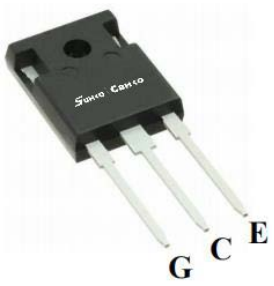
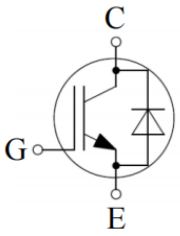
DGW40N120CTL1A



IGBT Discrete

V_{CE}	1200	V
I_C	40	A
$V_{CE(SAT)}$ I_C=40A	1.70	V

Circuit



Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Features

- High breakdown voltage to 1200V for improved reliability
- Maximum junction temperature 175℃
- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- High short circuit capability(10us)

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	1200	V
DC Collector Current, limited by T_{jmax} T_C= 25°C T_C= 100°C	I_C	 80 40	A
Diode Forward Current, limited by T_{jmax} T_C= 25°C T_C= 100°C	I_F	 80 40	A
Continuous Gate-Emitter Voltage	V_{GE}	±20	V
Transient Gate-Emitter Voltage (tp≤10μs,D<0.010)	V_{GE}	±30	V
Turn off Safe Operating Area V_{CE}≤1200V, T_j≤ 150°C		160	A
Pulsed Collector Current, V_{GE}=15V, tp limited by T_{jmax}	I_{CM}	160	A
Diode Pulsed Current, tp limited by T_{jmax}	I_{Fpuls}	160	A
Short Circuit Withstand Time, V_{GE}= 15V, V_{CC}=600V, V_{CEM}≤1200V	T_{sc}	10	μs
Power Dissipation , Tj=175°C, Tc=25°C	P_{tot}	375	W

Operating Junction Temperature	T_j	-40...+175	℃
Storage Temperature	T_s	-55...+150	℃
Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	℃

Electrical Characteristics of the IGBT（T_j= 25℃unless otherwise specified）:

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Collector-Emitter Breakdown Voltage	BV_{CES}	V_{GE}=0V, I_C=250μA	1200		-	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1.4mA	5.2	5.8	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=40A T_j=25°C, T_j=125°C T_j=150°C		1.70 1.95 2.05	2.00	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=1200V, V_{GE}=0V T_j= 25°C, T_j=150°C			0.25 4	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE}= 0V, V_{GE}= ± 20V			100	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Input Capacitance	C_{ies}	V_{CE}= 25V, V_{GE}= 0V, f = 1MHz	-	5.47	-	nF
Reverse Transfer Capacitance	C_{res}		-	0.05	-	
Gate Charge	Q_G	V_{CC}=600V,I_C=40A, V_{GE}=15V	-	0.26	-	uC

Electrical Characteristics of the Diode（T_j= 25℃unless otherwise specified）:

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Diode Forward Voltage	V_F	I_F= 40A T_j= 25°C, T_j= 125°C T_j= 150°C		2.00 1.80 1.70	2.50	V

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T_j= 25℃						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}= 600V, I_C=40A, V_{GE}= -5V~15V, R_g=20Ω	-	23	-	ns
Rise Time	t_r		-	75	-	ns
Turn-on Energy	E_{on}		-	4.2	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	267	-	ns
Fall Time	t_f		-	175	-	ns
Turn-off Energy	E_{off}		-	2.1	-	mJ
Dynamic , at T_j= 125℃						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}= 600V, I_C=40A, V_{GE}= -5V~15V, R_g=20Ω	-	25	-	ns
Rise Time	t_r		-	73	-	ns
Turn-on Energy	E_{on}		-	4.3	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	298	-	ns
Fall Time	t_f		-	262	-	ns
Turn-off Energy	E_{off}		-	3.5	-	mJ
Dynamic , at T_j= 150℃						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}= 600V, I_C=40A, V_{GE}= -5V~15V, R_g=20Ω	-	26	-	ns
Rise Time	t_r		-	69	-	ns
Turn-on Energy	E_{on}		-	4.4	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	321	-	ns
Fall Time	t_f		-	315	-	ns
Turn-off Energy	E_{off}		-	3.9	-	mJ

Electrical Characteristics of the DIODE

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T_j= 25℃						
Reverse Recovery Current	I_{rr}	I_F=40A, V_R=600V, di/dt= -520A/μs,	-	16	-	A
Diode reverse recovery time	trr		-	524	-	ns
Reverse Recovery Charge	Q_{rr}		-	3.23	-	uC
Reverse Recovery Energy	Erec		-	1.2	-	mJ
Dynamic , at Tj= 125℃						
Reverse Recovery Current	I_{rr}	I_F=40A,V_R=600V di/dt= -520A/μs,	-	19	-	A
Diode reverse recovery time	trr		-	825	-	ns
Reverse Recovery Charge	Q_{rr}		-	7.41	-	uC
Reverse Recovery Energy	Erec		-	2.9	-	mJ
Dynamic , at Tj= 150℃						
Reverse Recovery Current	I_{rr}	I_F=40A,V_R=600V di/dt= -520A/μs,	-	23	-	A
Diode reverse recovery time	trr		-	938	-	ns
Reverse Recovery Charge	Q_{rr}		-	8.95	-	uC
Reverse Recovery Energy	Erec		-	3.6	-	mJ

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R_{θ}(j-c)	0.40	K/W
Diode Thermal Resistance, Junction - Case	R_{θ}(j-c)	0.65	K/W
Thermal Resistance, Junction - Ambient	R_{θ}(j-a)	40	K/W

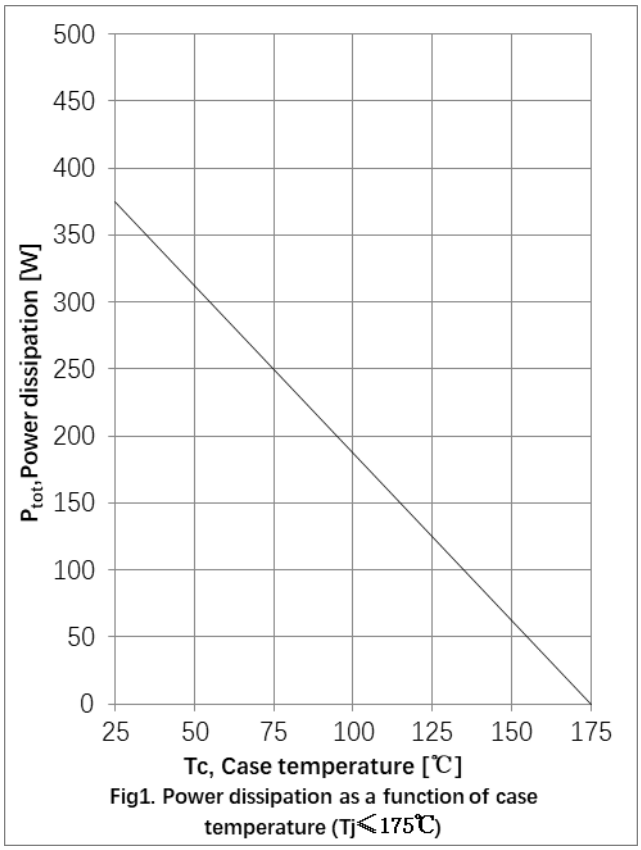


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

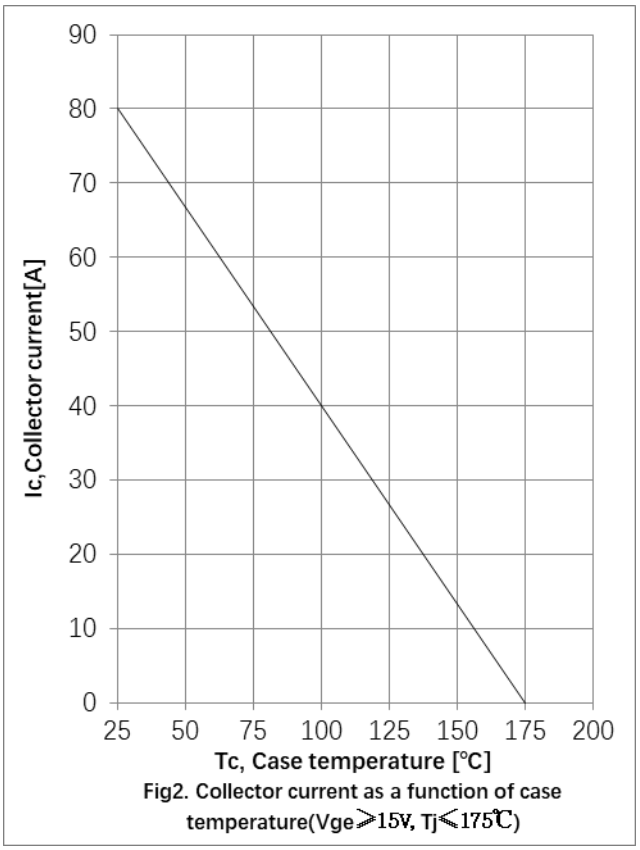


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

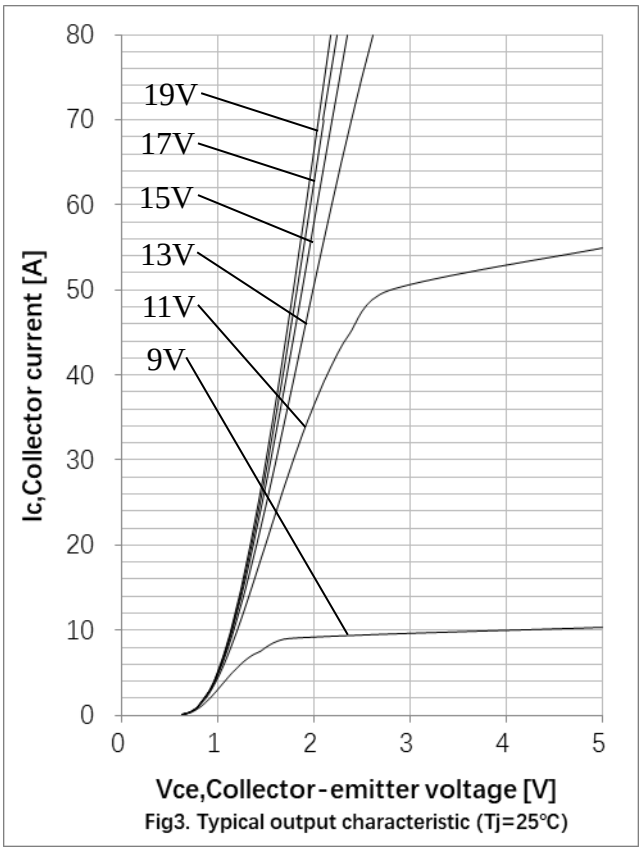


Fig3. Typical output characteristic (Tj=25℃)

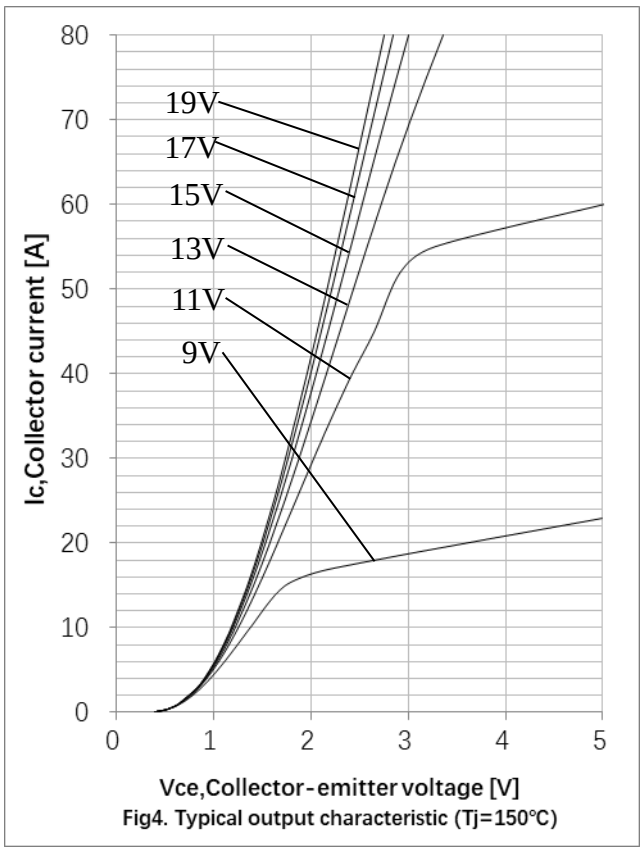


Fig4. Typical output characteristic (Tj=150℃)

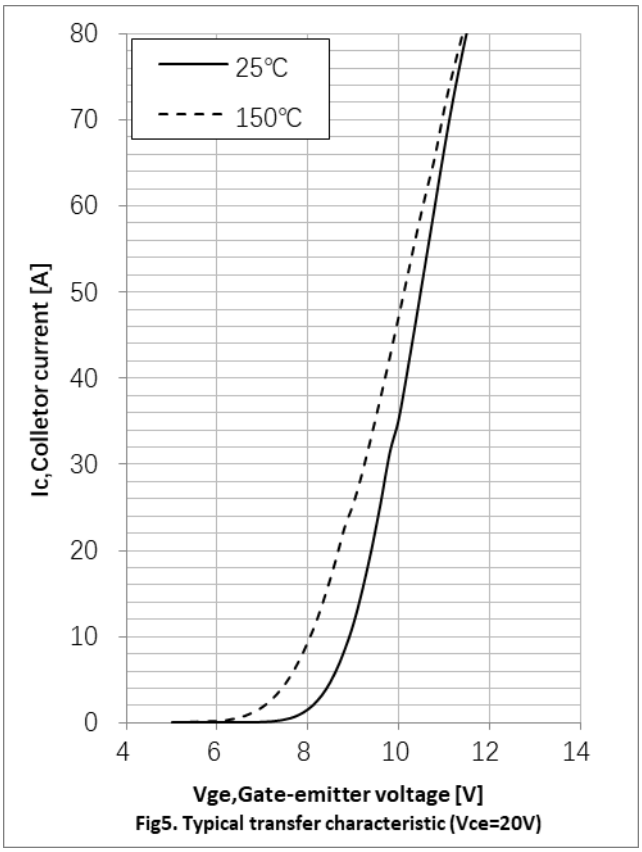


Fig5. Typical transfer characteristic (Vce=20V)

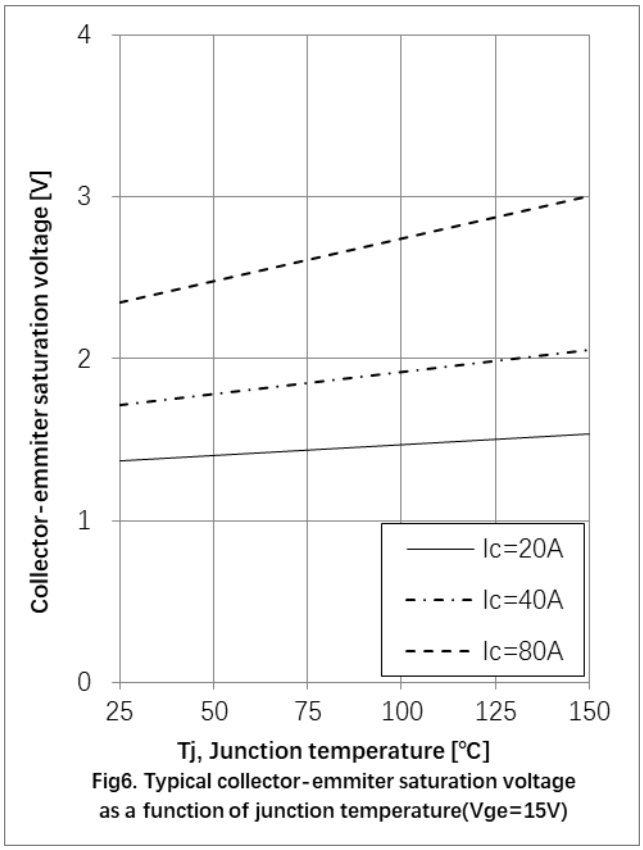


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

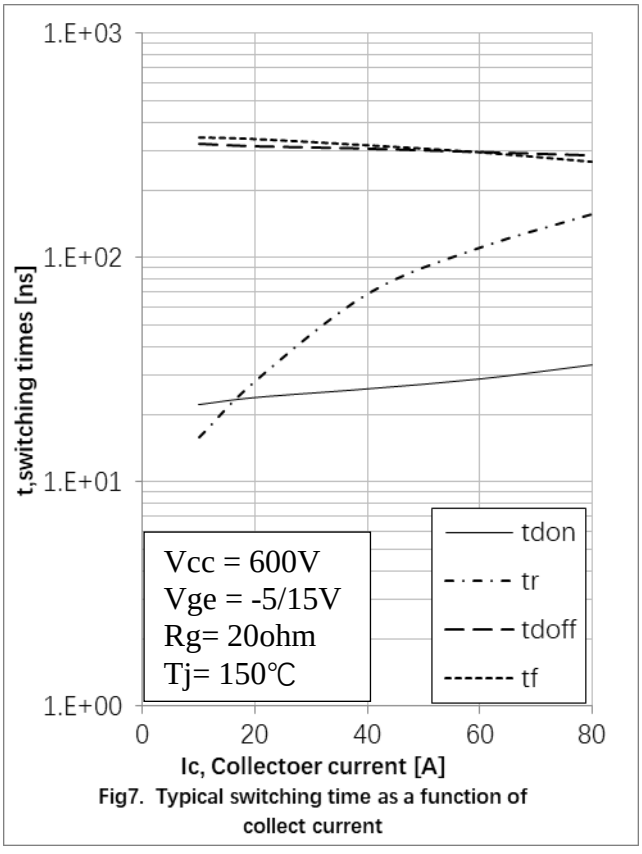


Fig7. Typical switching time as a function of collect current

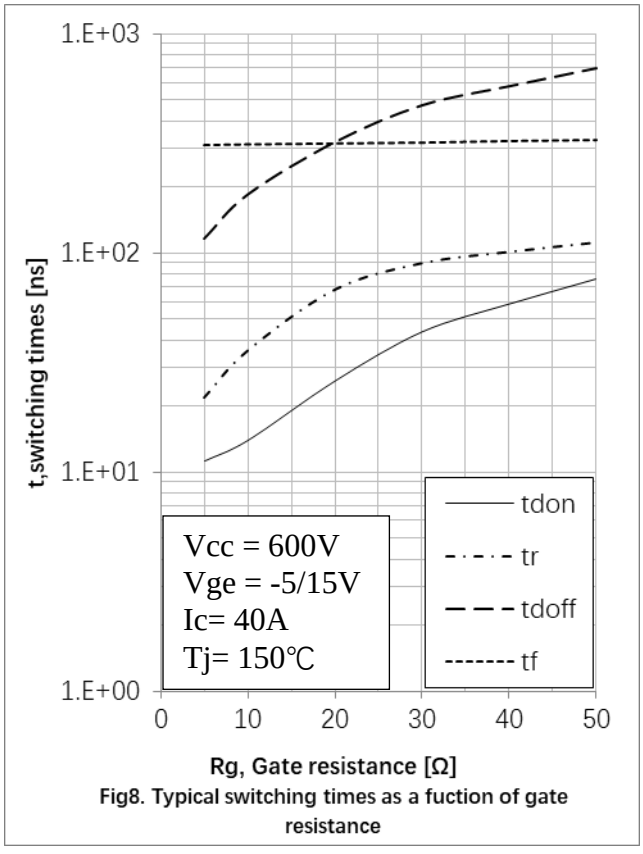


Fig8. Typical switching times as a fuction of gate resistance

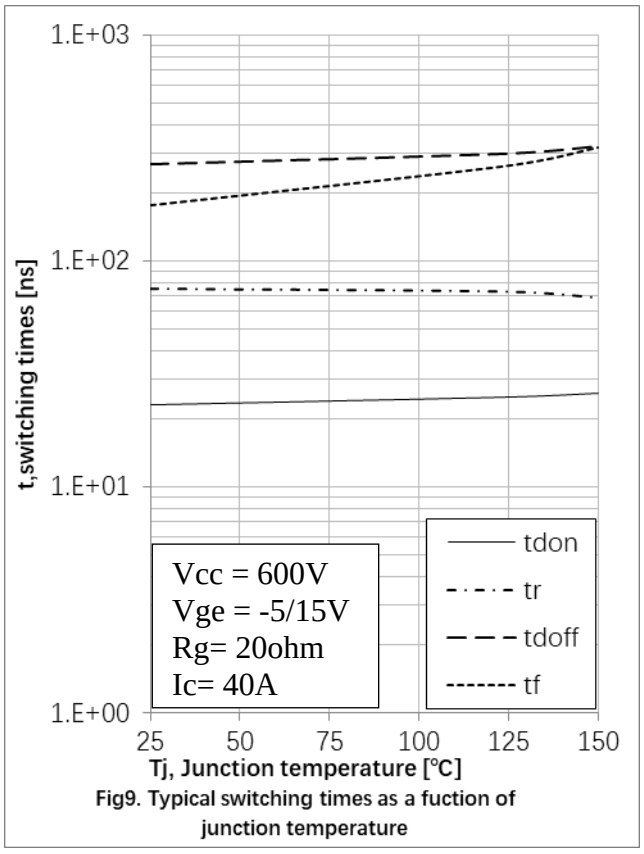


Fig9. Typical switching times as a fuction of junction temperature

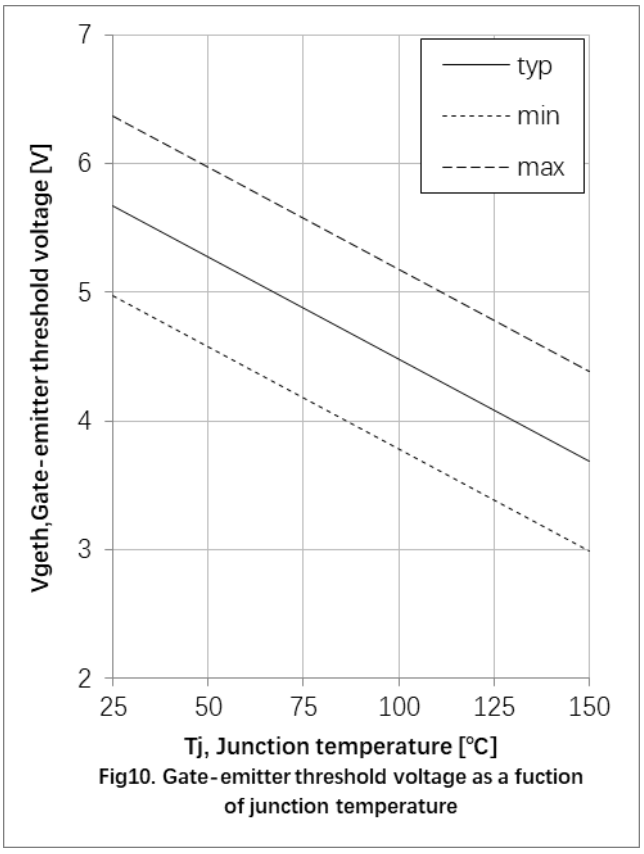


Fig10. Gate-emitter threshold voltage as a fuction of junction temperature

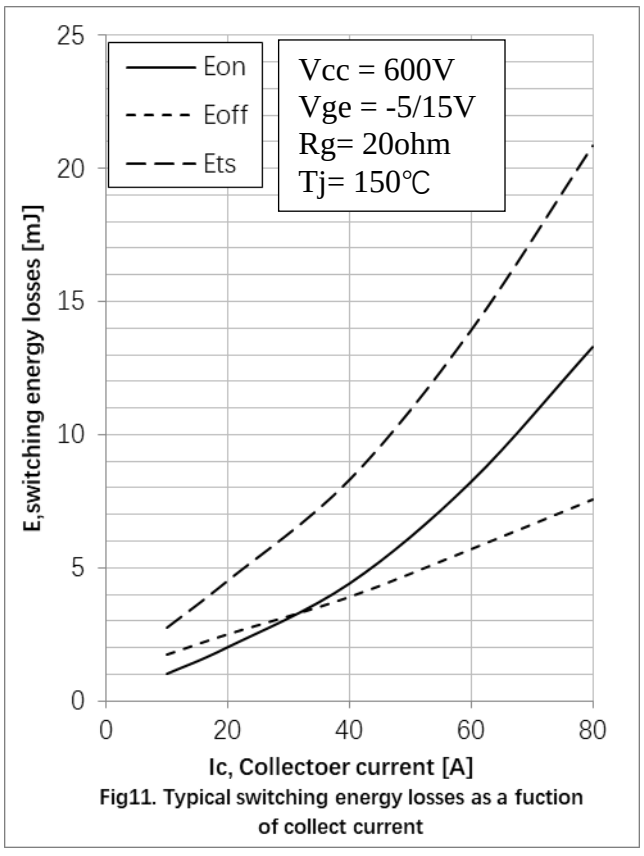


Fig11. Typical switching energy losses as a fuction of collect current

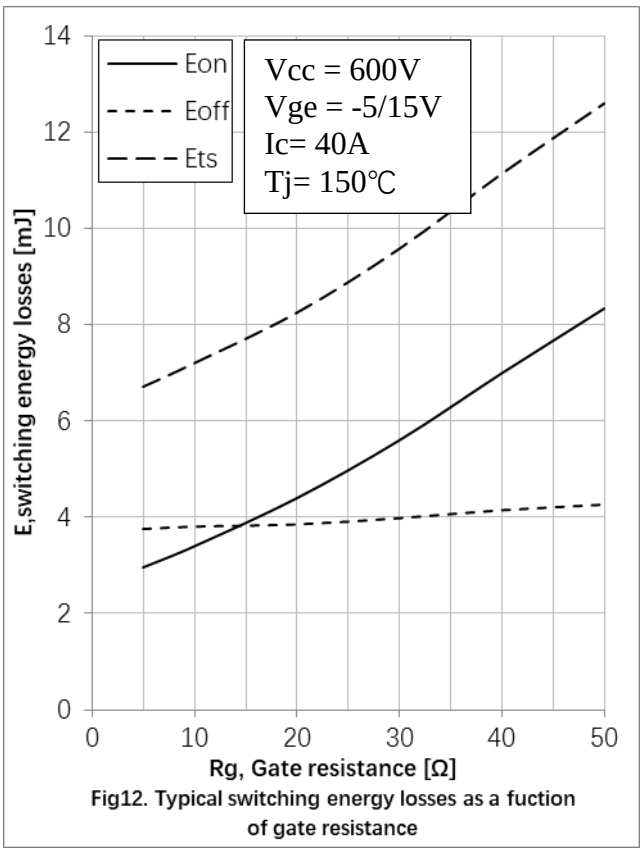


Fig12. Typical switching energy losses as a fuction of gate resistance

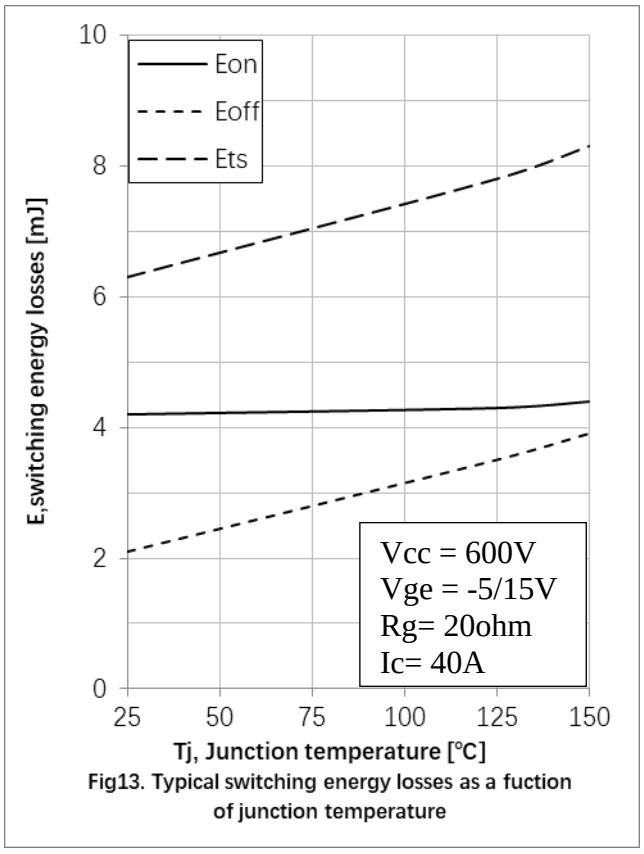


Fig13. Typical switching energy losses as a fuction of junction temperature

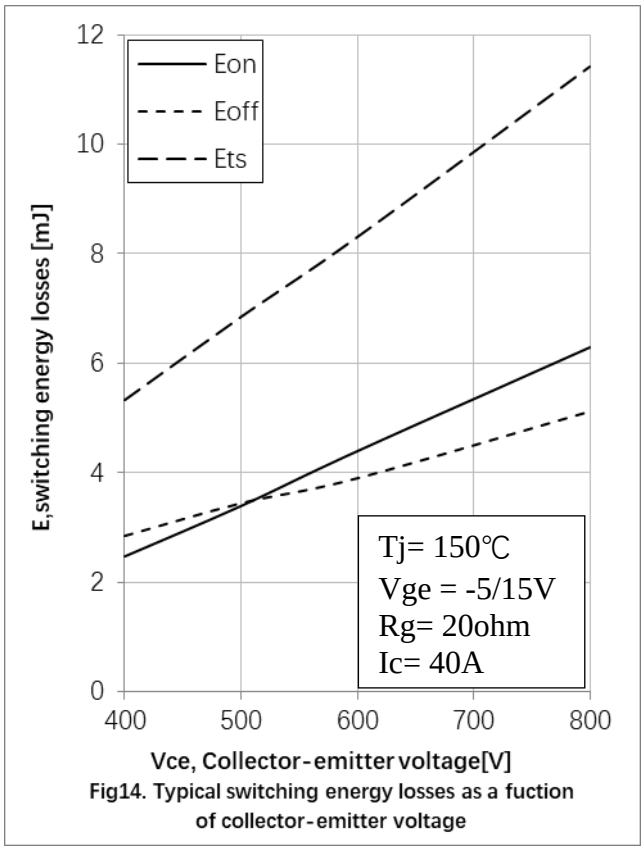


Fig14. Typical switching energy losses as a fuction of collector-emitter voltage

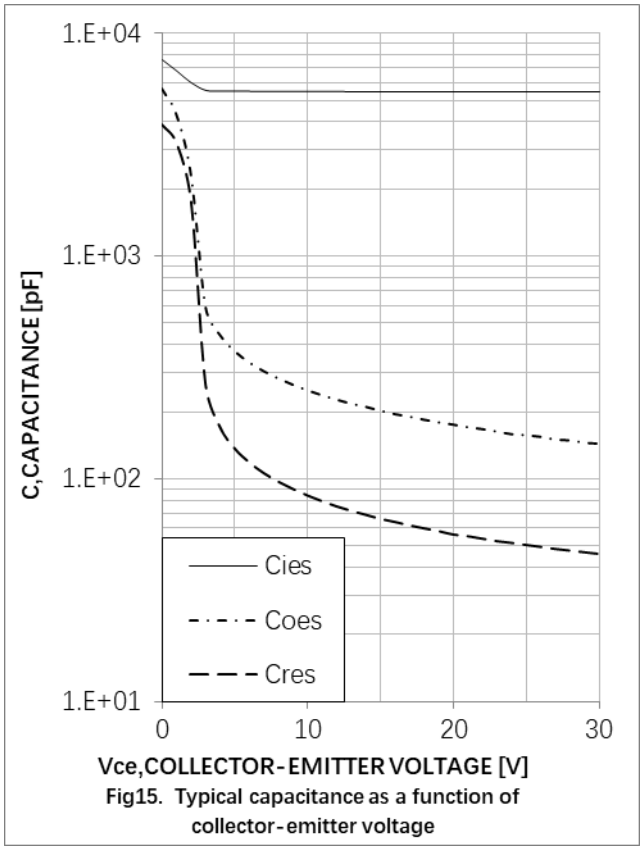


Fig15. Typical capacitance as a function of collector-emitter voltage

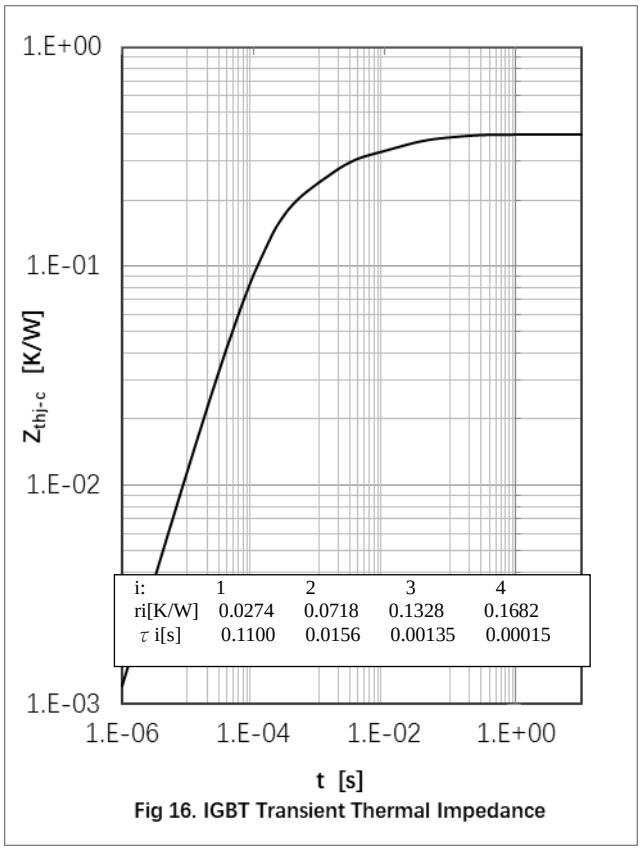


Fig 16. IGBT Transient Thermal Impedance

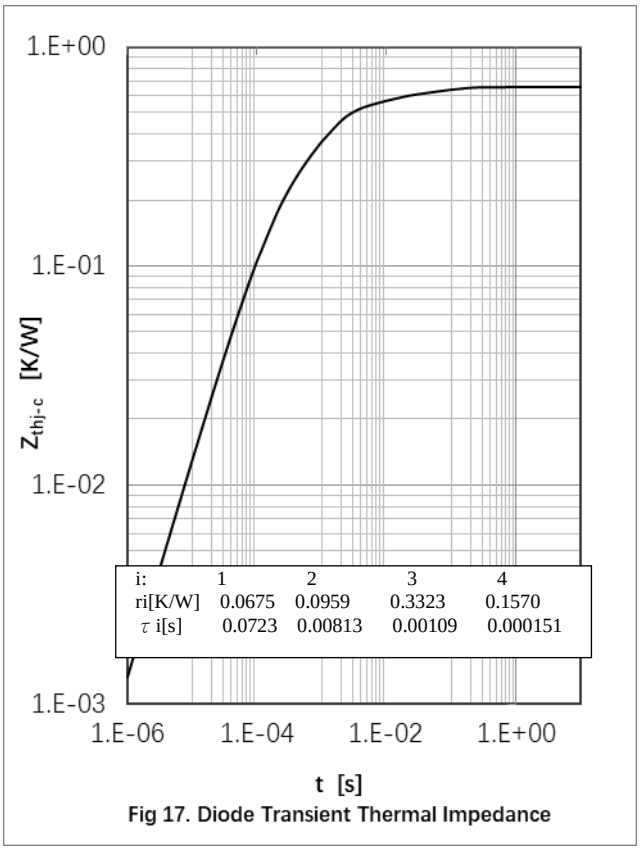


Fig 17. Diode Transient Thermal Impedance

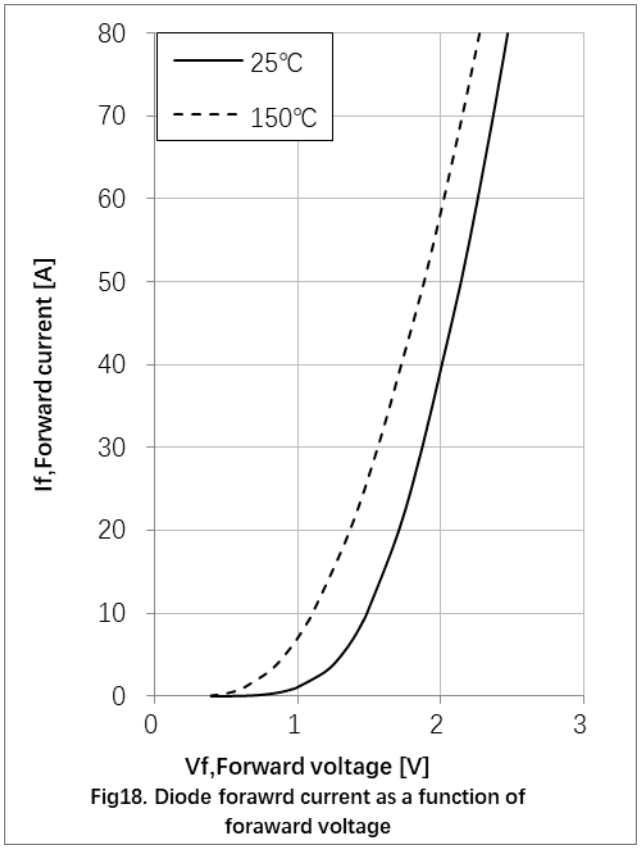


Fig18. Diode forawrd current as a function of foraward voltage

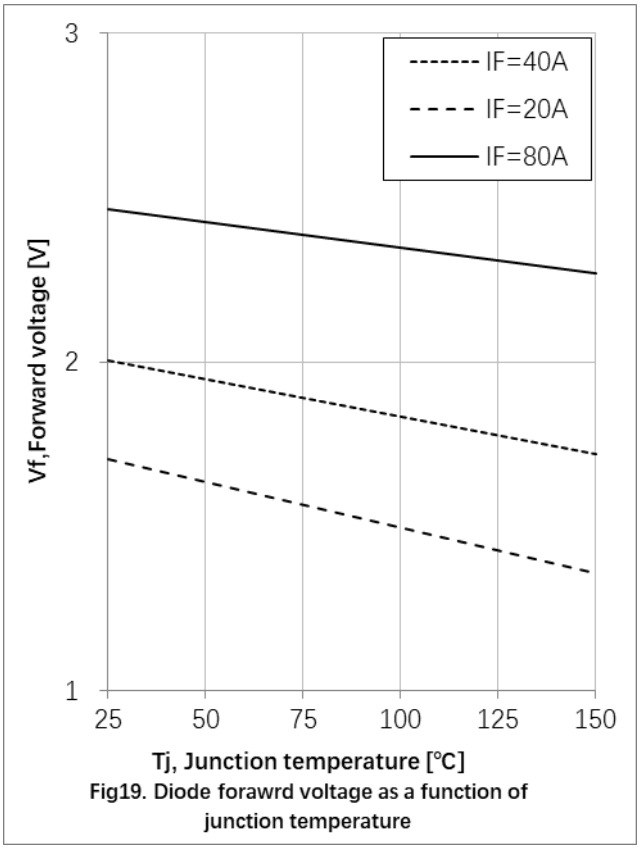
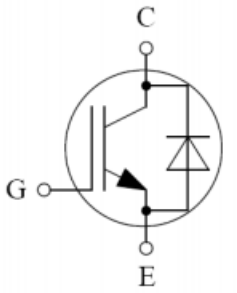


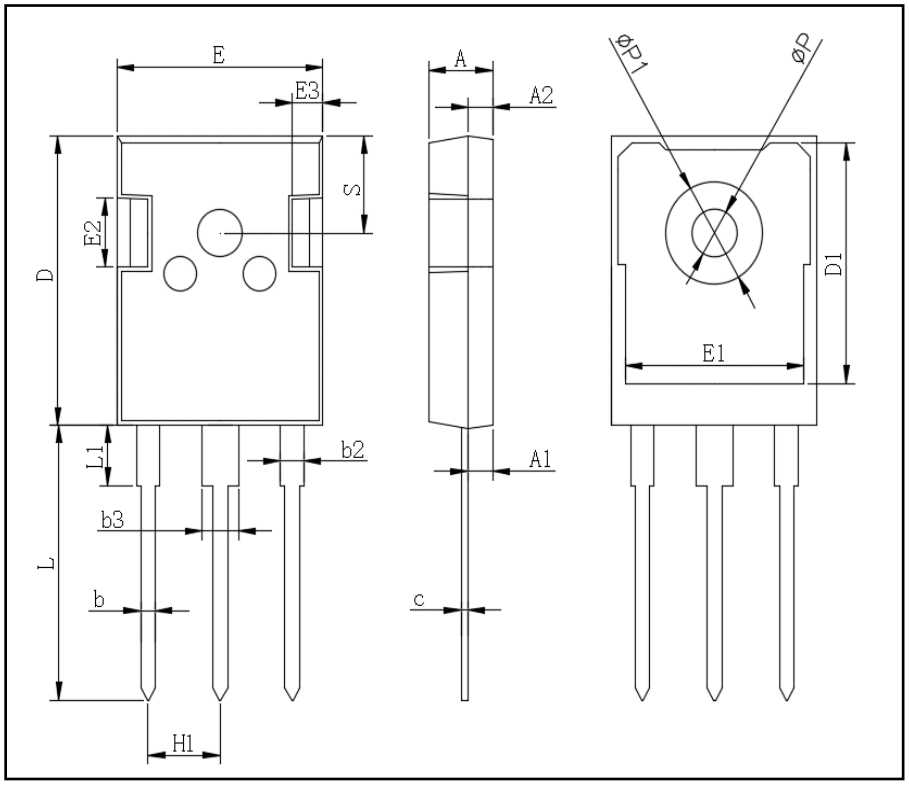
Fig19. Diode forawrd voltage as a function of junction temperature

Circuit Diagram



Package Outline Information

CASE: TO 247



TO-247AB		
Dim	Min	Max
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.0	1.4
b2	1.91	2.21
C	0.5	0.7
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.0	13.6
E2	4.80	5.20
E3	2.30	2.70
L	19.62	20.22
L1	-	4.30
ΦP	3.40	3.80
ΦP1	-	7.30
S	6.15TYP	
H1	5.44TYP	
b3	2.80	3.20