

Features

- Si IGBT + SiC diode
- Advanced IGBT technology
- Excellent conduction and switching loss
- Excellent stability and uniformity
- Fast and soft antiparallel diode

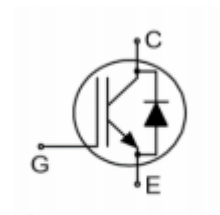
V_{CE}	650V
$I_C (T_C = 25^\circ\text{C})$	85A

Applications

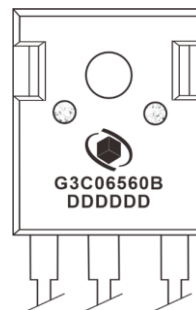
- Induction converters
- Uninterruptible power supplies



TO-247AB



Inner Circuit



G = GPT
3 = Gen3
C = Hybrid SiC Discrete
Devices
065 = Voltage Rating 650V
60 = Current Rating 60A
B = TO-247AB
DDDDDD = Traceable code



Maximum Ratings (at $T_j = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector Emitter Voltage	V_{CES}	650	V
Gate Emitter Voltage Transient gate emitter voltage, $T_p \leq 10 \mu\text{s}$, $D < 0.01$	V_{GES}	-20/+20 -30/+30	V
Continuous Collector Current $T_c = 25^\circ\text{C}$ $T_c = 100^\circ\text{C}$	I_c	85 60	A A
Pulsed Collector Current $T_c = 25^\circ\text{C}$	$I_{C,pulse}$	240	A
Diode Forward Current $T_c = 25^\circ\text{C}$ $T_c = 52^\circ\text{C}$	I_F	67 60	A A
Non-Repetitive Forward Surge Current $T_c = 25^\circ\text{C}$, $t_p = 10\text{ms}$, Half Sine Pulse	I_{FSM}	180	A
Short-circuit withstand time $V_{GE}=15\text{ V}$, $V_{CC} \leq 400\text{ V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{ S}$ $T_{vj}=150^\circ\text{C}$	t_{SC}	10	μs
Power Dissipation $T_c = 25^\circ\text{C}$ $T_c = 110^\circ\text{C}$	P_{tot}	341 148	W
Operating Junction Range	T_j	-55 to +175	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$
Mounting Torque, M3 Screw	M	1	Nm

Thermal Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	
IGBT Thermal Resistance, junction-case	$R_{th(j-c)}$		-	0.44	-	°C/W
Diode Thermal Resistance, junction-case	$R_{th(j-c)}$		-	0.62	-	°C/W
Thermal Resistance, junction-ambient	$R_{th(j-a)}$		-	40	-	°C/W

Electrical Characteristics (at $T_J = 25\text{ °C}$, unless otherwise specified)

Static Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE} = 0V, I_C = 0.5mA$	650	-	-	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 650V, V_{GE} = 0V$	-	-	10	μA
Gate-Emitter Leakage Current	I_{GES}	$V_{GE} = 20V, V_{CE} = 0V$	-	-	100	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}, I_D = 0.5mA$	3.5	4.5	5.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 60A, T_J = 25\text{ °C}$	-	1.6	2.0	V
		$V_{GE} = 15V, I_C = 60A, T_J = 125\text{ °C}$	-	1.8	-	
		$V_{GE} = 15V, I_C = 60A, T_J = 175\text{ °C}$	-	1.9	-	
Diode Forward Voltage	V_F	$V_{GE} = 0V, I_F = 60A, T_J = 25\text{ °C}$	-	2.2	-	V
		$V_{GE} = 0V, I_F = 60A, T_J = 125\text{ °C}$	-	2.8	-	
		$V_{GE} = 0V, I_F = 60A, T_J = 175\text{ °C}$	-	3.3	-	

Dynamic Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	
Input Capacitance	C_{ies}	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$	-	5782	-	pF
Output Capacitance	C_{oes}		-	185	-	
Reverse Transfer Capacitance	C_{res}		-	4.9	-	
Total Gate Charge	Q_G	$V_{CC} = 520V, V_{GE} = 0V, I_C = 60A$	-	104	-	nC
Gate to Source Charge	Q_{GE}		-	46	-	
Gate to Drain Charge	Q_{GC}		-	16	-	

Switching Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	
Turn-on Delay Time	$t_{d(on)}$	$V_{CC} = 400V, I_C = 30A$ $V_{GE} = 0/15V, R_{G(ext)} = 10\Omega$	-	79	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	129	-	
Fall Time	t_f		-	79	-	
Turn-on Switching Energy	E_{on}	$V_{CC} = 400V, I_C = 60A$ $V_{GE} = 0/15V, R_{G(ext)} = 10\Omega$	-	0.47	-	mJ
Turn-off Switching Energy	E_{off}		-	0.88	-	
Turn-on Delay Time	$t_{d(on)}$		-	105	-	ns
Rise time	t_r		-	17	-	
Turn-off delay time	$t_{d(off)}$		-	113	-	
Fall Time	t_f		-	56	-	
Turn-on Switching Energy	E_{on}		-	1.21	-	mJ
Turn-off Switching Energy	E_{off}		-	1.64	-	

Body Diode Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	
Revers Recovery Time	t_{rr}	$V_{DD} = 400V, I_{SD} = 60A$ $V_{GS} = 0/15V, di/dt = 1000A/us$	-	25	-	ns
Revers Recovery Charge	Q_{rr}		-	70	-	nC
Peak Revers Recovery Current	I_{rrm}		-	5.3	-	A



Typical Characteristics Curves

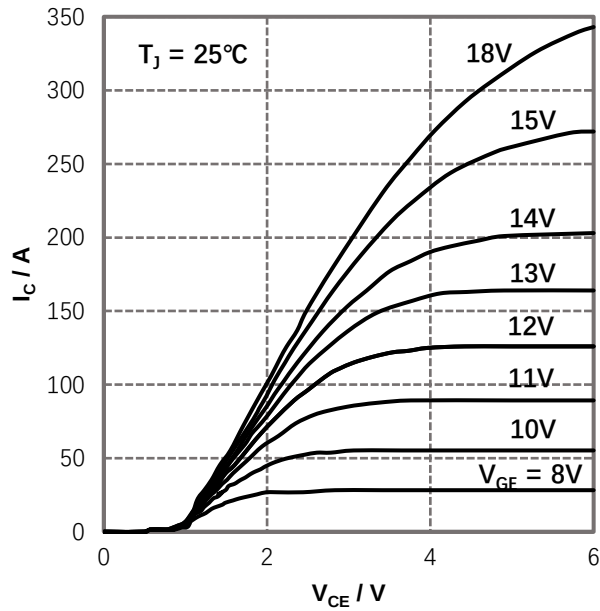


Figure 1. Output Characteristics $T_j=25^\circ\text{C}$

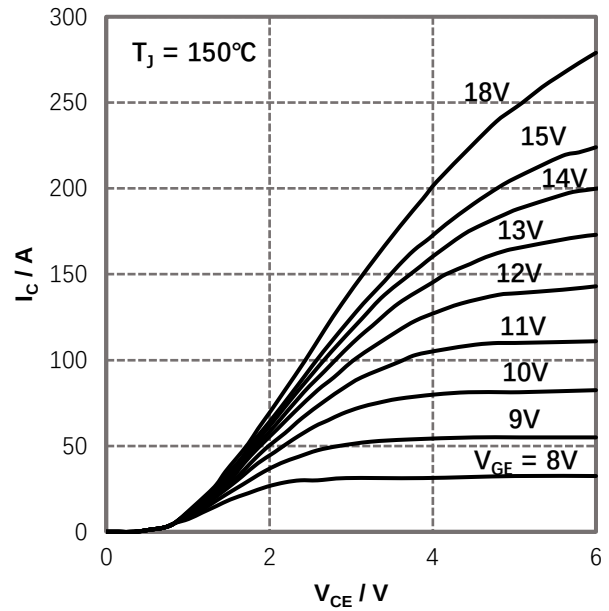


Figure 2. Output Characteristics $T_j=150^\circ\text{C}$

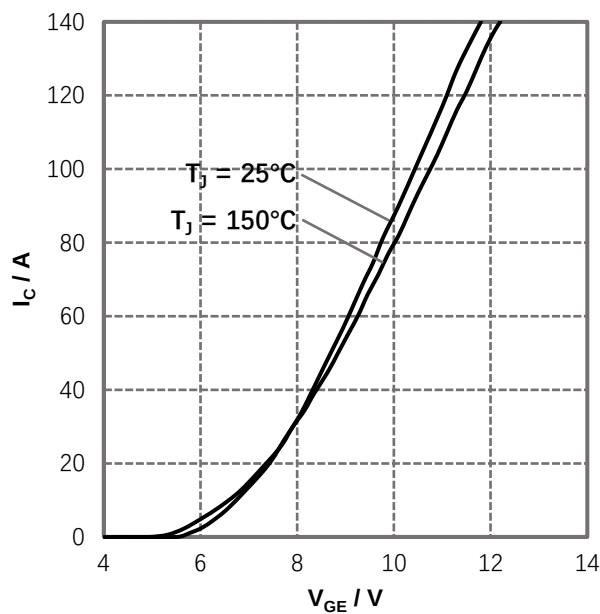


Figure 3. Transfer Characteristics

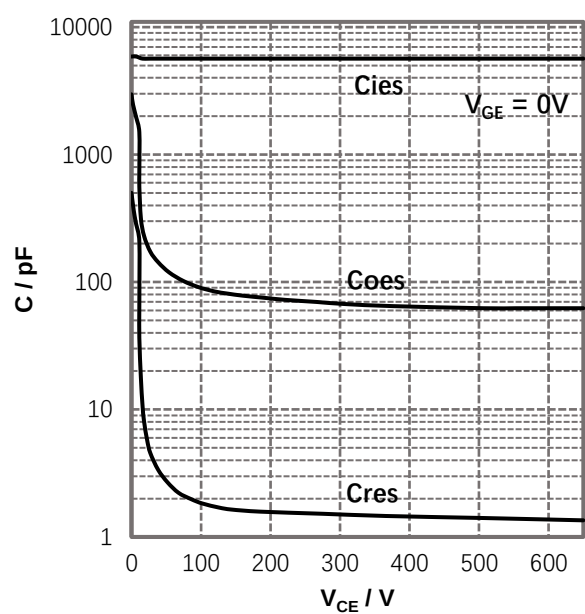


Figure 4. Capacitance

Typical Characteristics Curves

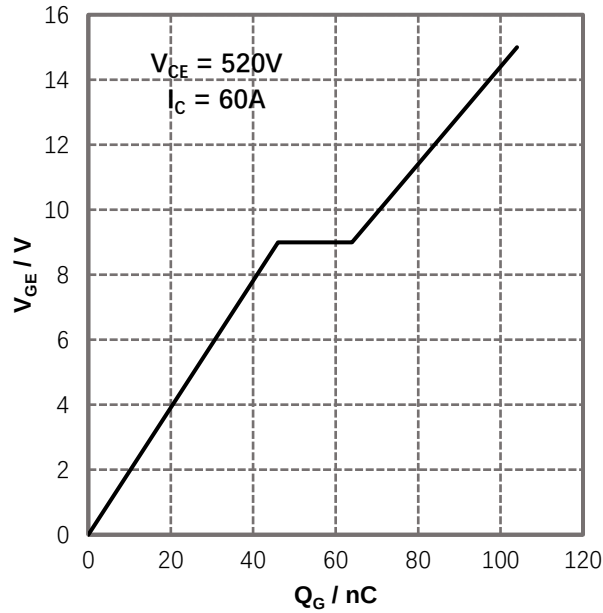


Figure 5. Gate Charge

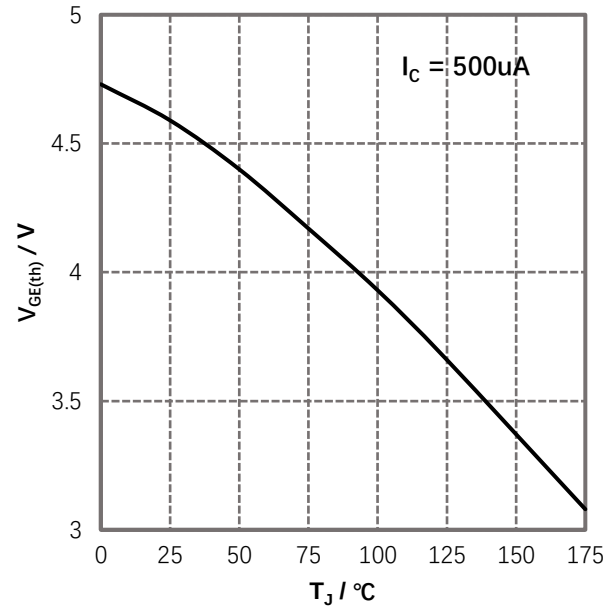


Figure 6. Gate-Emitter Threshold Voltage

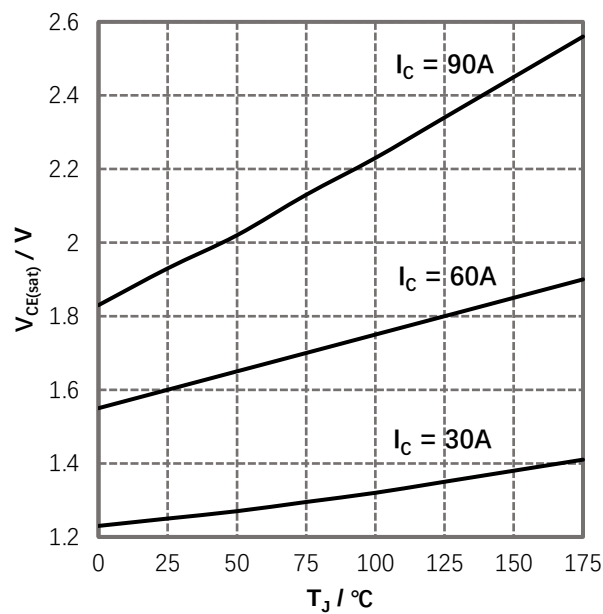


Figure 7. Collector-Emitter Voltage

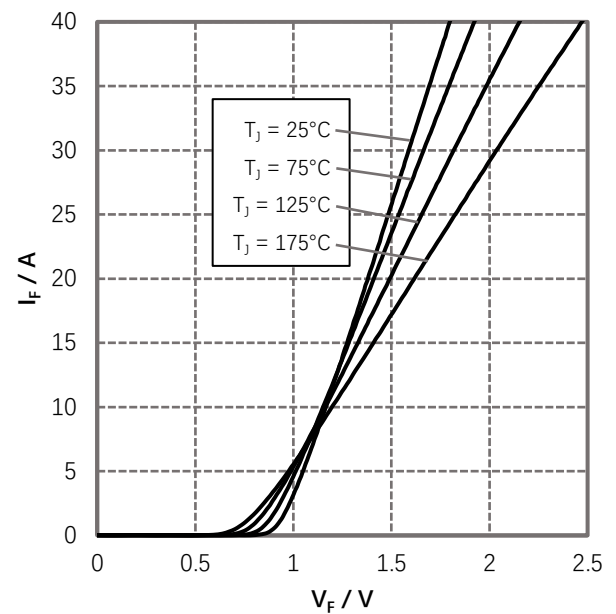


Figure 8. Forward Characteristic Of Diode

Typical Characteristics Curves

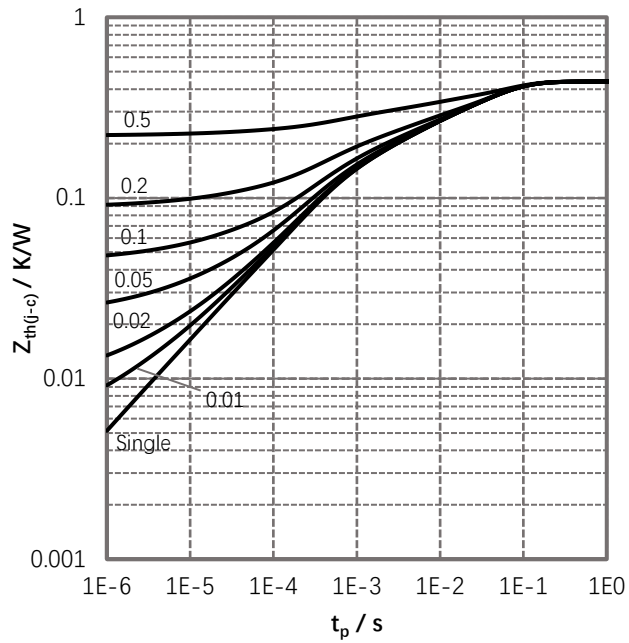


Figure 9. IGBT Transient Thermal Impedance

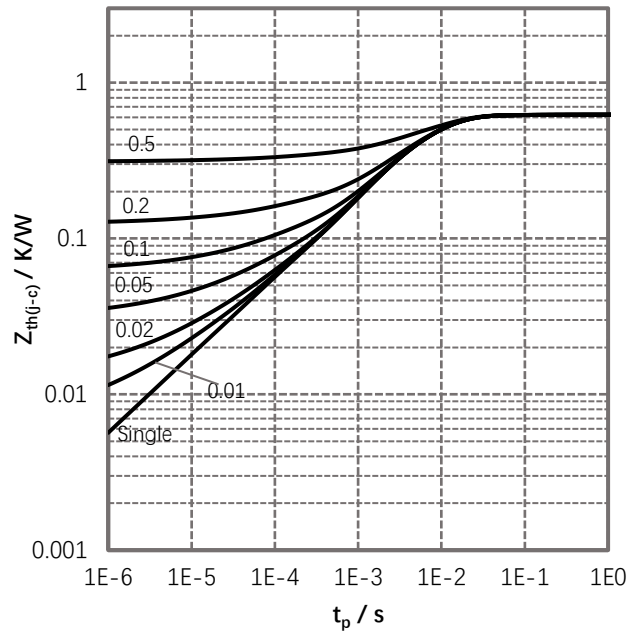
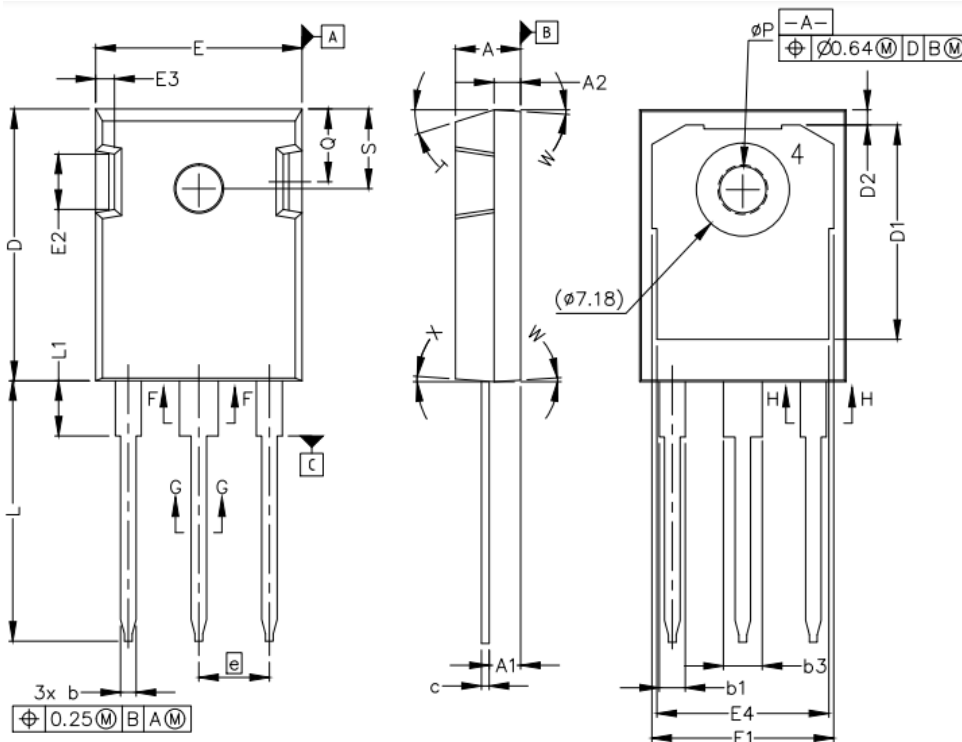


Figure 10. Diode Transient Thermal Impedance

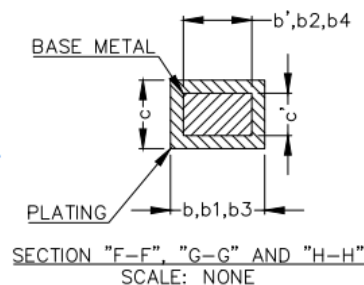
Package Dimensions



SYMBOL	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	4.10	4.40
φP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	

NOTE:
1. ALL METAL SURFACES: TIN PLATED, EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCING CONFIRM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS.
ANGLES ARE IN DEGREES.
4. THIS DRAWING WILL MEET ALL DIMENSIONS REQUIREMENT OF JEDEC outlines TO-247 AD.

- 1 - GATE
2 - DRAIN (COLLECTOR)
3 - SOURCE (EMITTER)
4 - DRAIN (COLLECTOR)



Ordering Information

Part Number	Marking	Package	Packaging Mode
G3C06560B	G3C06560B	TO-247AB	30pcs/Tube

Notes

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