



HBT20T60-SATCM

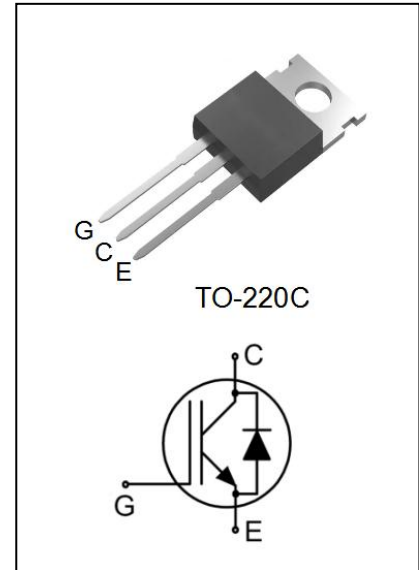
650V N-Channel Insulated Gate Bipolar Transistor

● Features:

- 20.0A, 600V, $V_{CESAT(Typ)} = 1.7V @ V_{GE} = 15V, I_C = 20A$
- Trench FS Technology
- With Fast Recovery anti-parallel Diode
- Low Gate Charge
- Low Saturation Voltage
- Low Switching Loss
- Positive Temperature Coefficient

● Application:

- General Purpose Inverters
- Welding Machine
- UPS



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

Symbol	Parameter	Value	Unit
V_{CE}	Collector-Emitter Voltage	600	V
I_C	Collector Current-Continuous - ($T_C = 25^\circ\text{C}$) - ($T_C = 100^\circ\text{C}$)	40	A
		20	A
I_{CM}	Collector Current – Pulse (Note1)	60	A
I_F	Diode Forward Current - ($T_C = 25^\circ\text{C}$) - ($T_C = 100^\circ\text{C}$)	40	A
		20	A
I_{FSM}	Surge non Repetitive Forward Current $t_p = 10\text{ms}$ Sinusoidal	60	A
V_{GE}	Gate-Emitter Voltage	± 20	V
T_{SC}	Short Circuit withstand Time ($V_{GE} = 15\text{V}, V_{CC} = 300\text{V}$)	10	μs
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	165	W
T_j	Operating Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

*Collector Current Limited by Maximum Junction Temperature.

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for IGBT	0.76	$^\circ\text{C} / \text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case for Diode	1.67	$^\circ\text{C} / \text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ\text{C} / \text{W}$



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Electrical Characteristics(Tc=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=1mA$	600	--	--	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE}=600V, V_{GE}=0V$	--	--	200	μA
I_{GESF}	Gate-Body Leakage Current, Forward	$V_{GE}=+20V, V_{CE}=0V$	--	--	400	nA
I_{GESR}	Gate-Body Leakage Current, Reverse	$V_{GE}=-20V, V_{CE}=0V$	--	--	-400	nA
On Characteristics						
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE}=V_{GE}, I_C=1mA$	4.0	5.6	7.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=20A$	--	1.7	2.4	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE}=30V, V_{GE}=0V, f=1.0MHz$	--	1100	--	pF
C_{oes}	Output Capacitance		--	55	--	pF
C_{res}	Reverse Transfer Capacitance		--	22	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CE}=400V, I_C=20A, R_G=10\Omega, V_{GE}=15V, \text{Inductive Load}$	--	19	--	ns
t_r	Turn-On Rise Time		--	55	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	48	--	ns
t_f	Turn-Off Fall Time		--	115	--	ns
E_{on}	Turn-On Energy		--	1	--	mJ
E_{off}	Turn-off Energy		--	0.3	--	mJ
E_{ts}	Total Switching Energy		--	1.3	--	mJ
Q_g	Total Gate Charge	$V_{CE}=400V, I_C=20A, V_{GE}=15V$	--	52	--	nC
Q_{ge}	Gate-Emitter Charge		--	15	--	nC
Q_{gc}	Gate-Collector Charge		--	22	--	nC
Anti-Parallel Diode Characteristics and Maximum Ratings						
V_F	Collector-Emitter Diode Forward Voltage	$I_F=20A, T_c=25^\circ C$	--	1.6	--	V
		$I_F=20A, T_c=125^\circ C$	--	1.5	--	V
t_{rr}	Diode Reverse Recovery Time	$I_{EC}=20A$	--	35	--	ns
Q_{rr}	Diode Reverse Recovery Charge	$dI_{EC}/dt=200A/\mu s$	--	75	--	nC

Notes:

- 1、Repetitive Rating:Pulse Width Limited by Maximum Junction Temperature.

Typical Performance Characteristics

Fig 1. Output Characteristic

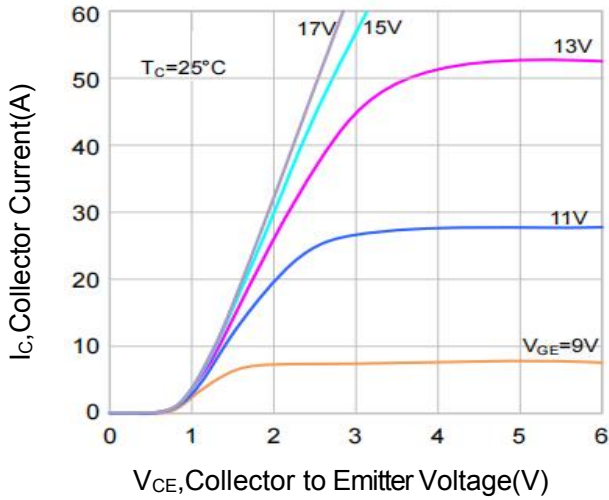


Fig 2. Output Characteristic

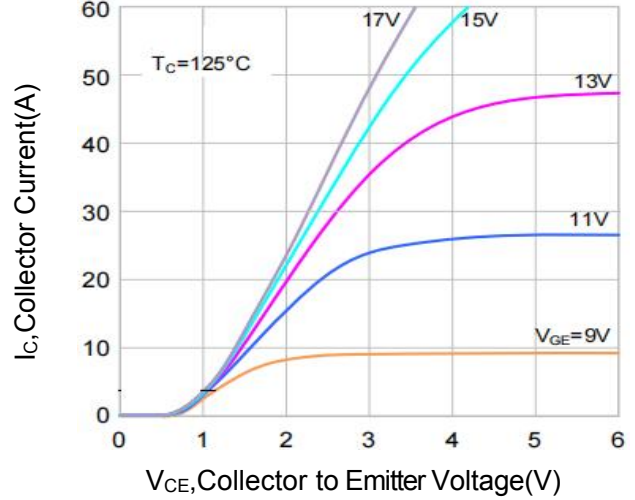


Fig 3. Saturation Voltage Characteristic

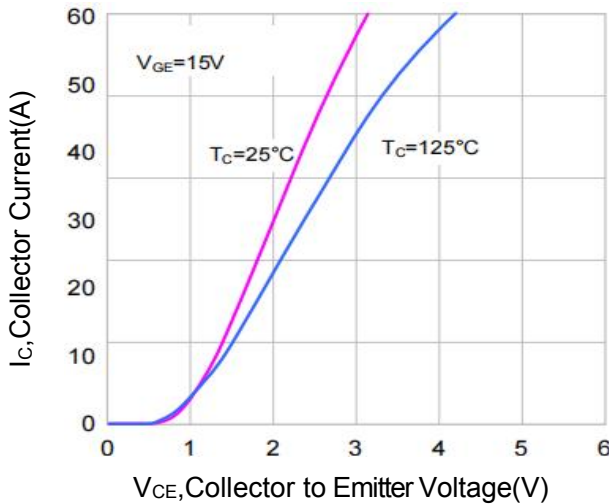


Fig 4. Transfer Characteristic

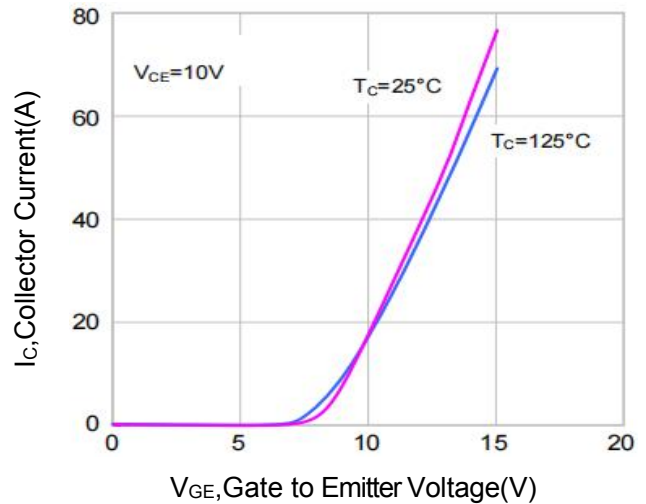


Fig 5. $V_{CE(sat)}$ vs. $V_{GE}(V)$

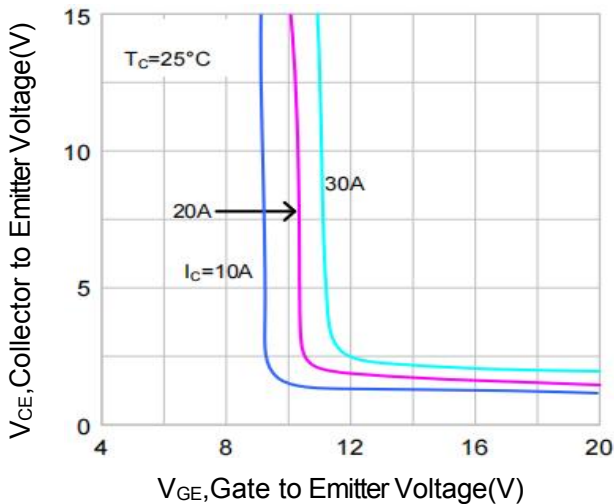


Fig 6. $V_{CE(sat)}$ vs. $V_{GE}(V)$

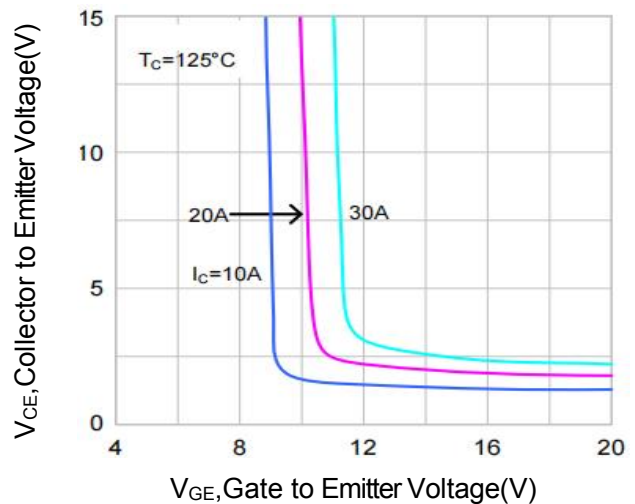


Fig 7. $V_{CE(sat)}$ vs. T_C

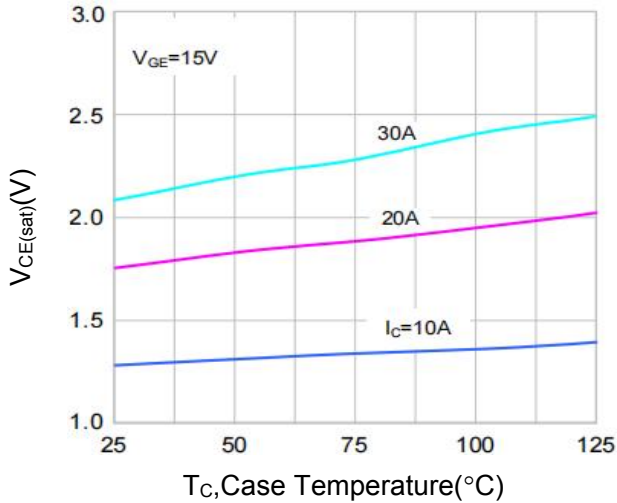


Fig 8. Capacitance Characteristic

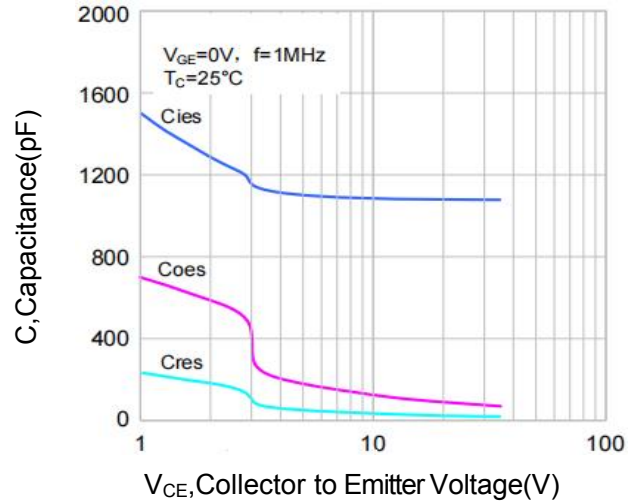


Fig 9. Gate Charge Characteristics

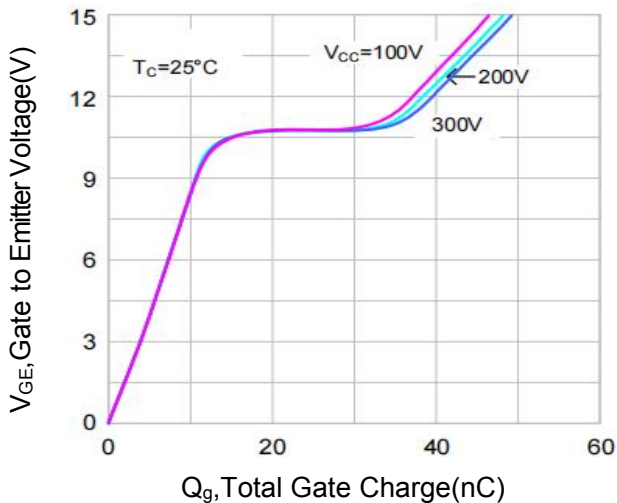


Fig 10. Switching Time vs. R_g

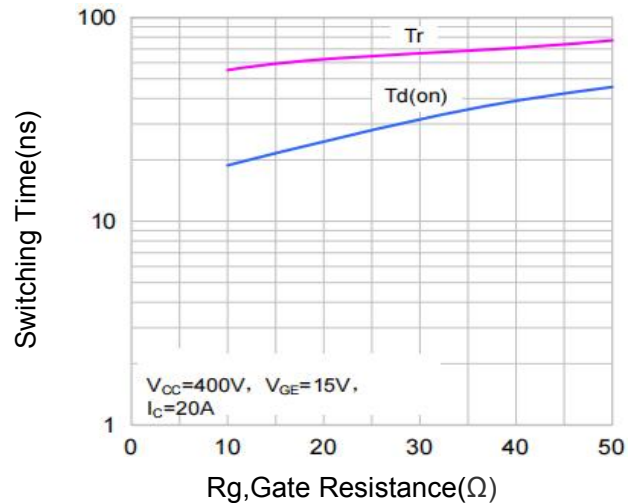


Fig 11. Switching Time vs. R_g

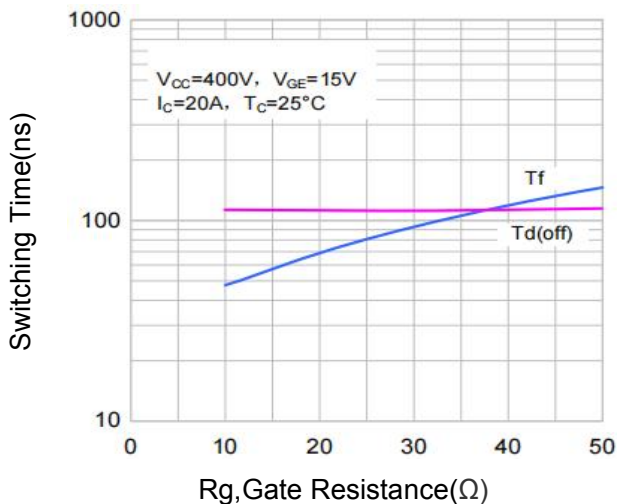


Fig 12. Switching Loss vs. R_g

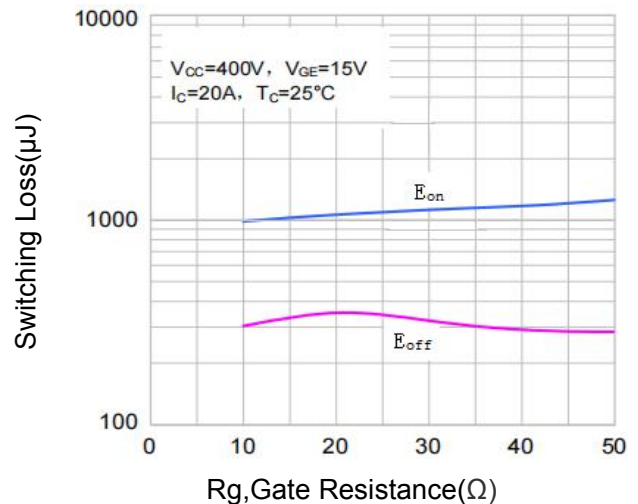


Fig 13. Switching Time vs. I_c

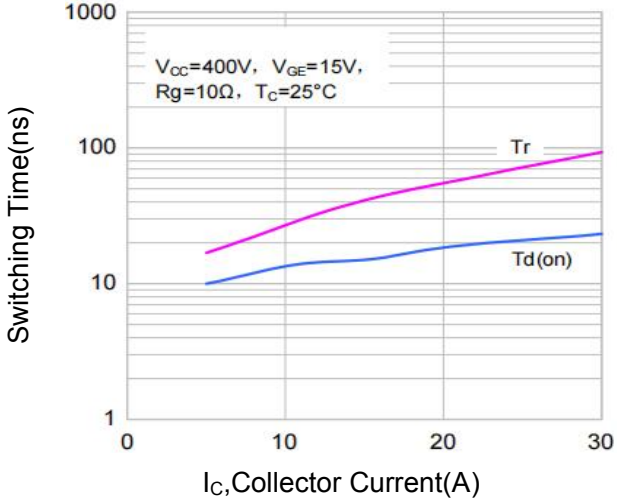


Fig 14. Switching Time vs. I_c

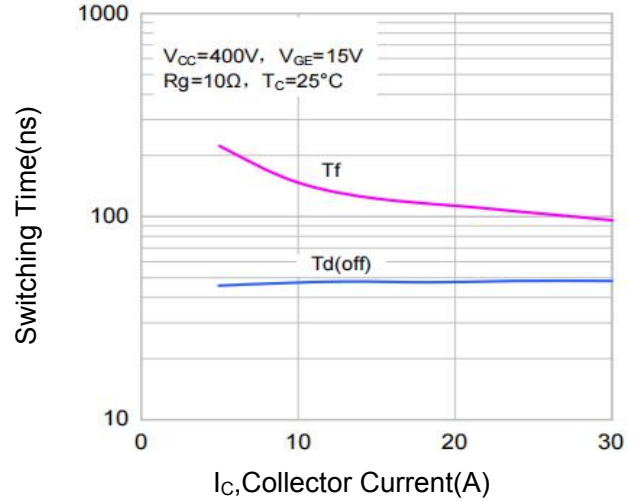


Fig 15. Switching Loss vs. I_c

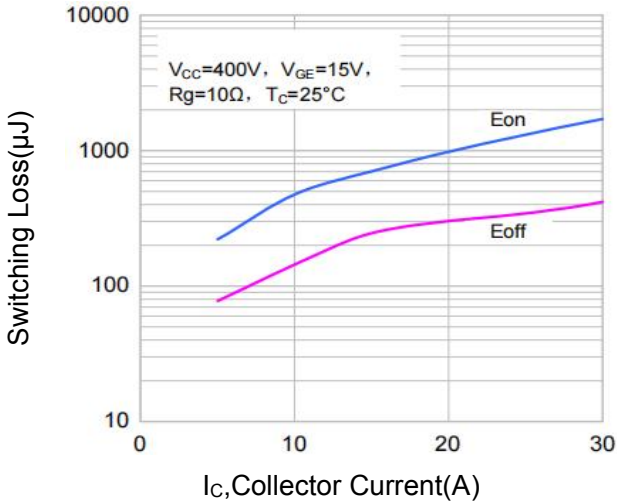


Fig 16. Diode Forward Characteristic

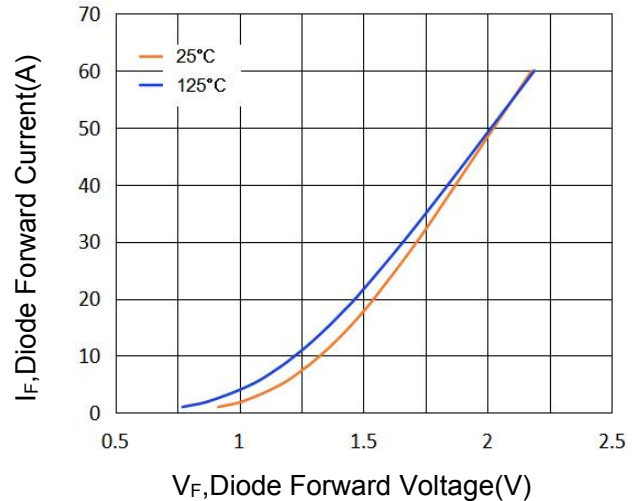


Fig 17. Safe Operating Area

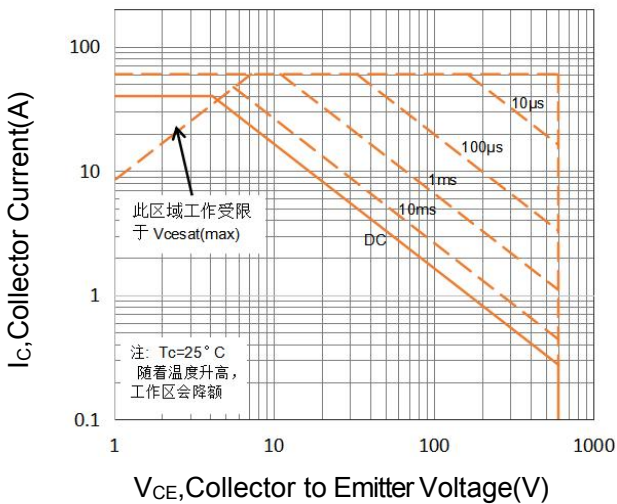
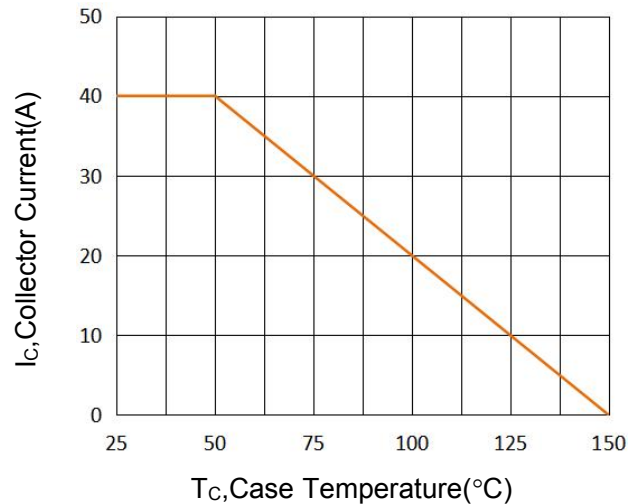


Fig 18. I_c vs T_c





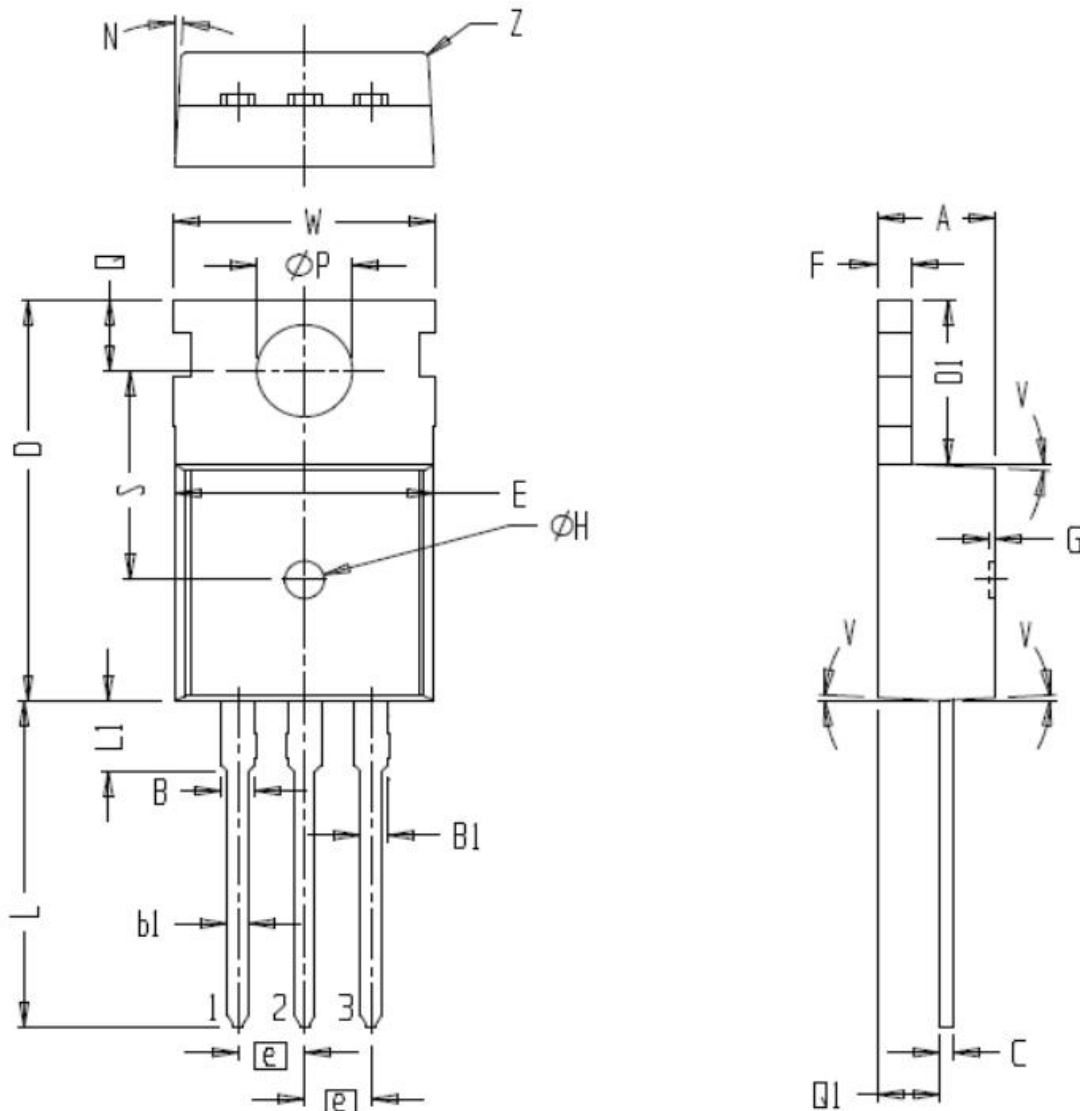
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TO-220C Package Dimensions

UNIT: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.00	4.40	4.80	E	9.40	9.90	10.40
B	1.17	1.32	1.47	e		2.54	
B1	0.91	1.06	1.21	F	1.15	1.30	1.45
b1	0.65	0.80	0.95	L	12.00	13.00	14.00
c	0.40	0.50	0.60	L1	2.50	3.00	3.50
D	14.90	15.90	16.90	Q	2.30	2.80	3.30
D1	6.10	6.60	7.10	Q1	1.90	2.40	2.90
W	9.50	10.00	10.50	ϕP	3.40	3.65	3.90
S		8.30		Z	0		0.20
ϕH		1.50		N		3 °	
G		0.10		V		3 °	





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注意事项:

- 1、在电路设计时请不要超过器件的最大额定值，否则会影响整机的可靠性。
- 2、IGBT产品为静电敏感型器件，使用时应注意采取防静电保护措施，如佩戴防静电手环、设备接地等。
- 3、如需安装散热片，请注意控制扭力大小及散热片的平整度。
- 4、该规格书由华科公司制作，并可能不定期更改，恕不另行通知。
- 5、如有疑问，请及时联系我司销售代表。

版本履历表:

序号	版本号	修改时间	修改记录
1	V1.0	2023-1-10	首次发行