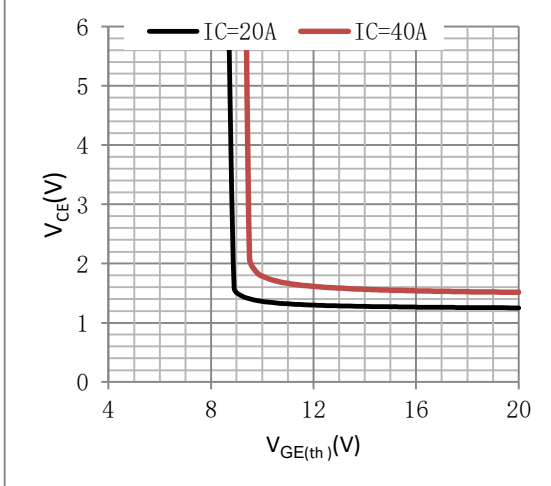


Figure 8. Transfer characteristics

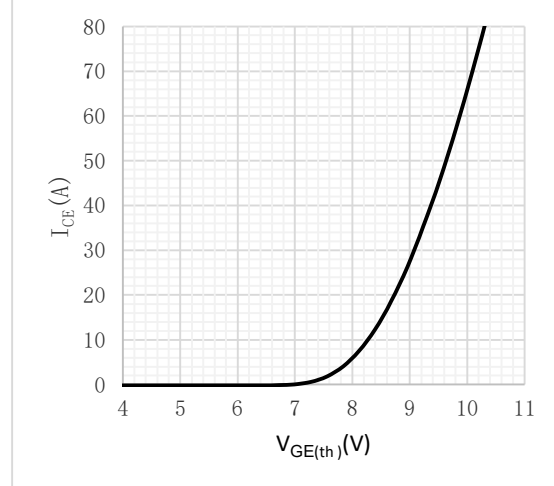


Fig.9 Safe operating area

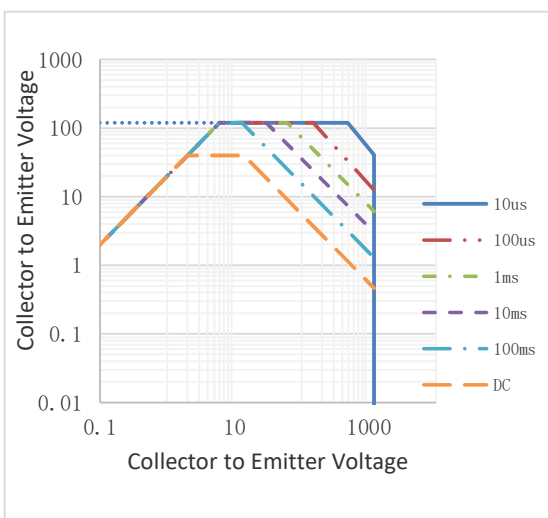
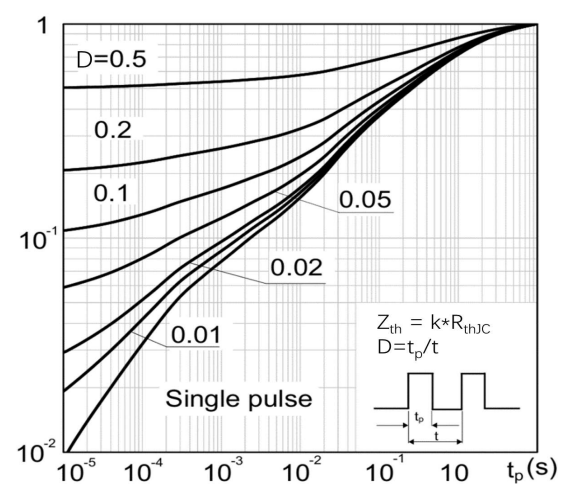
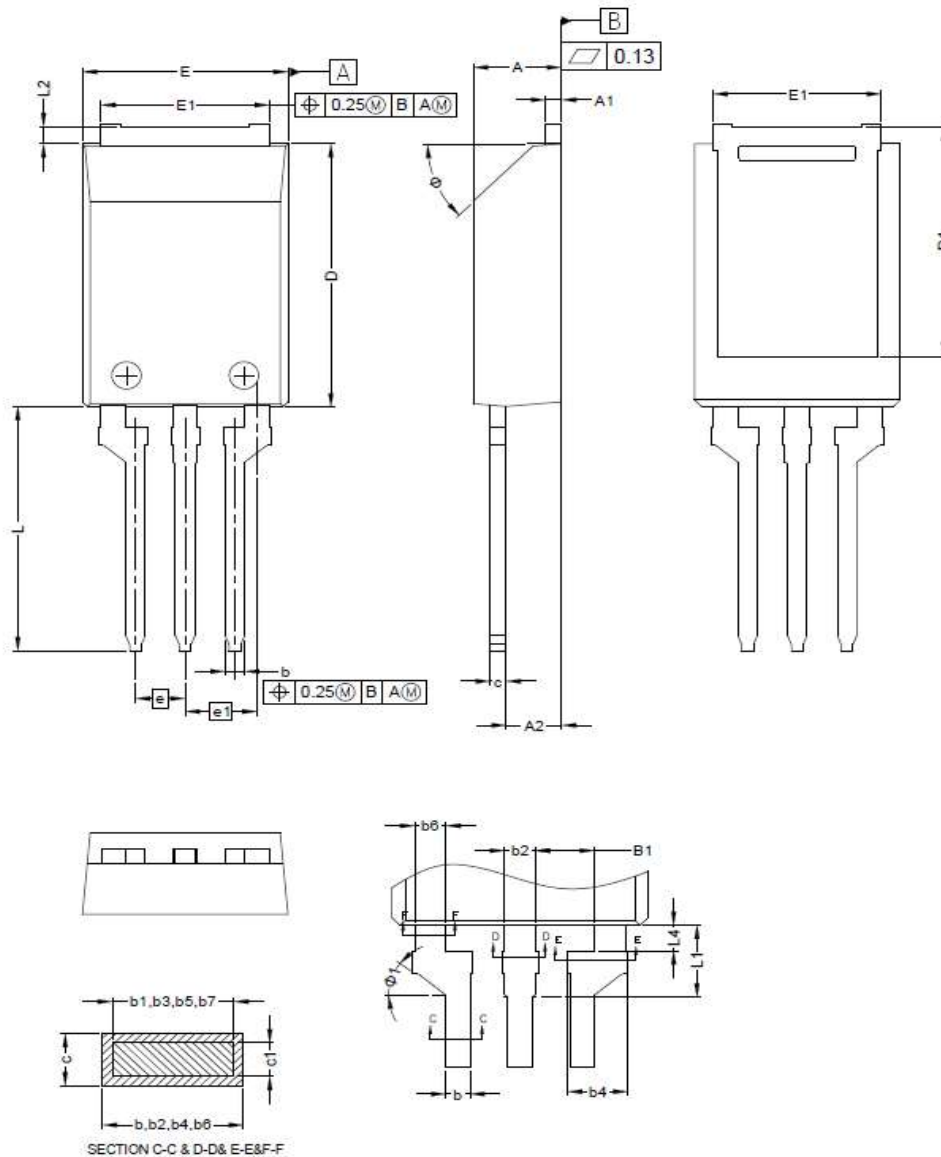


Fig.10 Max transient thermal impedance for IGBT



•TO-273 Package Outline



Symbol	MIN	MAX	Symbol	MIN	MAX
A	4.34	4.74	c1	0.60	0.90
A1	0.50	1.00	D	14.00	15.00
A2	2.50	3.00	D1	12.50	13.50
B1	(2.20)	-	E	10.00	11.00
b	0.90	1.30	E1	8.00	9.00
b1	0.80	1.10	e	2.55 BSC	
b2	1.25	1.65	e1	3.66 BSC	
b3	1.10	1.55	L	13.00	14.50
b4	2.35	2.55	L1	3.00	3.50
b5	2.30	2.50	L2	0.50	1.50
b6	1.25	1.65	L4	-	1.50
b7	1.10	1.55	φ	42.50	47.50
c	0.70	1.00	φ1	-	42.50

Note:

- ① Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$, Accumulation time ≤ 50 hours; For DC , the following test conditions can be passed: $V_{GE}=20V/-10V$, $T_j=175^\circ\text{C}$, $t=1000$ hours;
- 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
Preliminary	2025/3/5	New