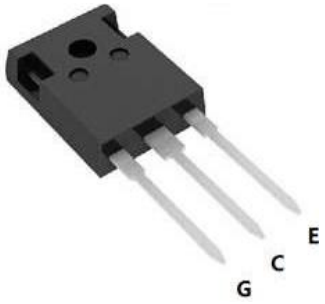
DGW40N65BTH

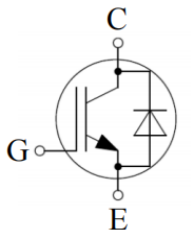
RoHS COMPLIANT



IGBT Discrete

V_{CE}	650	V
I_C	40	A
$V_{CE(SAT)}$ I_C=40A	1.95	V

Circuit



Applications

- High frequency switching application
- Medical applications
- Uninterruptible power supply
- Motion/servo control

Features

- Low switching losses
- Maximum junction temperature 175℃
- Positive temperature coefficient
- High ruggedness, temperature stable
- High short circuit capability(5us)

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	650	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	 60 30	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}	120	A
Short Circuit Withstand Time, V_{GE}= 15V, V_{CC}=400V, V_{CEM}≤650V	T_{sc}	5	μs
Power Dissipation , Tj=175°C, Tc=25°C	P_{tot}	250	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	650		-	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=0.64mA	4.1	4.7	6.1	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		1.95 2.30 2.40	2.40	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}=650V, V_{GE}=0V T_j= 25°C, T_j=150°C			0.25 4.00	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	-	1.56	-	nF
Reverse Transfer Capacitance	C_{res}		-	0.06	-	
Gate Charge	Q_G	V_{CC}=300V,I_C=40A, V_{GE}=15V	-	0.16	-	uC
Short Circuit Collector Current	I_{SC}	V_{GE}=15V, tsc≤5us, Vcc=300V,Tj⩽150°C	-	200	-	A

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= 30A T_j= 25°C, T_j= 125°C T_j= 150°C		1.90 1.85 1.75	2.60	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}=400V, I_C=40A, V_{GE}= 0v~15V, Rg=10Ω,Ls=60nH	-	12	-	ns
Rise Time	t_r		-	31	-	ns
Turn-on Energy	E_{on}		-	1.55	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	124	-	ns
Fall Time	t_f		-	54	-	ns
Turn-off Energy	E_{off}		-	0.59	-	mJ
Dynamic , at T_j= 125℃						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=400V, I_C=40A,, V_{GE}= 0v~15V, Rg=10Ω,Ls=60nH	-	11	-	ns
Rise Time	t_r		-	30	-	ns
Turn-on Energy	E_{on}		-	1.57	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	132	-	ns
Fall Time	t_f		-	84	-	ns
Turn-off Energy	E_{off}		-	0.83	-	mJ
Dynamic , at T_j= 150℃						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=400V, I_C=40A,, V_{GE}= 0v~15V, Rg=10Ω,Ls=60nH	-	11	-	ns
Rise Time	t_r		-	30	-	ns
Turn-on Energy	E_{on}		-	1.6	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	137	-	ns
Fall Time	t_f		-	102	-	ns
Turn-off Energy	E_{off}		-	0.88	-	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=30A,V_R=400V di/dt= -350A/μs,	-	7	-	A
Reverse Recovery Charge	Q_{rr}		-	0.14	-	uC
Diode reverse recovery time	trr		-	42	-	ns
Reverse Recovery Energy	Erec		-	0.09	-	mJ
Dynamic , at Tj= 125℃						
Reverse Recovery Current	I_{rr}	I_F=30A,V_R=400V di/dt= -350A/μs,	-	13	-	A
Reverse Recovery Charge	Q_{rr}		-	0.94	-	uC
Diode reverse recovery time	trr		-	153	-	ns
Reverse Recovery Energy	Erec		-	0.22	-	mJ
Dynamic , at Tj= 150℃						
Reverse Recovery Current	I_{rr}	I_F=30A,V_R=400V di/dt= -350A/μs,	-	15	-	A
Reverse Recovery Charge	Q_{rr}		-	1.26	-	uC
Diode reverse recovery time	trr		-	161	-	ns
Reverse Recovery Energy	Erec		-	0.26	-	mJ

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R_{th}(j-c)	0.60	K/W
Diode Thermal Resistance, Junction - Case	R_{th}(j-c)	1.05	K/W
Thermal Resistance, Junction - Ambient	R_{th}(j-a)	40	K/W

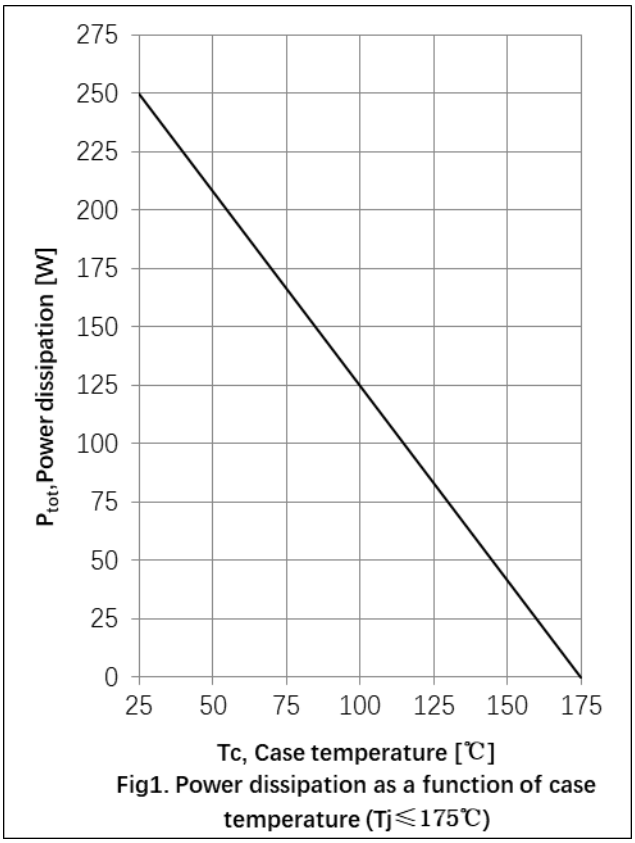


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

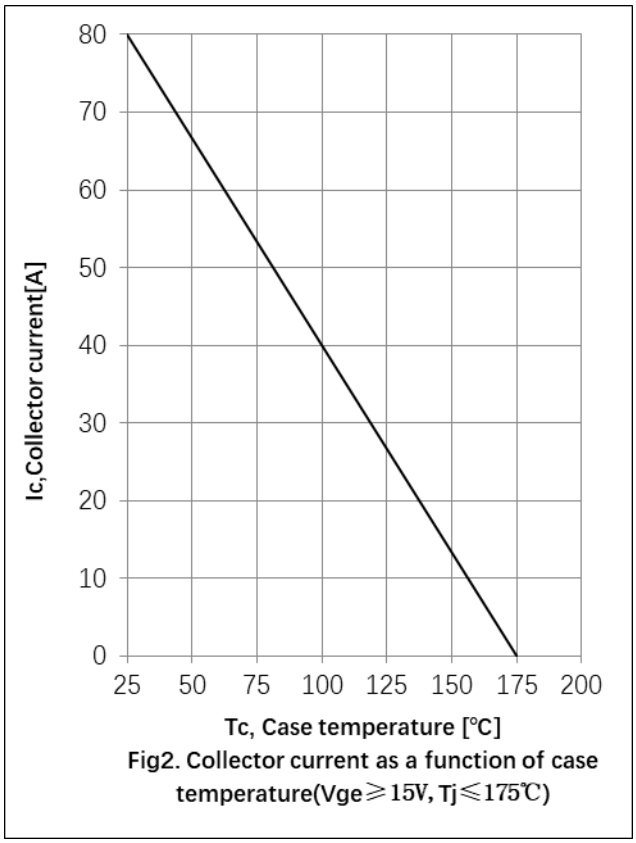


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

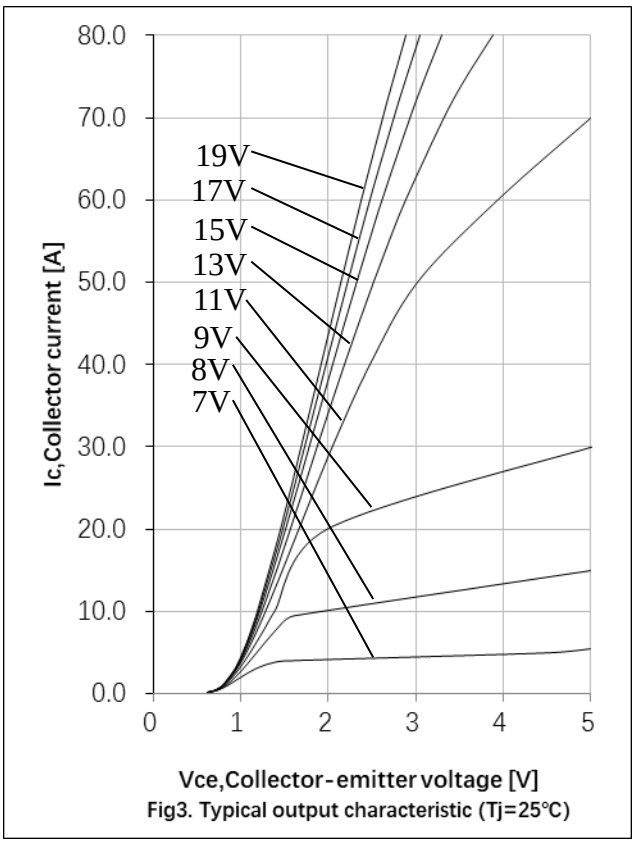


Fig3. Typical output characteristic (Tj=25℃)

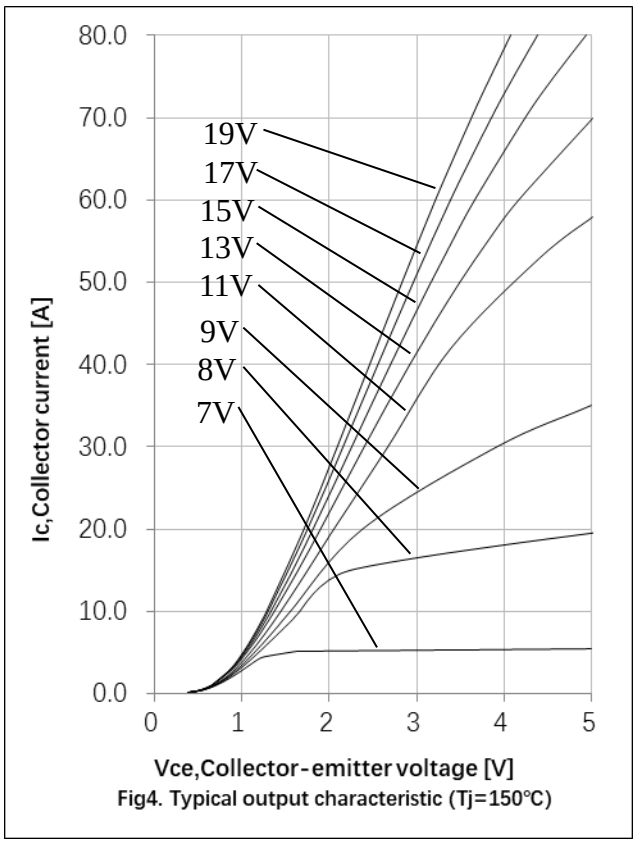


Fig4. Typical output characteristic (Tj=150℃)

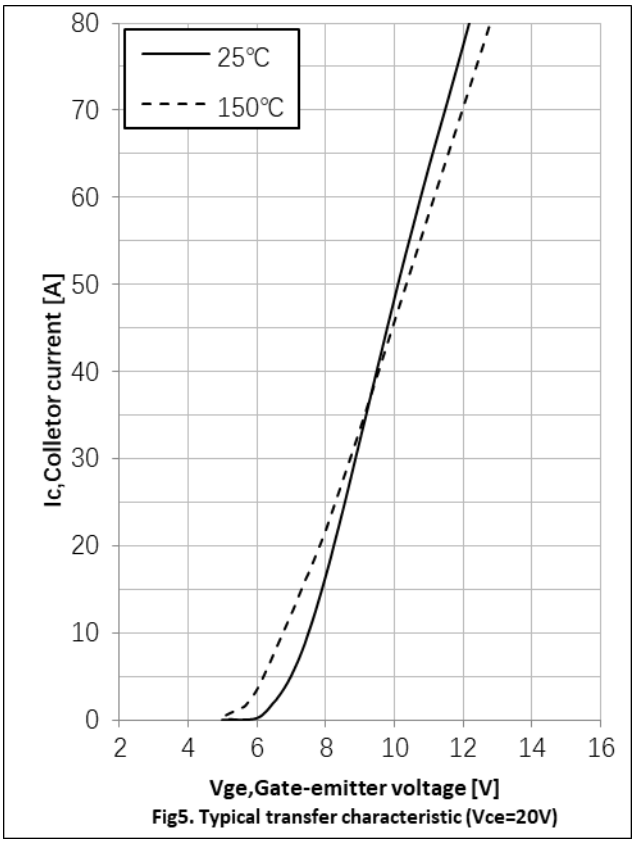


Fig5. Typical transfer characteristic (Vce=20V)

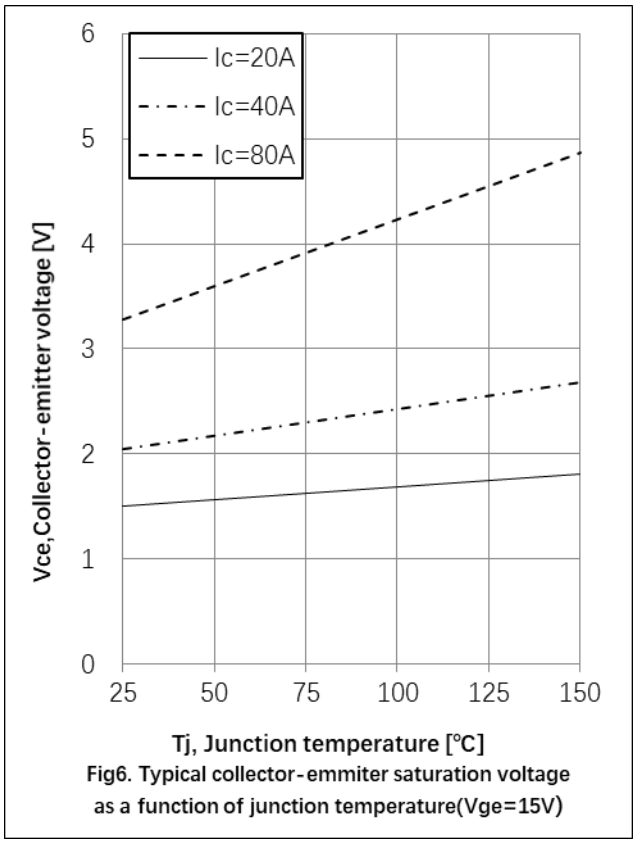


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

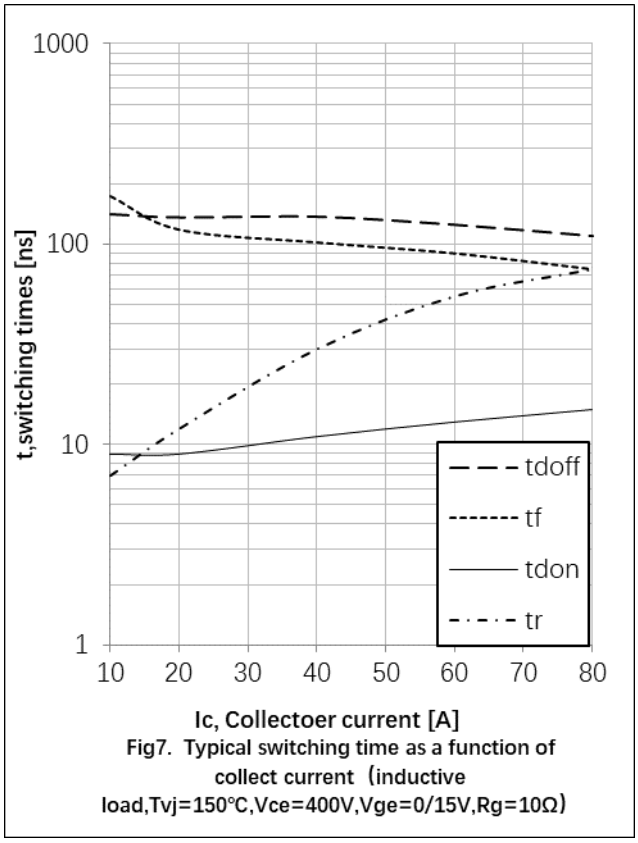


Fig7. Typical switching time as a function of collect current（inductive load,Tvj=150℃,Vce=400V,Vge=0/15V,Rg=10Ω）

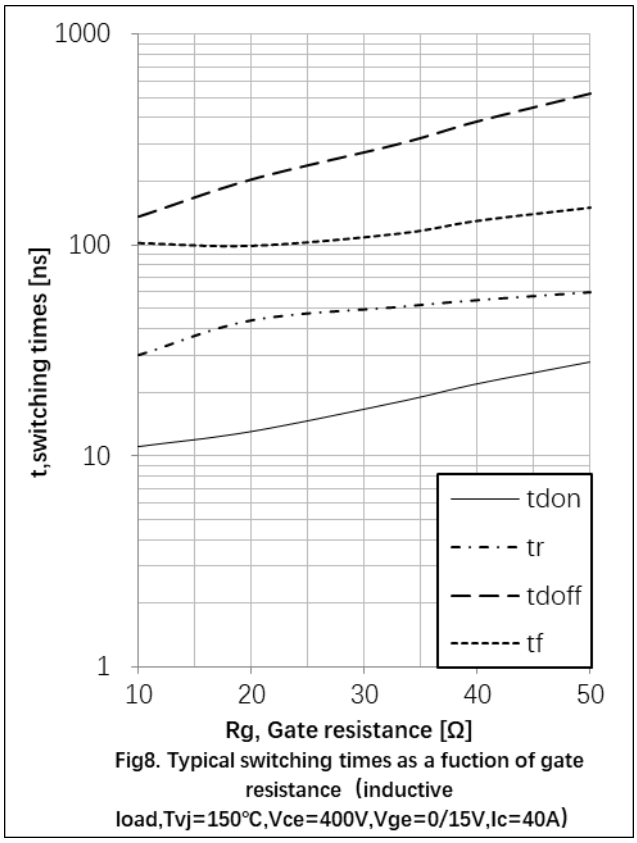


Fig8. Typical switching times as a fuction of gate resistance（inductive load,Tvj=150℃,Vce=400V,Vge=0/15V,Ic=40A）

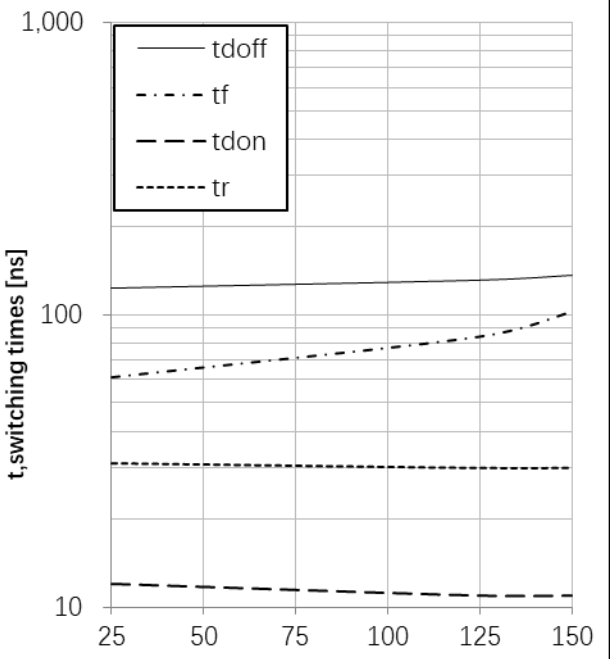


Fig9. Typical switching times as a fuction of junction temperature (inductive load,Ic=40A,Vce=400V,Vge=0/15V,Rg=10Ω)

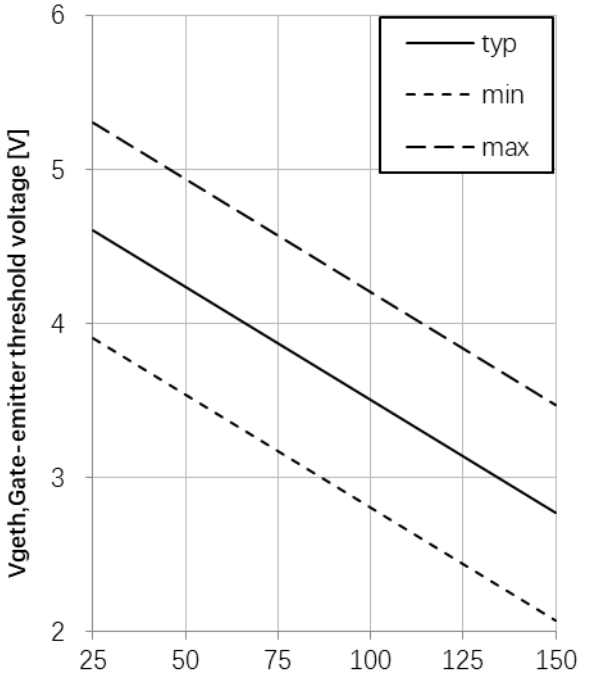


Fig10. Gate-emitter threshold voltage as a fuction of junction temperature(Ic=0.75mA)

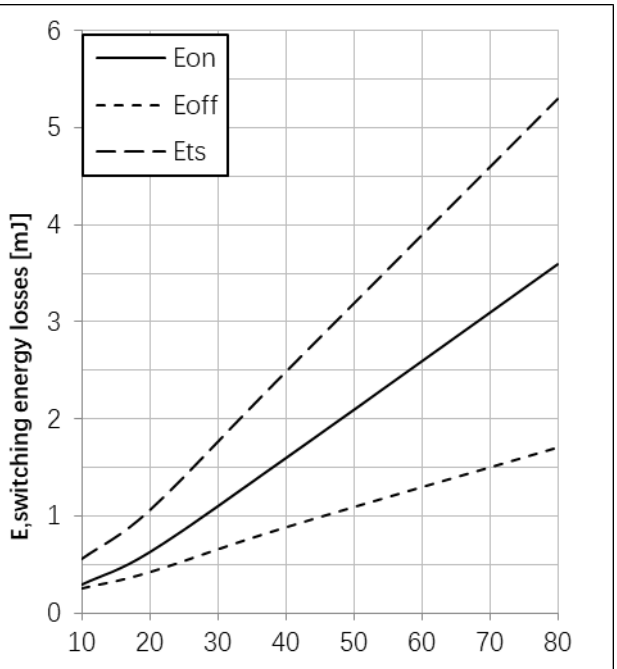


Fig11. Typical switching energy losses as a fuction of collect current (inductive load,Tvj=150℃,Vce=400V,Vge=0/15V,Rg=10Ω)

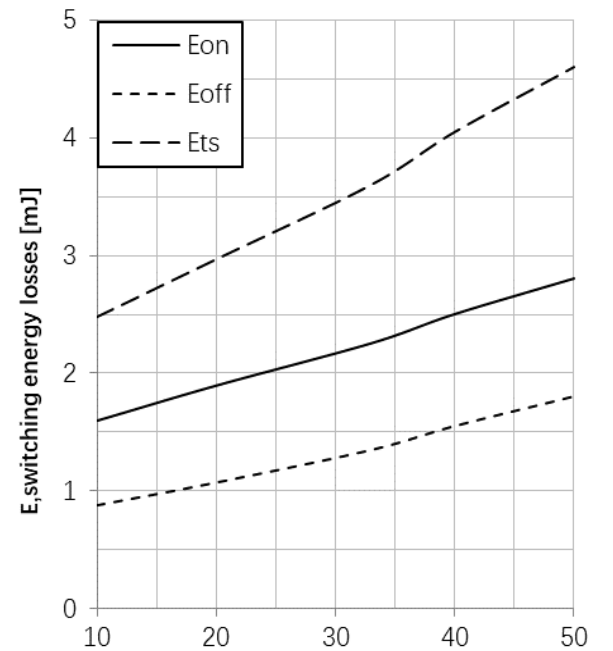


Fig12. Typical switching energy losses as a fuction of gate resistance (inductive load,Tvj=150℃,Vce=400V,Vge=0/15V,Ic=40A)

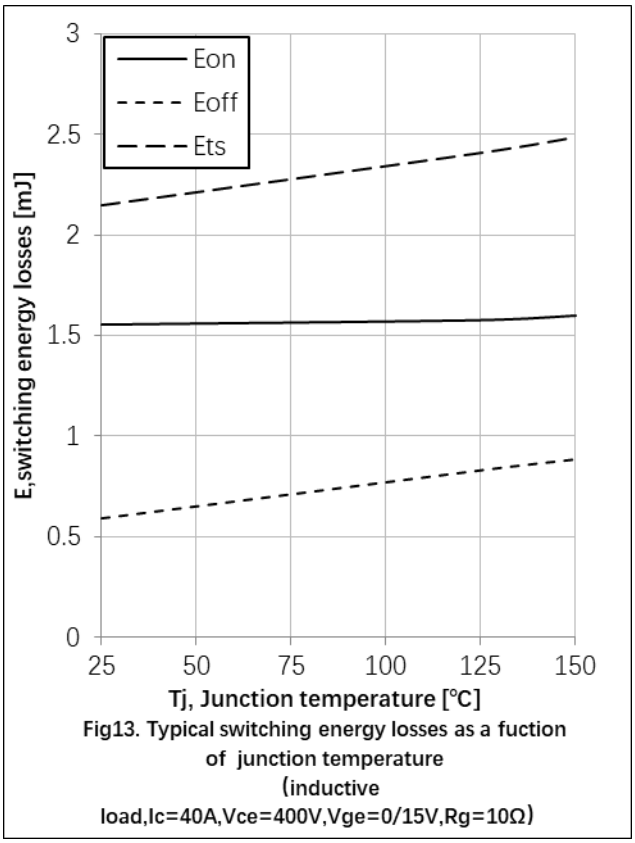


Fig13. Typical switching energy losses as a fuction of junction temperature (inductive load,Ic=40A,Vce=400V,Vge=0/15V,Rg=10Ω)

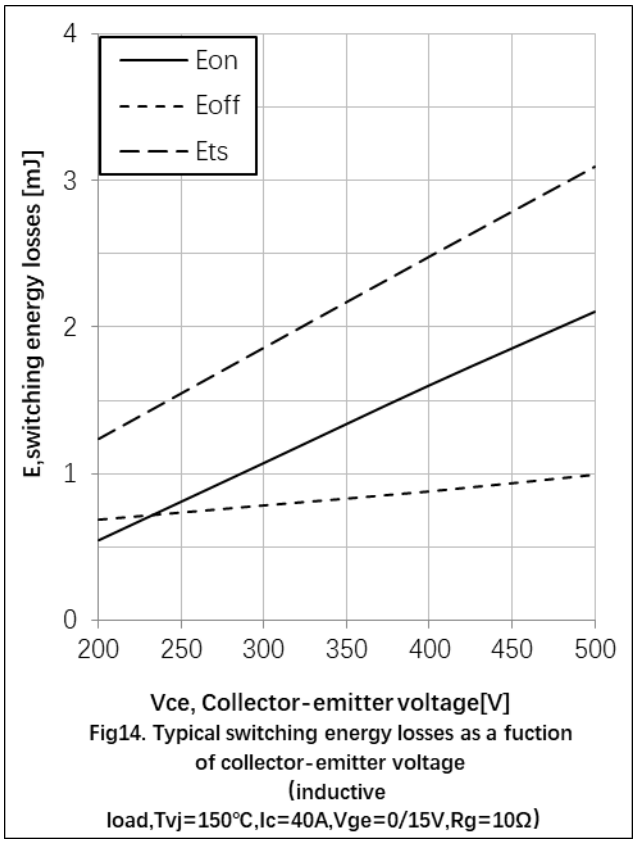


Fig14. Typical switching energy losses as a fuction of collector-emitter voltage (inductive load,Tvj=150℃,Ic=40A,Vge=0/15V,Rg=10Ω)

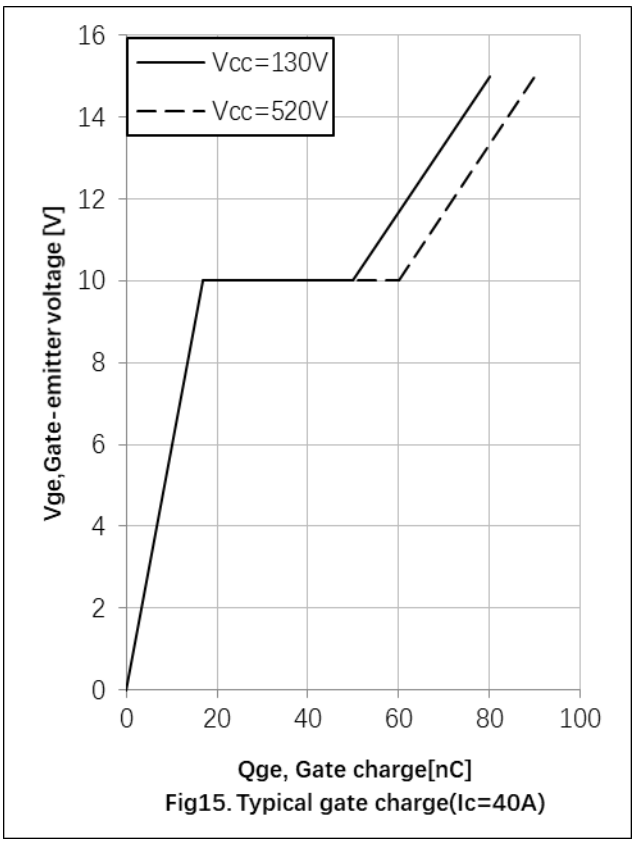


Fig15. Typical gate charge(Ic=40A)

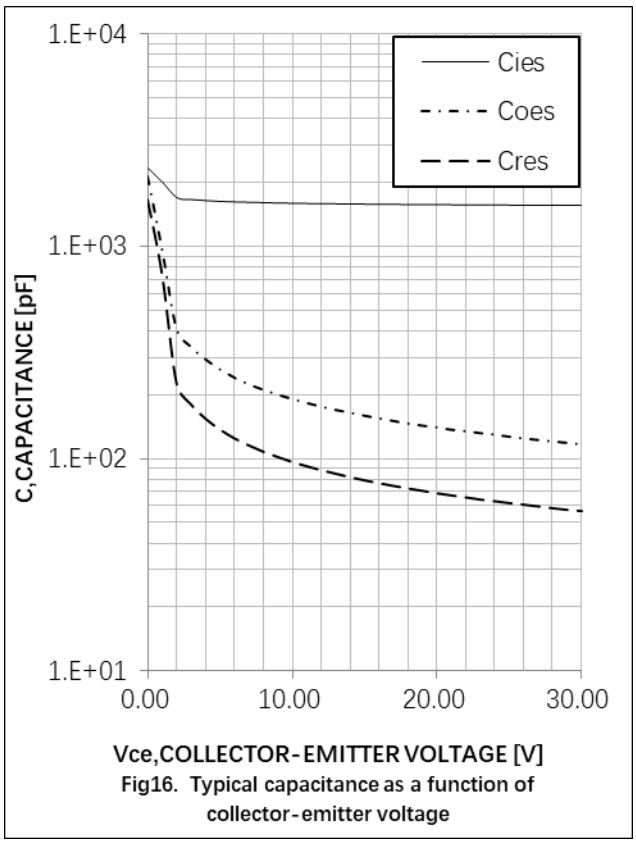


Fig16. Typical capacitance as a function of collector-emitter voltage

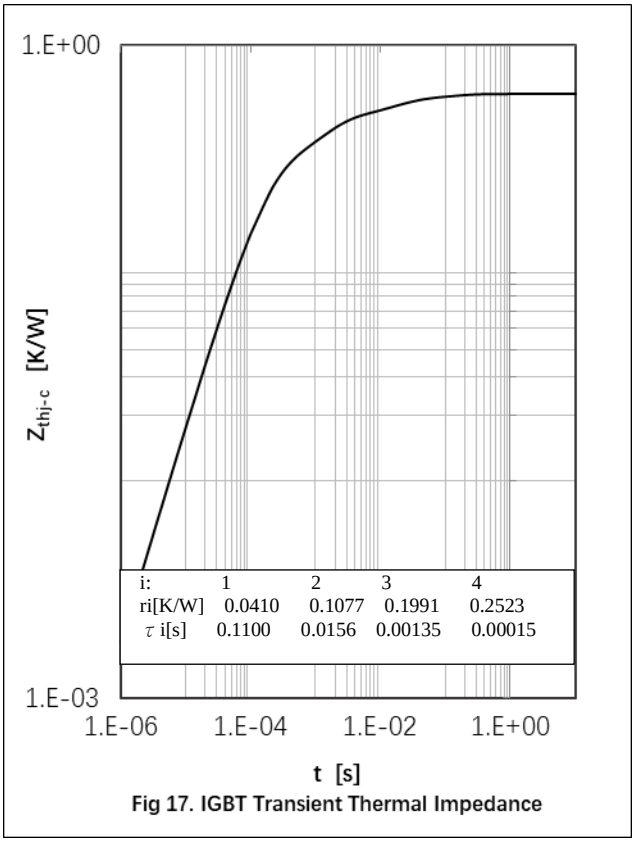


Fig 17. IGBT Transient Thermal Impedance

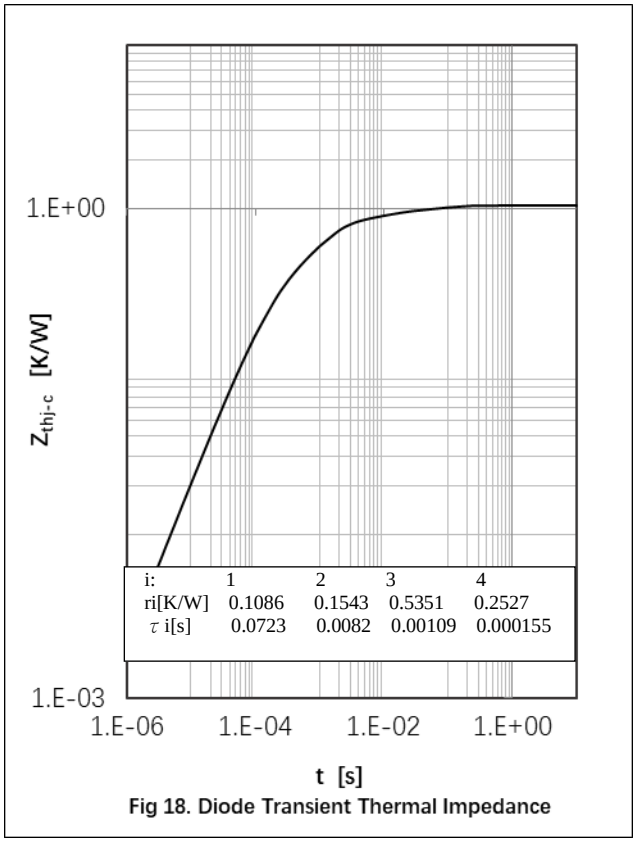


Fig 18. Diode Transient Thermal Impedance

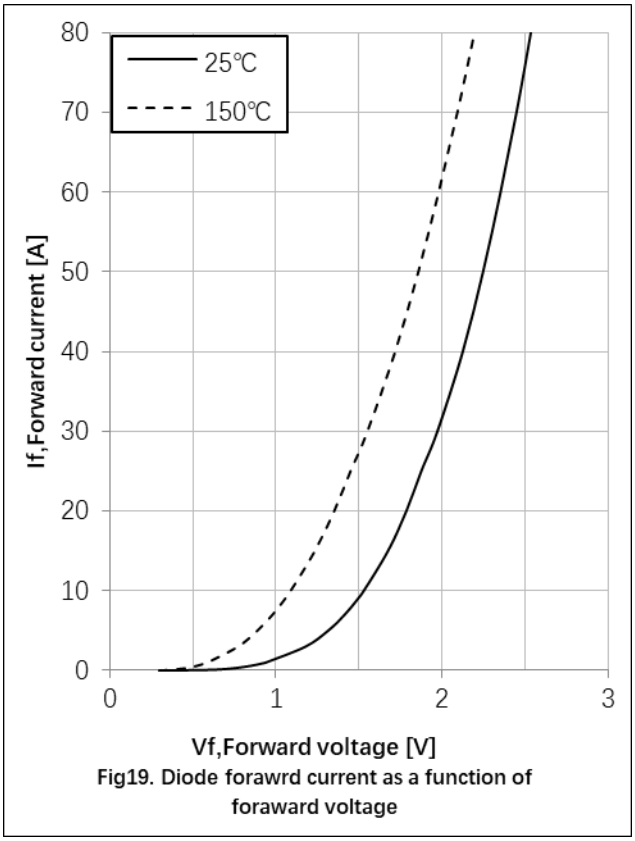


Fig19. Diode forawrd current as a function of foraward voltage

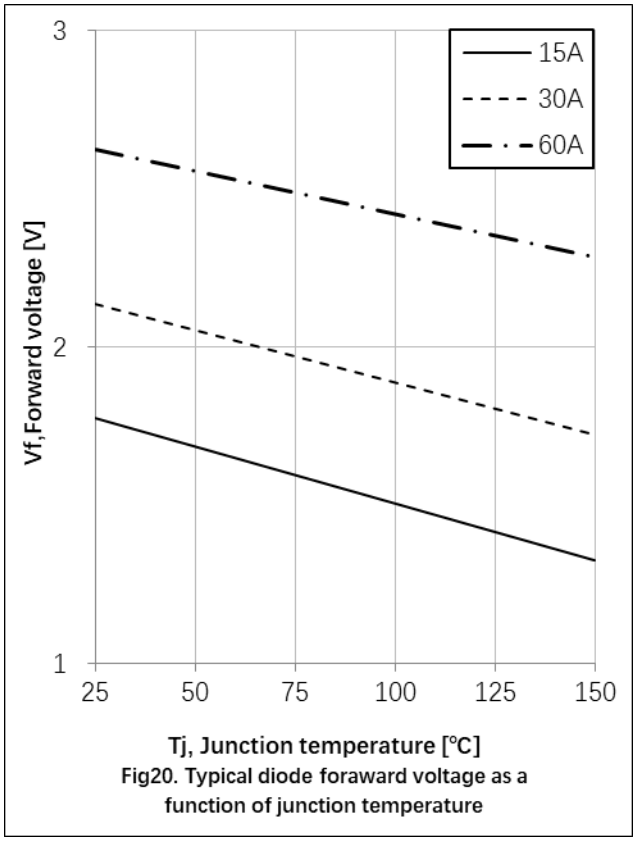


Fig20. Typical diode foraward voltage as a function of junction temperature

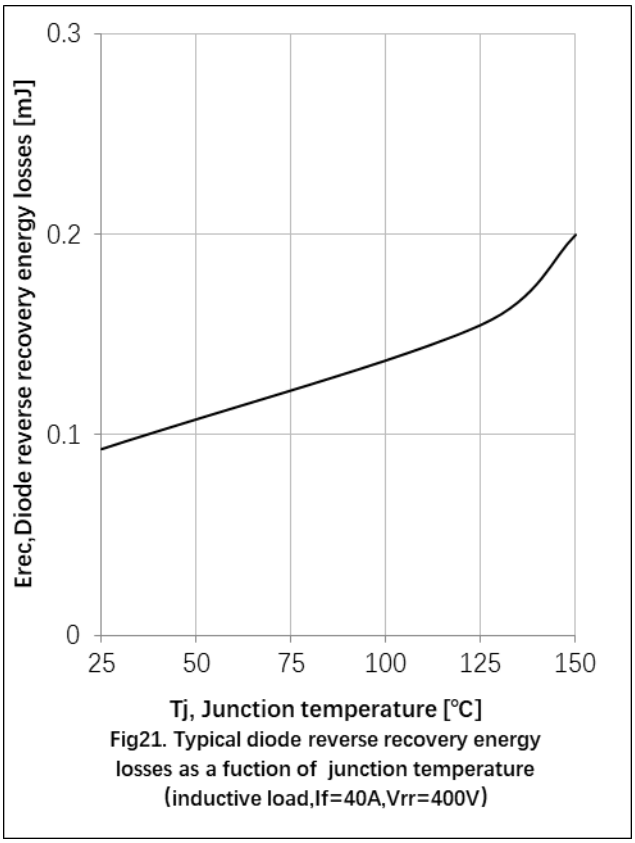


Fig21. Typical diode reverse recovery energy losses as a fuction of junction temperature (inductive load,If=40A,Vrr=400V)

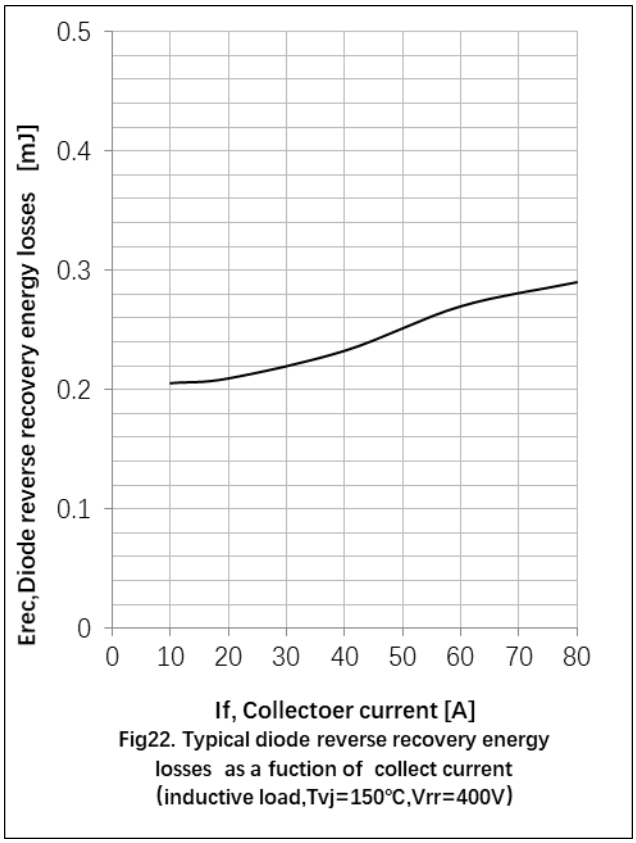
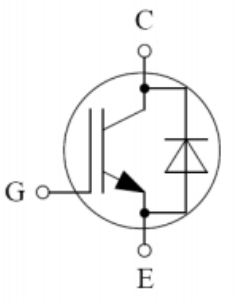


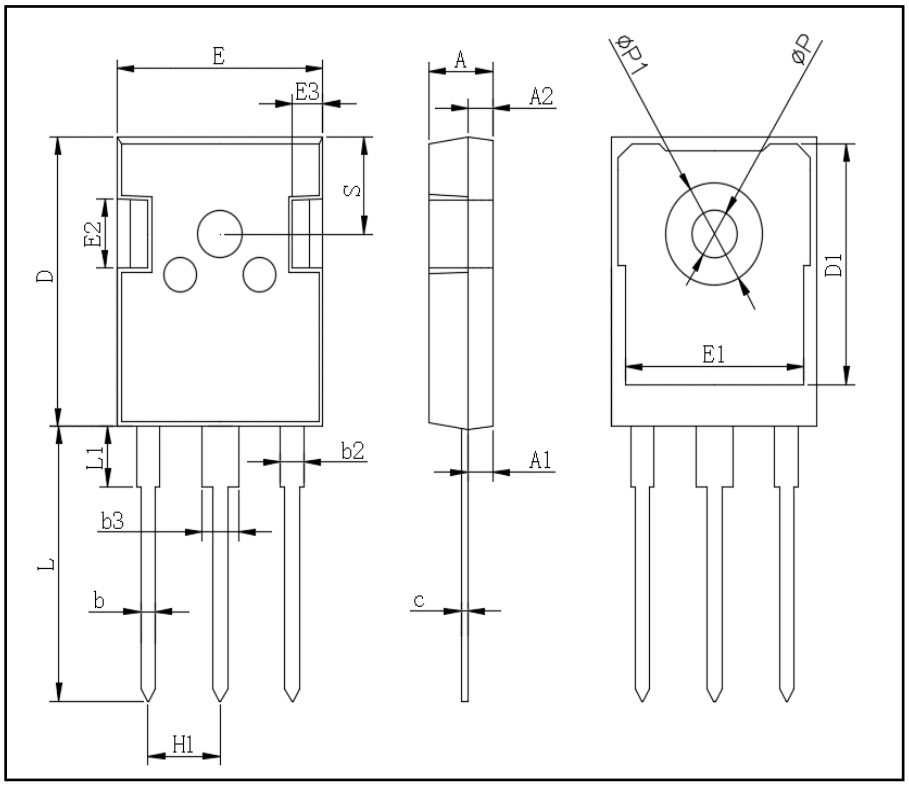
Fig22. Typical diode reverse recovery energy losses as a fuction of collect current (inductive load,Tvj=150℃,Vrr=400V)

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