



HBP20T60-SATCM

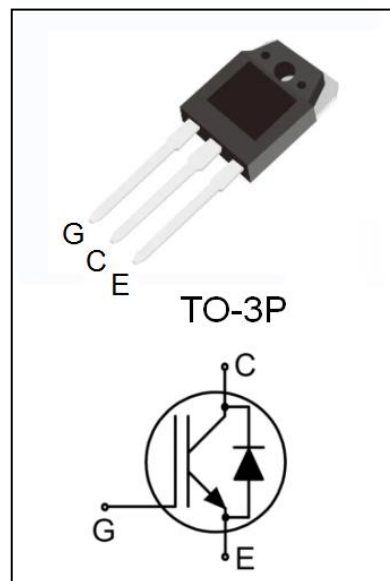
650V N-Channel Insulated Gate Bipolar Transistor

● 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 ($T_c=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CE}	Collector-Emitter Voltage	600	V
I_C	Collector Current-Continuous - ($T_c=25^{\circ}C$) - ($T_c=100^{\circ}C$)	40	A
		20	A
I_{CM}	Collector Current – Pulse (Note1)	60	A
I_F	Diode Forward Current - ($T_c=25^{\circ}C$) - ($T_c=100^{\circ}C$)	40	A
		20	A
I_{FSM}	Surge non Repetitive Forward Current $t_p=10ms$ Sinusoidal	60	A
V_{GE}	Gate-Emitter Voltage	± 20	V
T_{sc}	Short Circuit withstand Time ($V_{GE}=15V, V_{CC}=300V$)	10	μs
P_D	Power Dissipation ($T_c=25^{\circ}C$)	176	W
T_j	Operating Junction Temperature	150	$^{\circ}C$
T_{stg}	Storage Temperature Range	-55 to +150	$^{\circ}C$

*Collector Current Limited by Maximum Junction Temperature.

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for IGBT	0.71	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance, Junction to Case for Diode	1.58	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	$^{\circ}C/W$

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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} =15 V, 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} = 400 V, I _C = 20 A, R _G = 10 Ω,V _{GE} =15 V, 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} = 400 V, I _C =20 A, V _{GE} = 15 V	--	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°C	--	1.6	--	V
		I _F =20A,T _c =125°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/μs	--	75	--	nC

Notes:

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

Typical Performance Characteristics

Fig 1. Output Characteristic

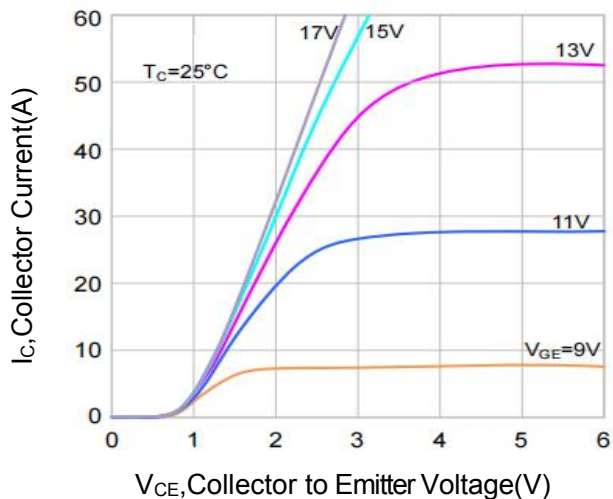


Fig 2. Output Characteristic

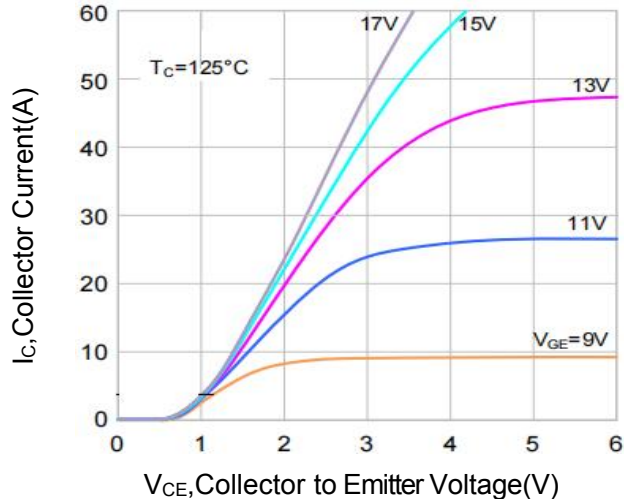


Fig 3. Saturation Voltage Characteristic

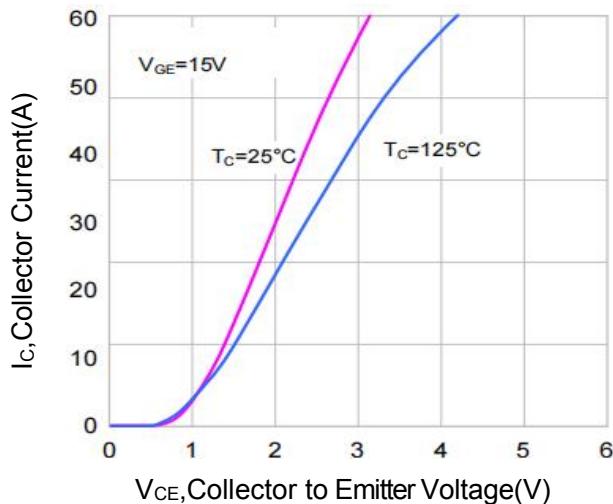


Fig 4. Transfer Characteristic

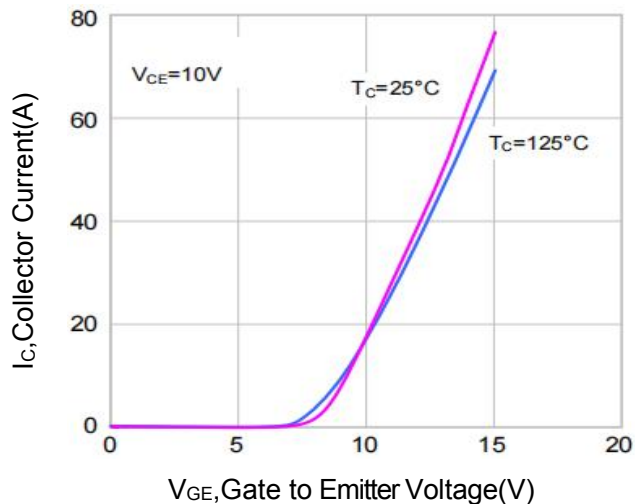


Fig 5. $V_{CE(sat)}$ vs. V_{GE} (V)

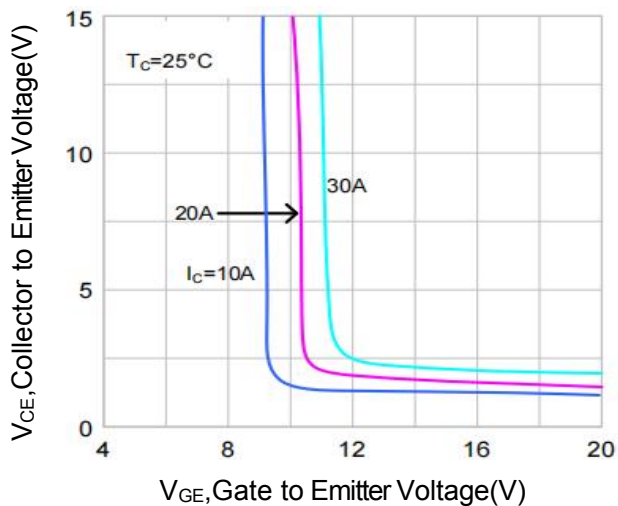


Fig 6. $V_{CE(sat)}$ vs. V_{GE} (V)

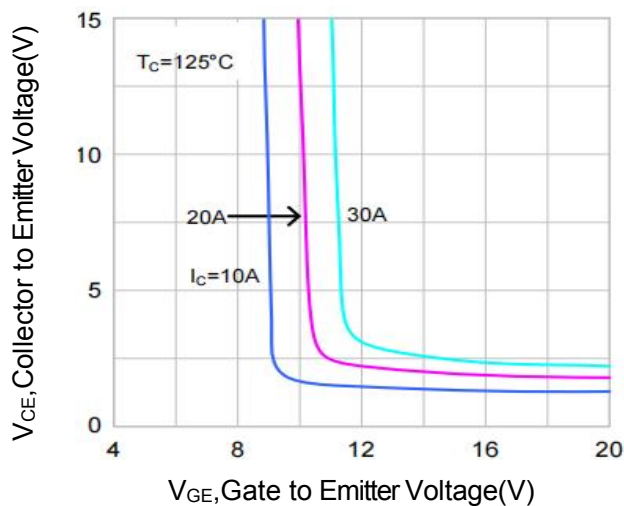


Fig 7. $V_{CE(sat)}$ vs. T_C

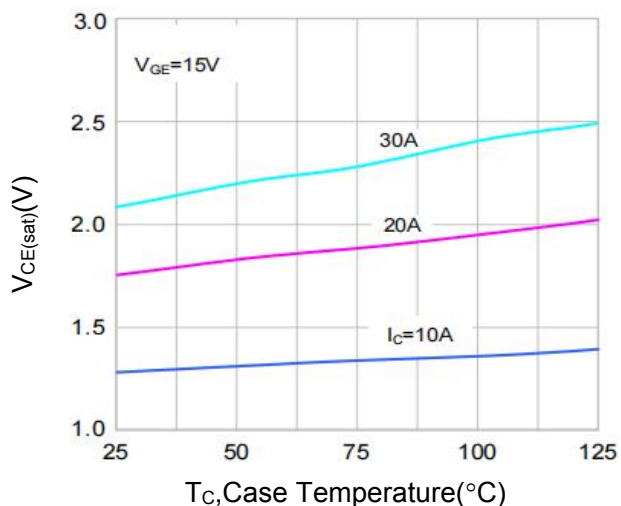


Fig 8. Capacitance Characteristic

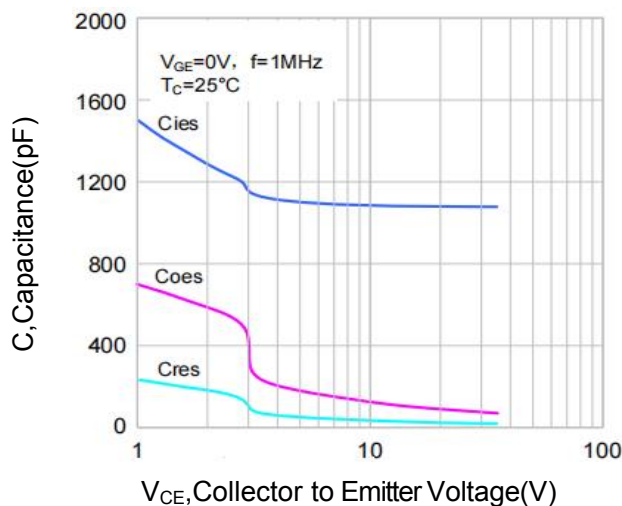


Fig 9. Gate Charge Characteristics

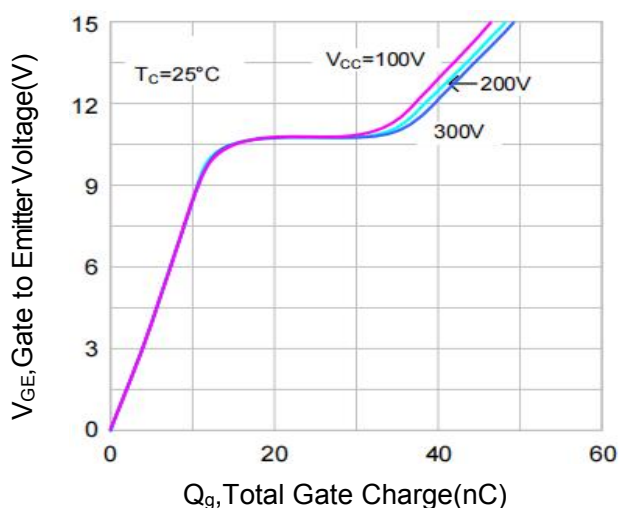


Fig 10. Switching Time vs. R_g

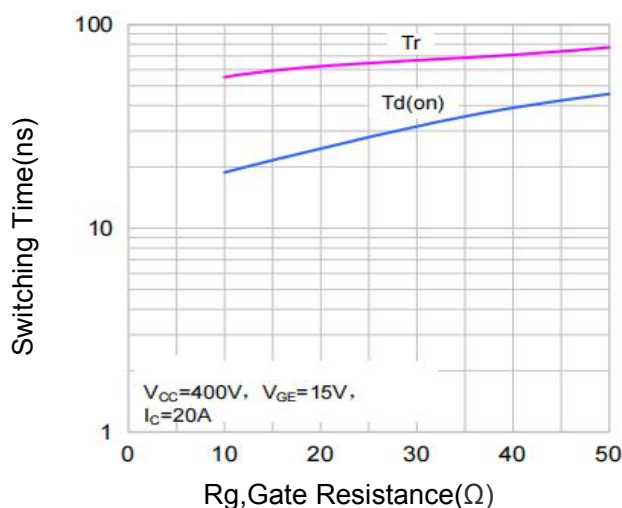


Fig 11. Switching Time vs. R_g

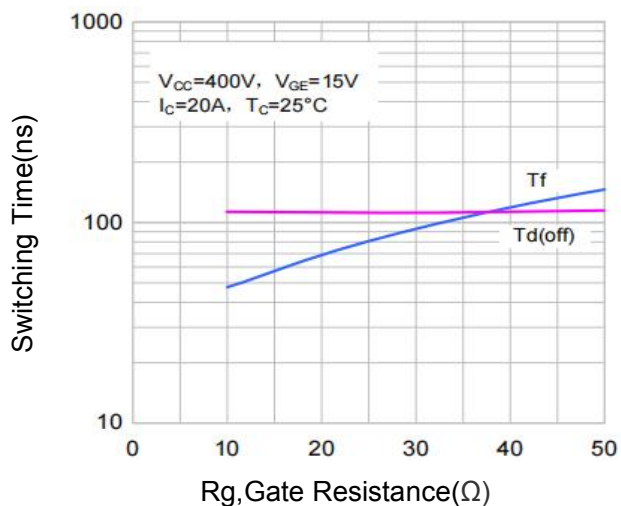


Fig 12. Switching Loss vs. R_g

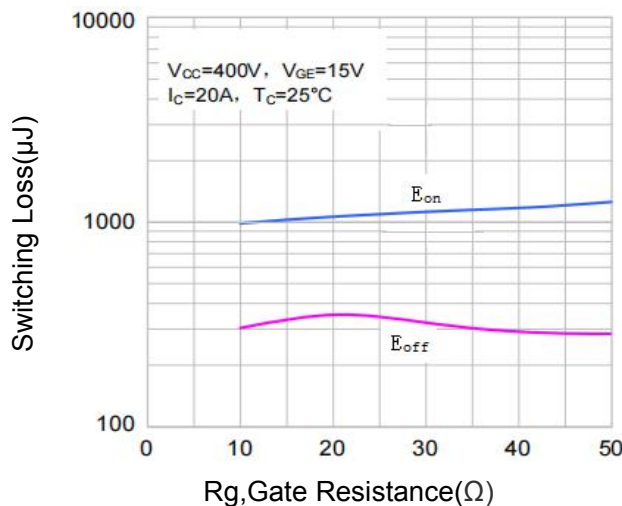


Fig 13. Switching Time vs. I_c

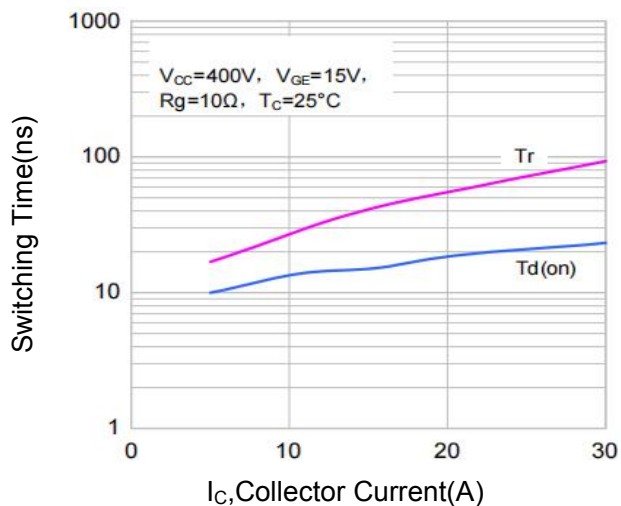


Fig 14. Switching Time vs. I_c

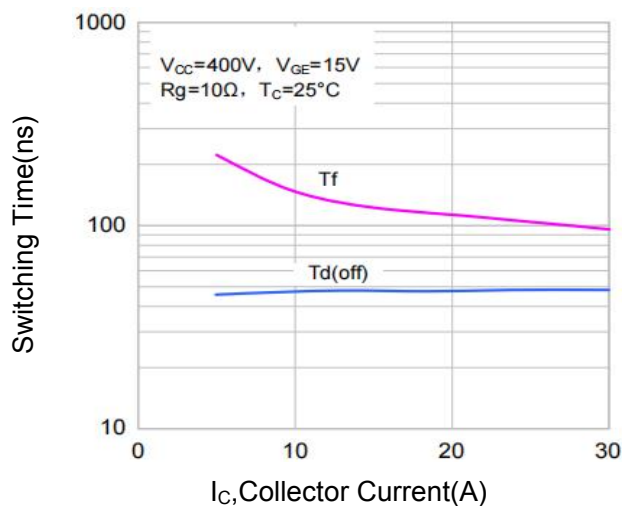


Fig 15. Switching Loss vs. I_c

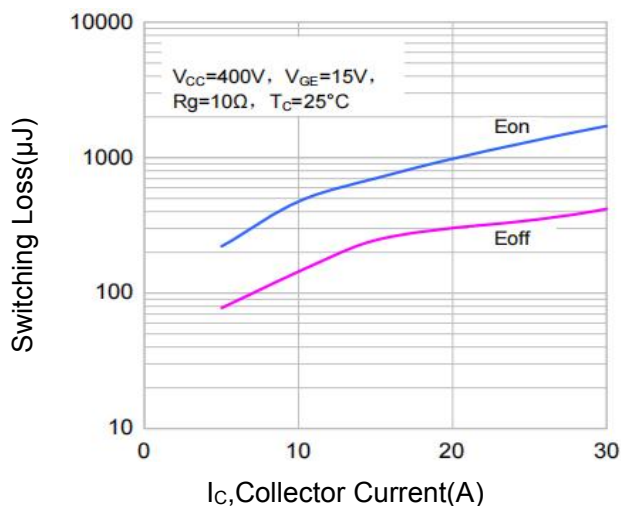


Fig 16. Diode Forward Characteristic

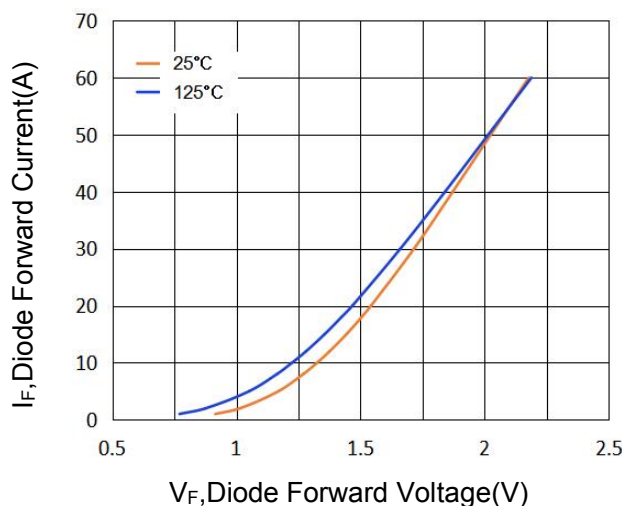


Fig 17. Safe Operating Area

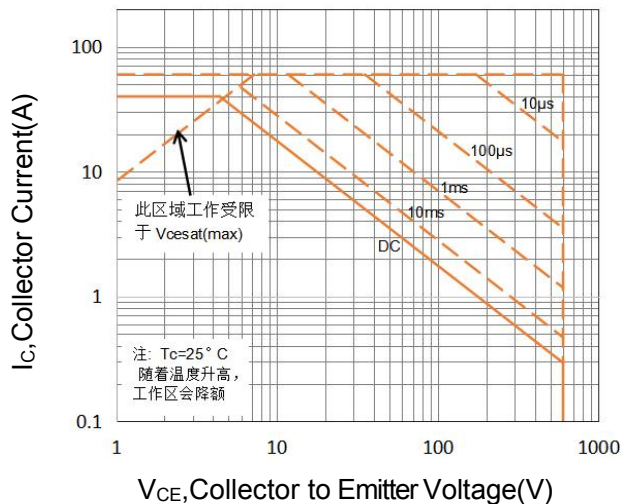
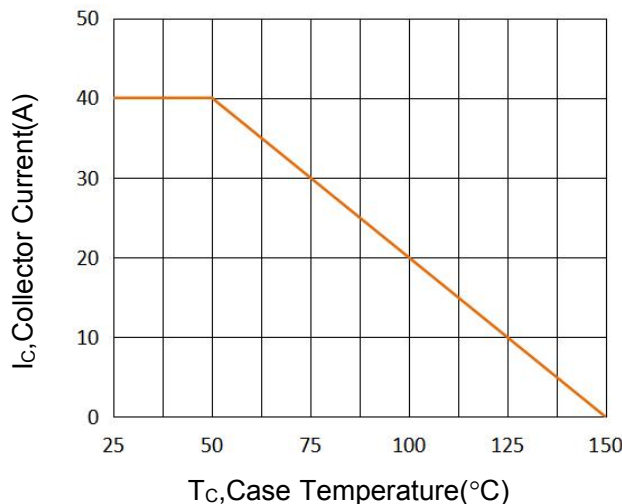


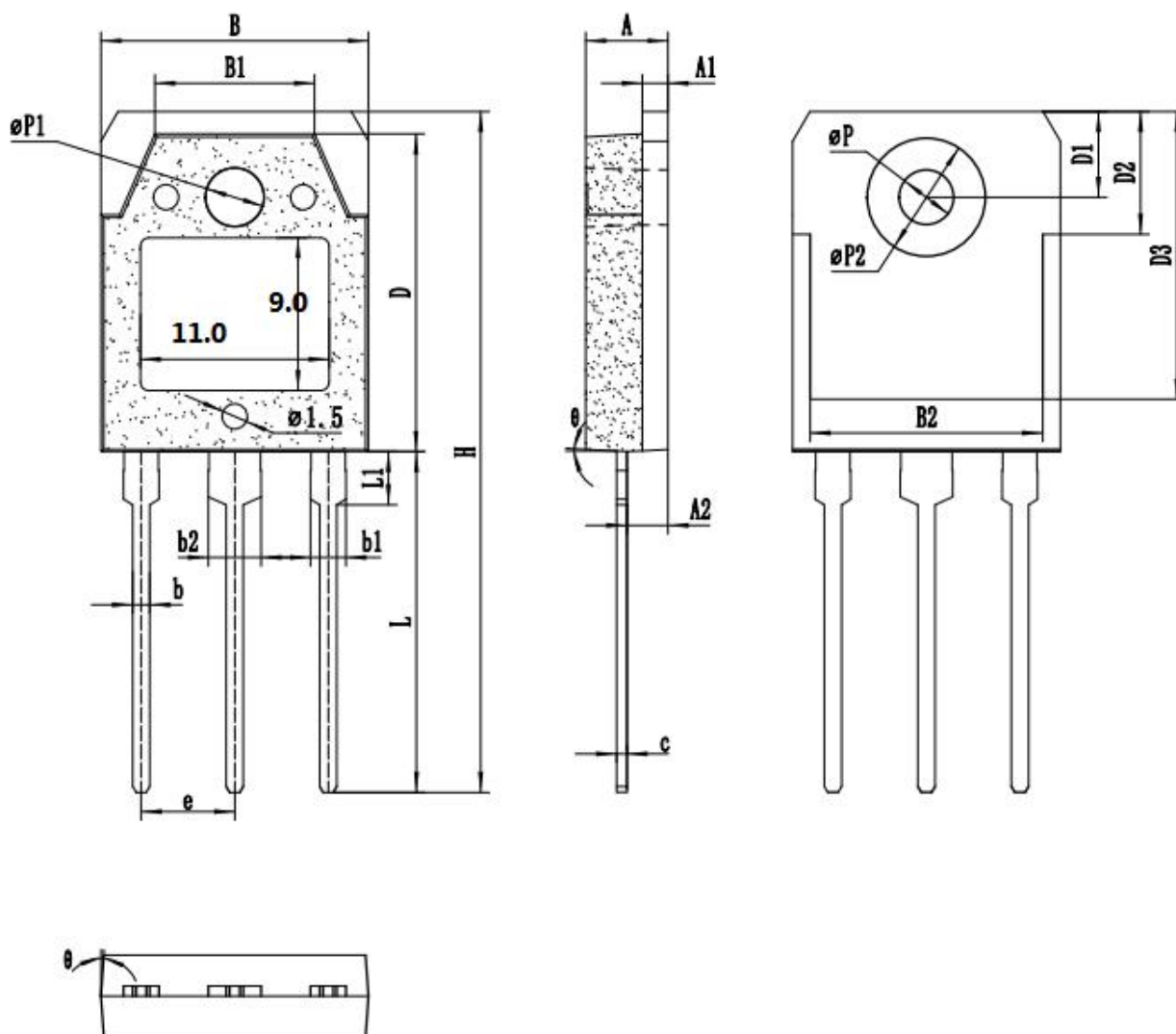
Fig 18. I_c vs T_c



TO-3P Package Dimensions

UNIT: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.50	4.80	5.10	D	18.00	18.50	19.00
A1	1.40	1.50	1.60	D1	4.60	5.00	5.40
A2	2.10	2.40	2.70	D2	6.70	7.10	7.50
b	0.80	1.00	1.20	D3	16.20	16.70	17.20
b1	1.90	2.10	2.30	L1	2.70	3.10	3.50
b2	2.90	3.10	3.30	L	19.20	20.20	21.20
e		5.45		H	38.40	39.90	41.40
B	15.20	15.70	16.20	ΦP	2.90	3.15	3.40
B1	9.10	9.40	9.70	ΦP1	3.15	3.40	3.65
B2	13.20	13.60	14.00	ΦP2	6.70	7.00	7.30
c	0.50	0.60	0.70	θ	3°	5°	7°



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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