



IGBT Discrete

V_{CE}	650	V
I_C	50	A
$V_{CE(SAT)}$ $I_C=50A$	1.60	V

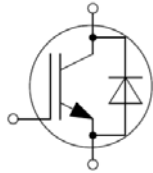
Applications

- High frequency switching application
- Resonant converters
- Uninterruptible power supply
- Welding converters

Features

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175°C
- Positive temperature coefficient
- High ruggedness, temperature stable
- Pb-free lead plating; RoHS compliant

Circuit



Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	650	V
DC Collector Current, limited by T_{jmax} $T_C=25^{\circ}C$ value limited by bondwire $T_C=100^{\circ}C$	I_C	85 60	A
Diode Forward Current, limited by T_{jmax} $T_C=25^{\circ}C$ value limited by bondwire $T_C=100^{\circ}C$	I_F	85 60	A
Continuous Gate-Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage ($t_p \leq 10\mu s, D < 0.010$)	V_{GE}	± 30	V
Turn off Safe Operating Area $V_{CE} \leq 650V$, $T_j \leq 150^{\circ}C$		200	A
Pulsed Collector Current, $V_{GE}=15V$, t_p limited by T_{jmax}	I_{CM}	200	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	200	A
Power Dissipation, $T_j=175^{\circ}C$, $T_C=25^{\circ}C$	P_{tot}	326	W
Operating Junction Temperature	T_j	40...+175	$^{\circ}C$
Storage Temperature	T_s	55...+150	$^{\circ}C$
Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	$^{\circ}C$



DGW50N65CTL1

■Electrical Characteristics of the IGBT (T_j= 25°C 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 =0.75mA	4.25	5.05	5.85	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =50A T _j =25°C, T _j =125°C T _j =150°C	1.45	1.60 1.95 2.05	1.95	V
Zero Gate Voltage Collector Current	I _{CES}	V _{CE} =650V, V _{GE} =0V T _j = 25°C, T _j =150°C			0.25 3.00	mA
Gate-Emitter Leakage Current	I _{GES}	V _{CE} = 0V, V _{GE} = 20V			200	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Input Capacitance	C _{ies}	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz	-	5.92	-	nF
Reverse Transfer Capacitance	C _{res}		-	0.23	-	
Gate Charge	Q _G	V _{CC} =300V, I _C =50A, V _{GE} =15V	-	0.45	-	uC



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■Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _J = 25°C						
Turn-on Delay Time	t _d (on)	V _{CC} =300V, I _C =50A, V _{GE} = 0v~15V, R _g =10Ω,L _s =60nH	-	55	-	ns
Rise Time	t _r		-	56	-	ns
Turn-on Energy	E _{on}		-	1.27	-	mJ
Turn-off Delay Time	t _d (off)		-	319	-	ns
Fall Time	t _f		-	24	-	ns
Turn-off Energy	E _{off}		-	0.65	-	mJ
Total switching energy	E _{ts}			1.92		mJ
Dynamic , at T _J = 125°C						
Turn-on Delay Time	t _d (on)	V _{CC} =300V, I _C =50A, V _{GE} = 0v~15V, R _g =10Ω,L _s =60nH	-	53	-	ns
Rise Time	t _r		-	61	-	ns
Turn-on Energy	E _{on}		-	1.51	-	mJ
Turn-off Delay Time	t _d (off)		-	351	-	ns
Fall Time	t _f		-	59	-	ns
Turn-off Energy	E _{off}		-	0.80	-	mJ
Total switching energy	E _{ts}			2.31		mJ
Dynamic , at T _J = 150°C						
Turn-on Delay Time	t _d (on)	V _{CC} =300V, I _C =50A, V _{GE} = 0v~15V, R _g =10Ω,L _s =60nH	-	52	-	ns
Rise Time	t _r		-	60	-	ns
Turn-on Energy	E _{on}		-	1.62	-	mJ
Turn-off Delay Time	t _d (off)		-	361	-	ns
Fall Time	t _f		-	71	-	ns
Turn-off Energy	E _{off}		-	0.85	-	mJ
Total switching energy	E _{ts}			2.47		mJ



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■Electrical Characteristics of the Diode (T_j= 25°C unless otherwise specified):

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Diode Forward Voltage	V _F	I _F = 50A T _j = 25°C, T _j = 125°C T _j = 150°C	1.30	1.45 1.29 1.23	1.80	V

■Electrical Characteristics of the DIODE

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _j = 25°C						
Reverse Recovery Current	I _{rr}	I _F =50A,V _R =300V -di/dt= 610A/μs,	-	13	-	A
Reverse Recovery Charge	Q _{rr}		-	0.78	-	uC
Diode reverse recovery time	t _{rr}		-	100	-	ns
Reverse Recovery Energy	E _{rec}		-	0.1		mJ
Dynamic , at T _j = 125°C						
Reverse Recovery Current	I _{rr}	I _F =50A,V _R =300V -di/dt= 610A/μs,	-	35	-	A
Reverse Recovery Charge	Q _{rr}		-	2.8	-	uC
Diode reverse recovery time	t _{rr}		-	140	-	ns
Reverse Recovery Energy	E _{rec}		-	0.38		mJ
Dynamic , at T _j = 150°C						
Reverse Recovery Current	I _{rr}	I _F =50A,V _R =300V -di/dt= 610A/μs,	-	40	-	A
Reverse Recovery Charge	Q _{rr}		-	3.22	-	uC
Diode reverse recovery time	t _{rr}		-	160	-	ns
Reverse Recovery Energy	E _{rec}		-	0.43		mJ

■Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R _{th(j-c)}	0.46	K/W
Diode Thermal Resistance, Junction - Case	R _{th(j-c)}	0.51	K/W
Thermal Resistance, Junction - Ambient	R _{th(j-a)}	40	K/W



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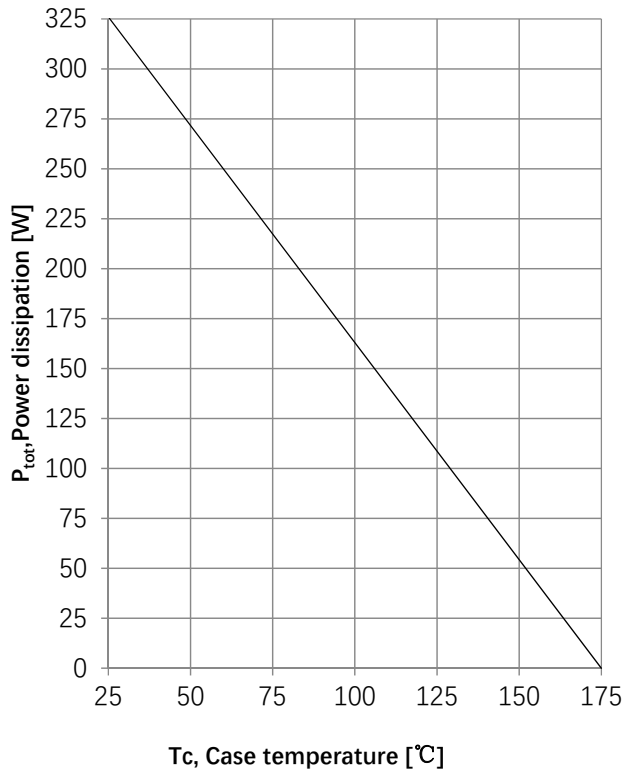


Fig1. Power dissipation as a function of case temperature ($T_j \leq 175^\circ\text{C}$)

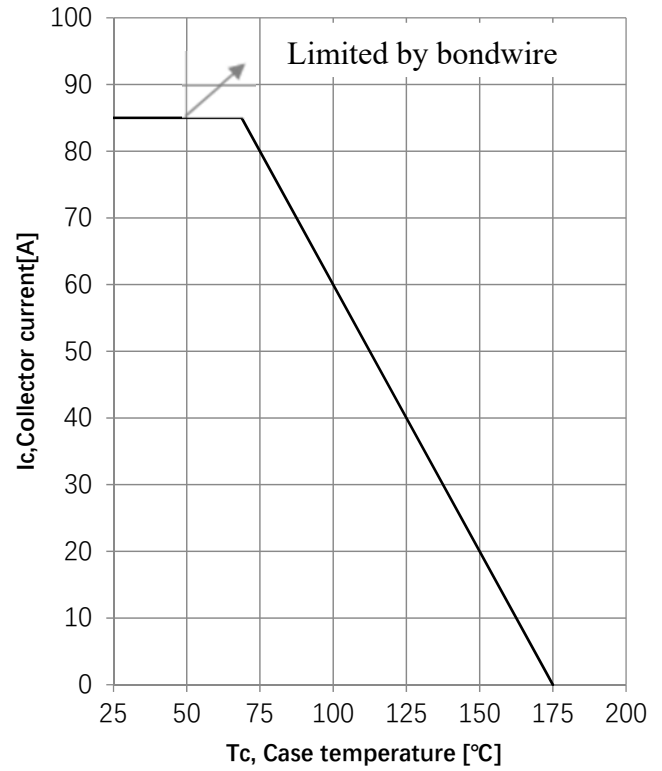


Fig2. Collector current as a function of case temperature ($V_{ge} \geq 15\text{V}, T_j \leq 175^\circ\text{C}$)

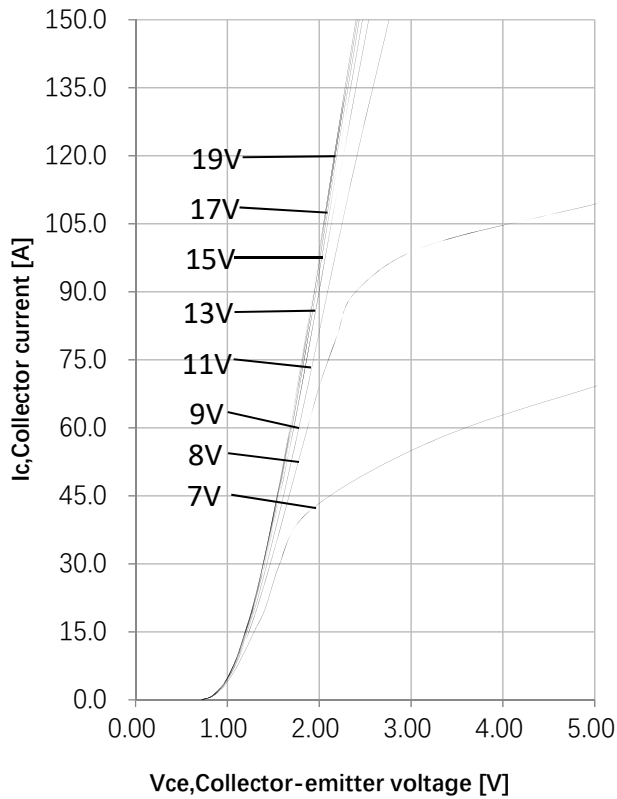


Fig3. Typical output characteristic ($T_j = 25^\circ\text{C}$)

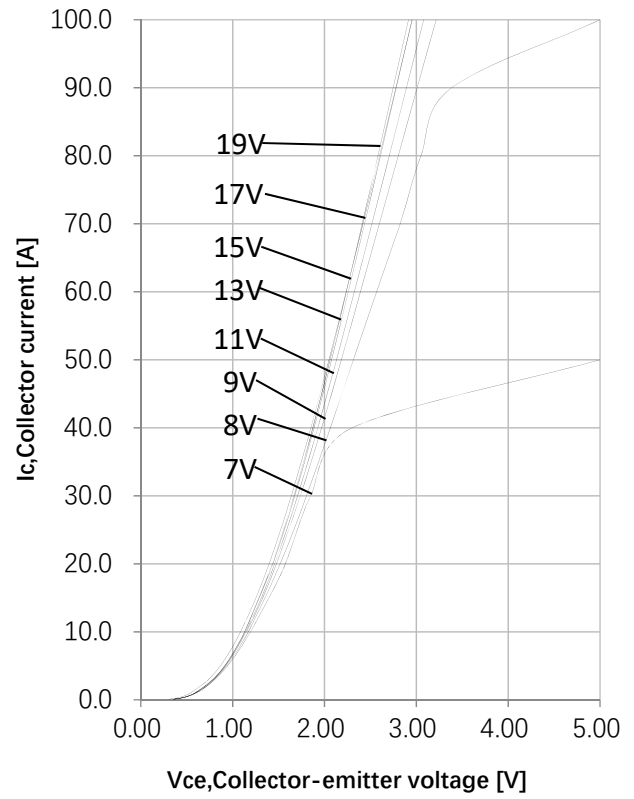
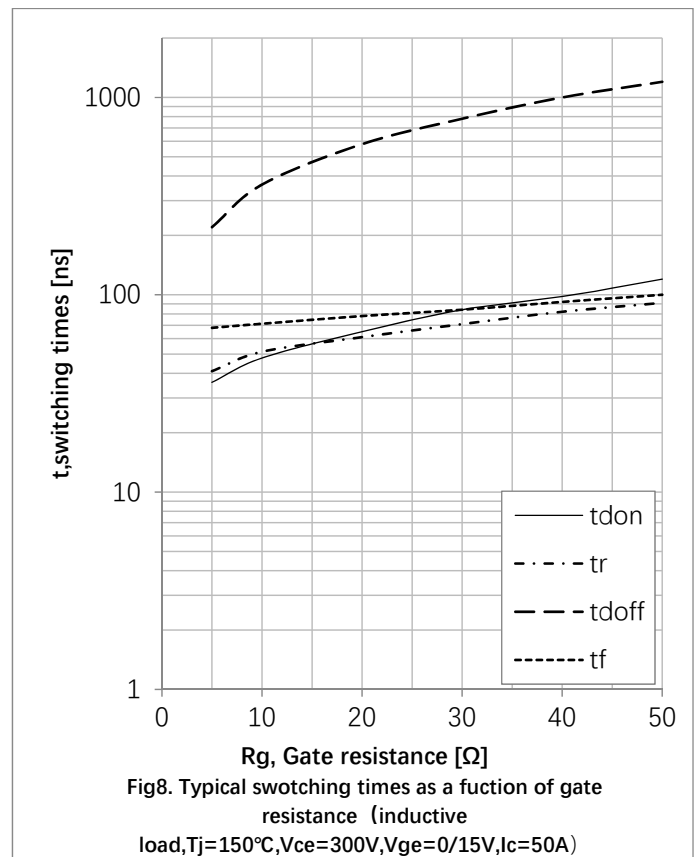
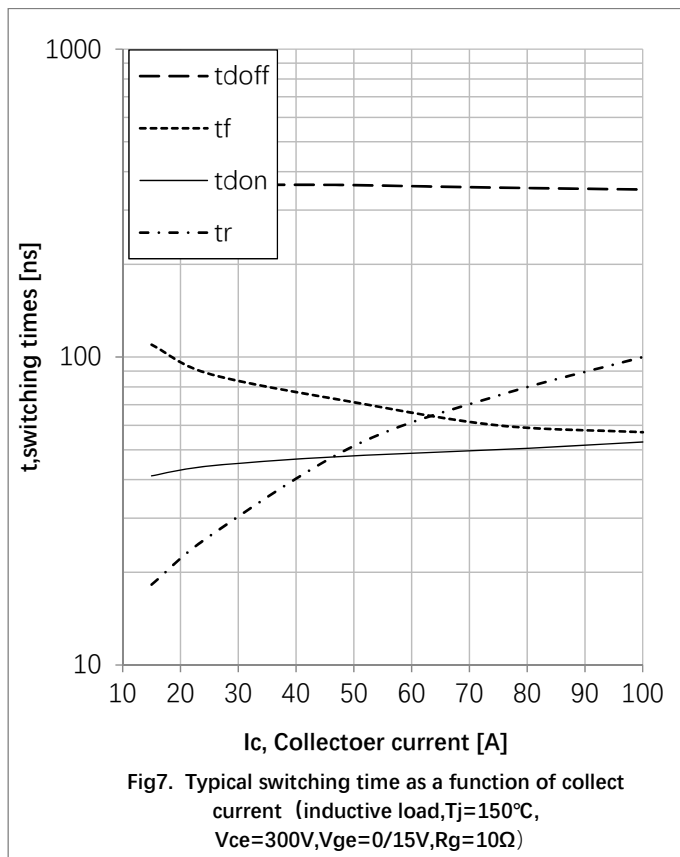
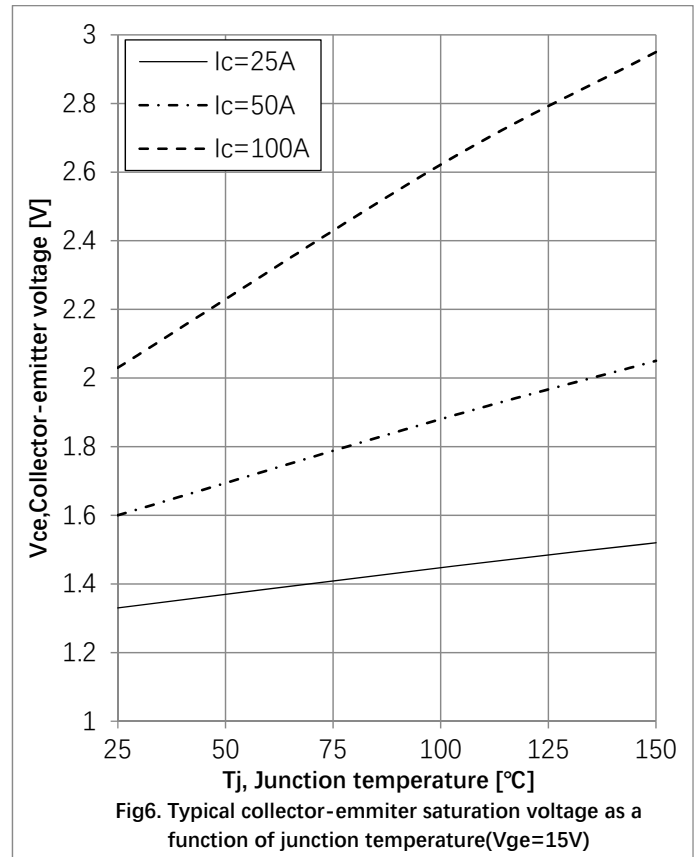
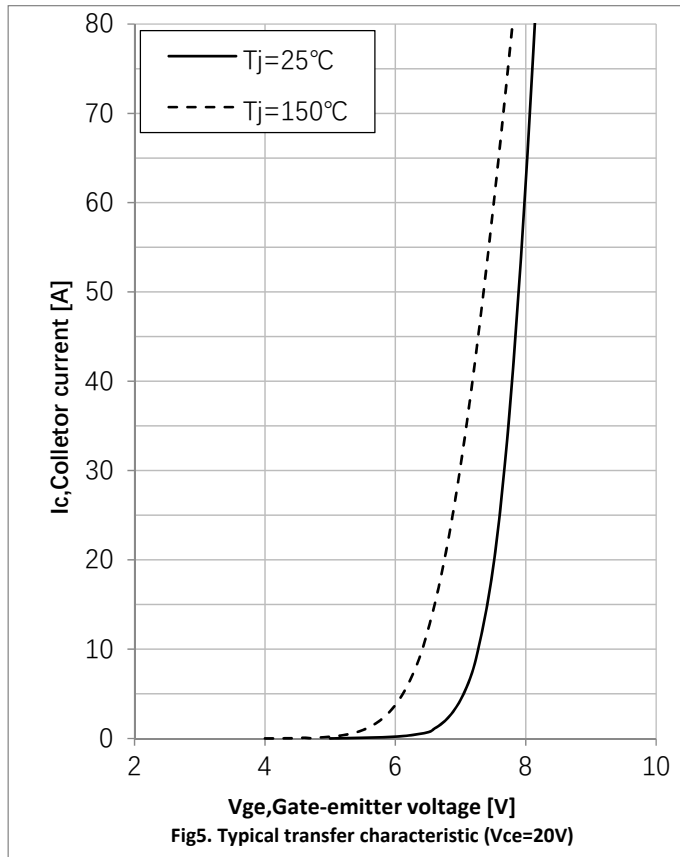
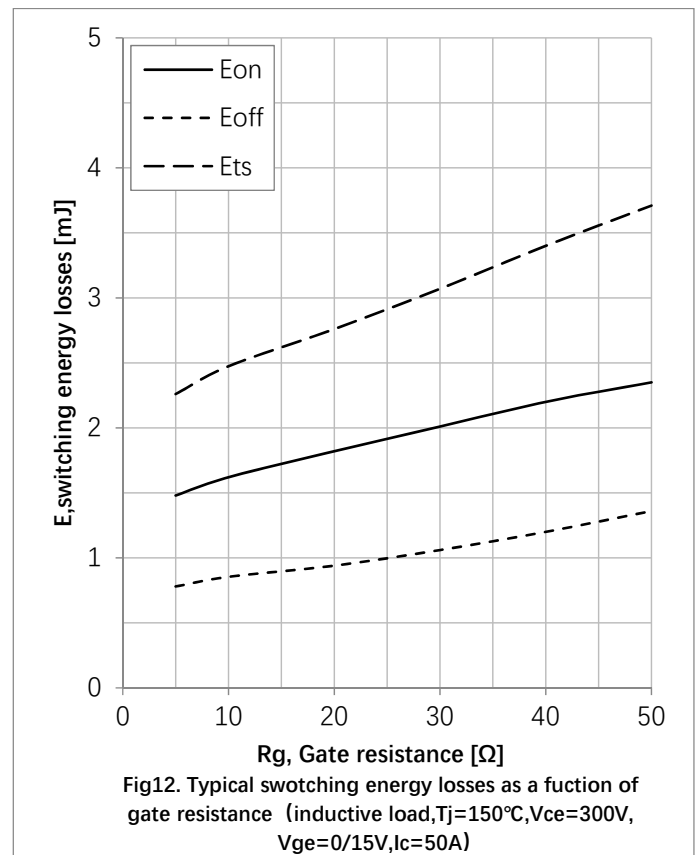
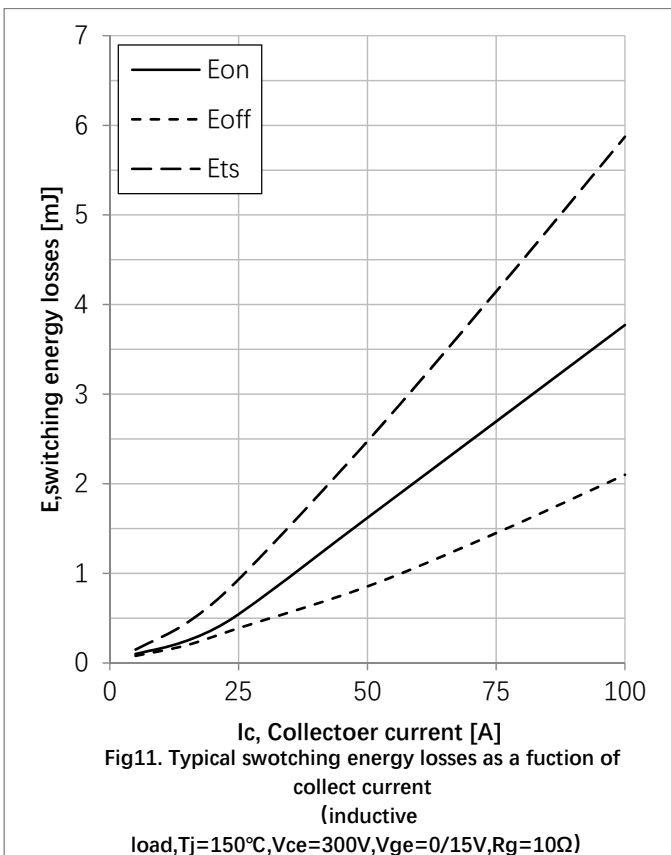
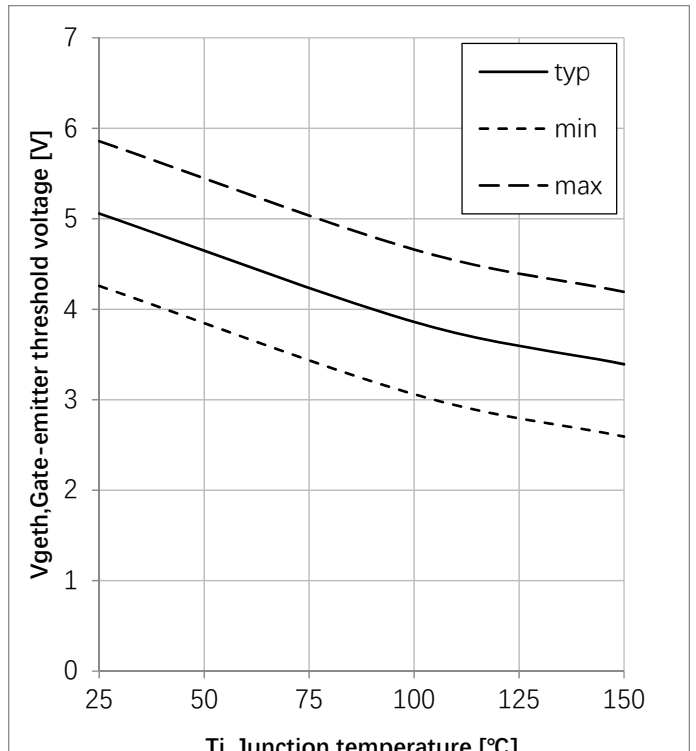
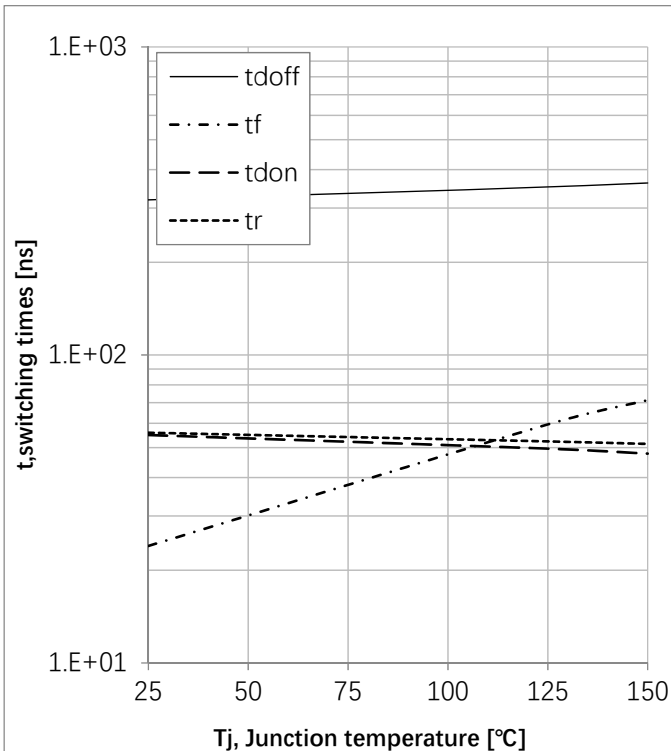


Fig4. Typical output characteristic ($T_j = 150^\circ\text{C}$)





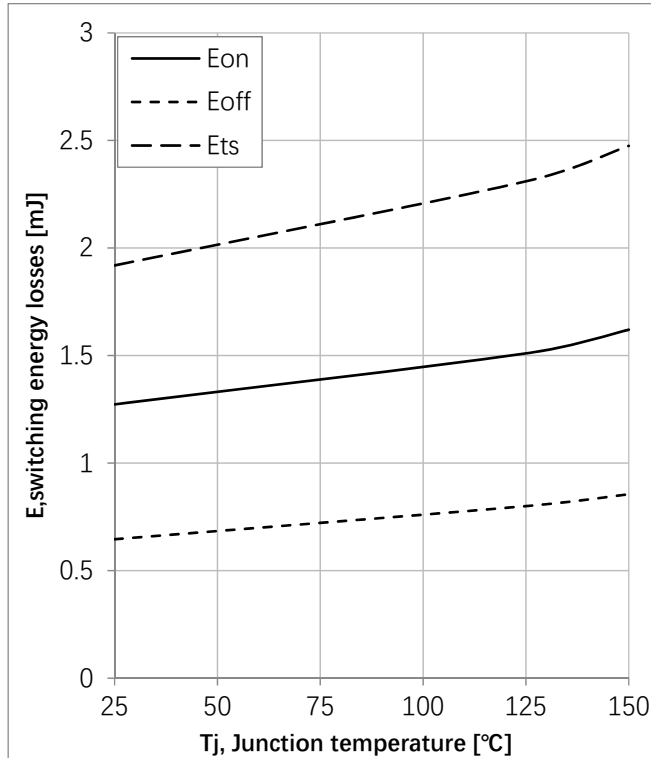


Fig13. Typical switching energy losses as a function of Junction temperature (inductive load, $I_c=50A$, $V_{ce}=300V$, $V_{ge}=0/15V$, $R_g=10\Omega$)

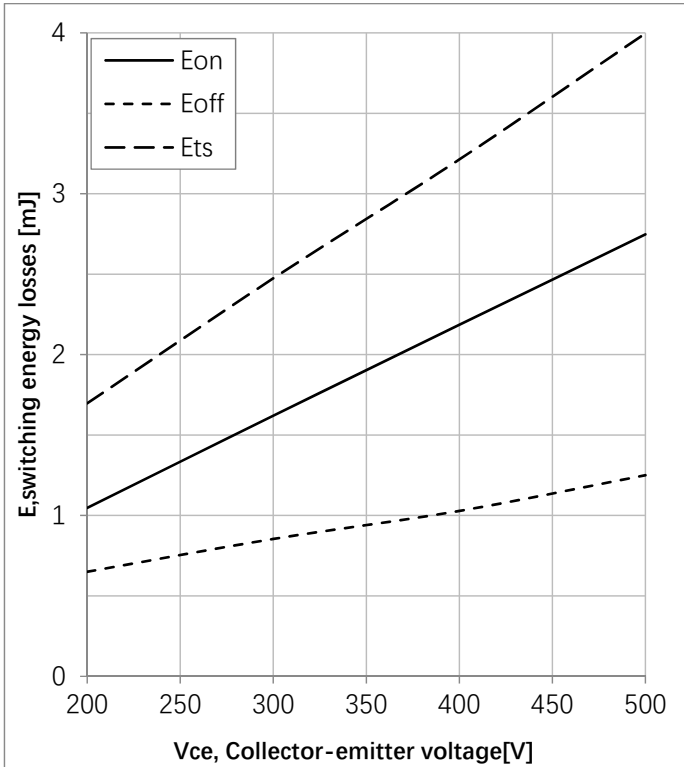


Fig14. Typical switching energy losses as a function of collector-emitter voltage (inductive load, $T_j=150^\circ C$, $I_c=50A$, $V_{ge}=0/15V$, $R_g=10\Omega$)

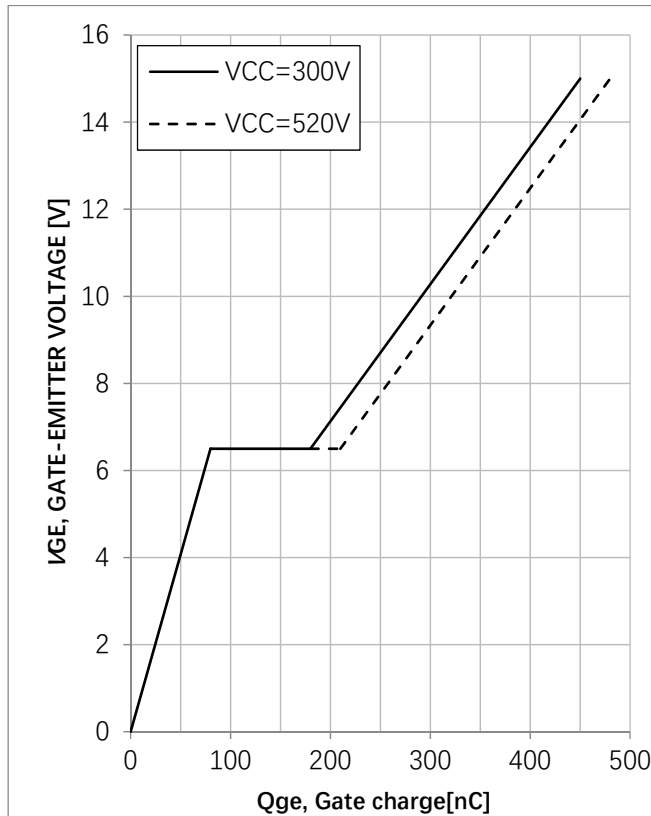


Fig15. Typical gate charge

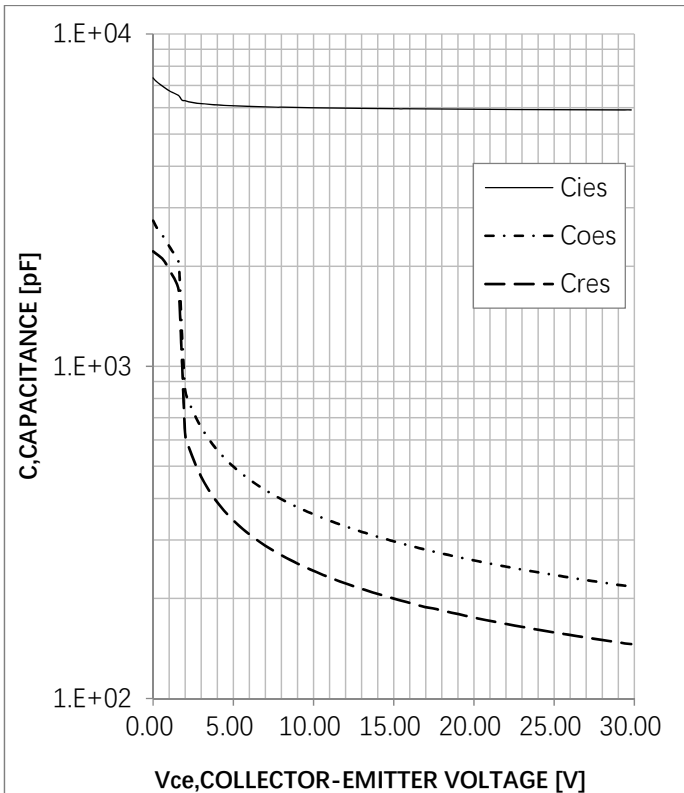
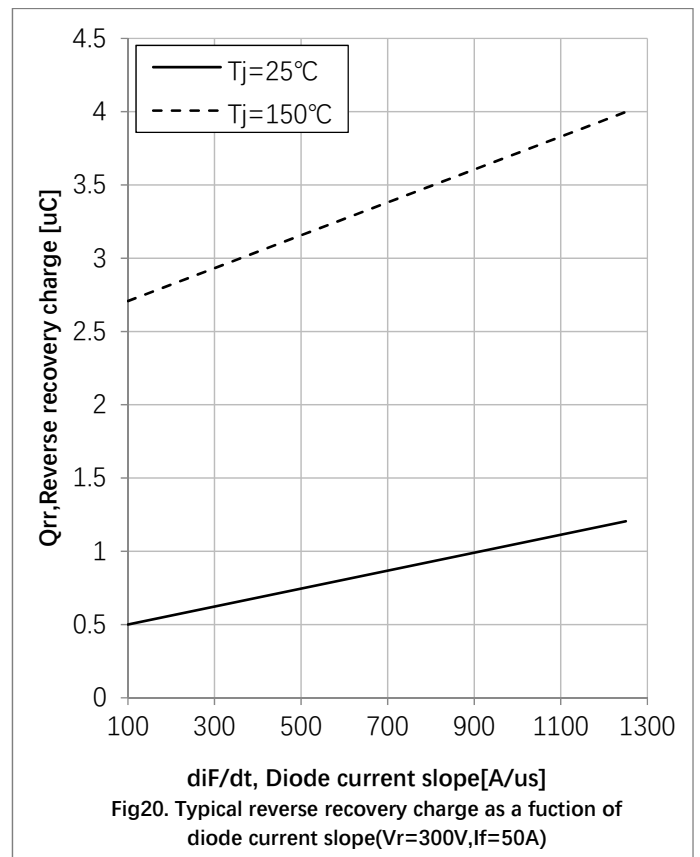
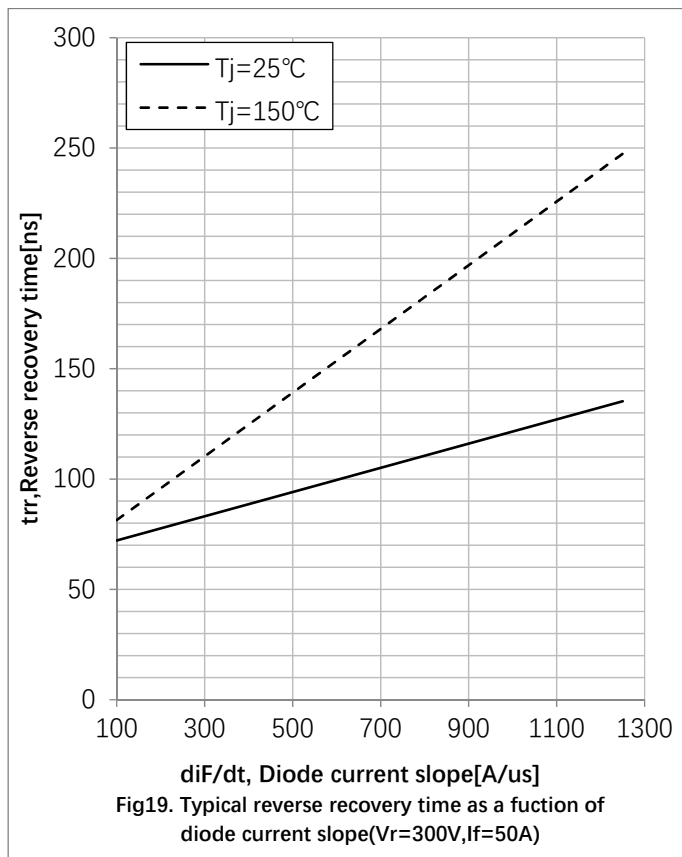
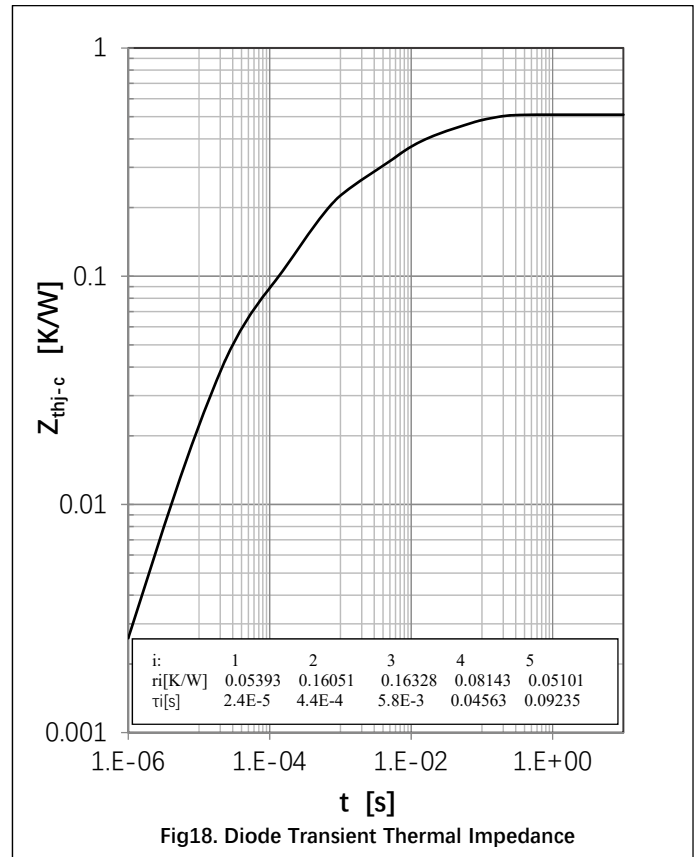
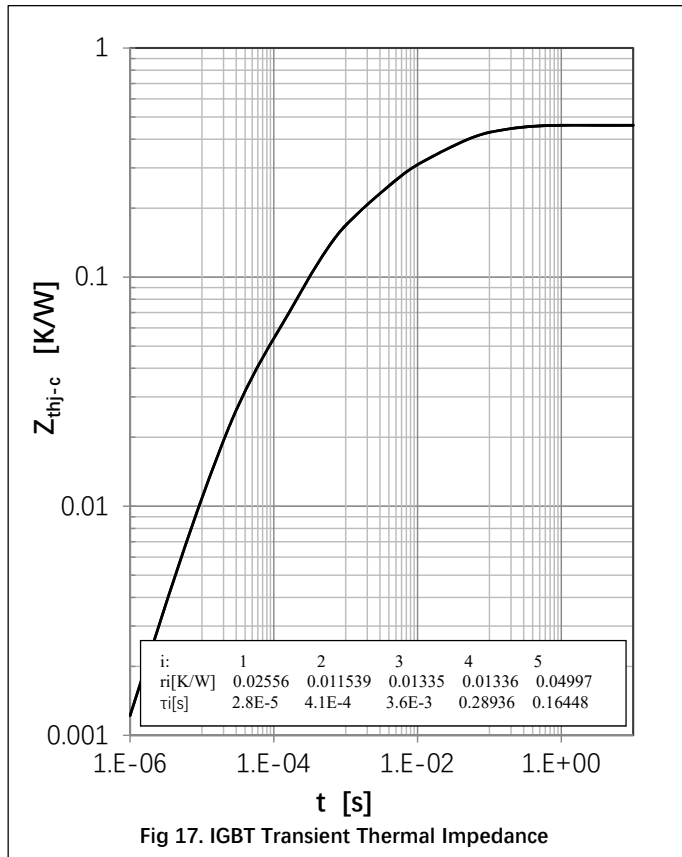


Fig16. Typical capacitance as a function of collector-emitter voltage



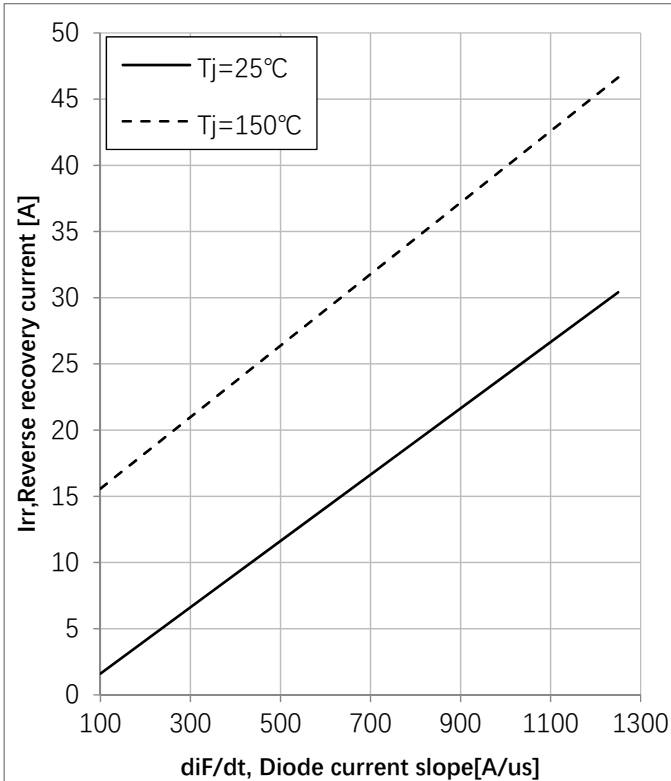


Fig21. Typical reverse recovery current as a function of diode current slope ($V_r=300V, I_f=50A$)

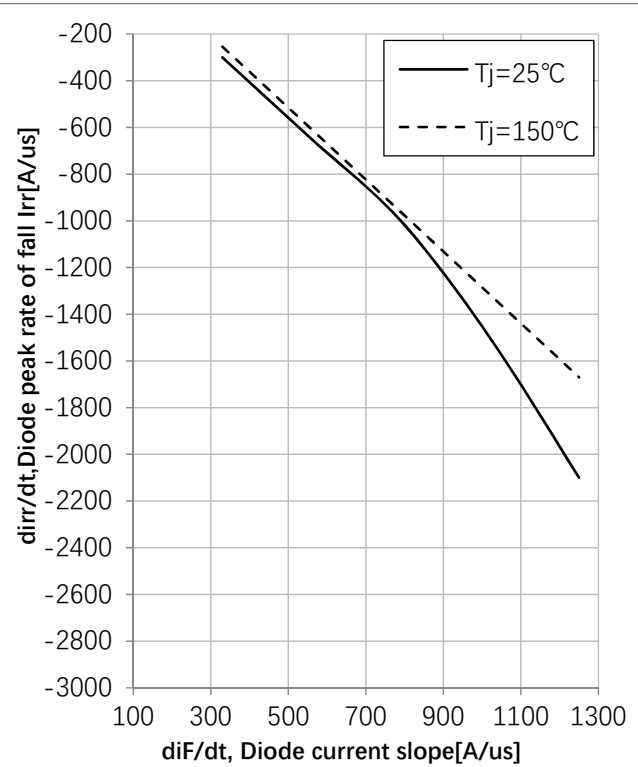


Fig22. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope ($V_r=300V, I_f=50A$)

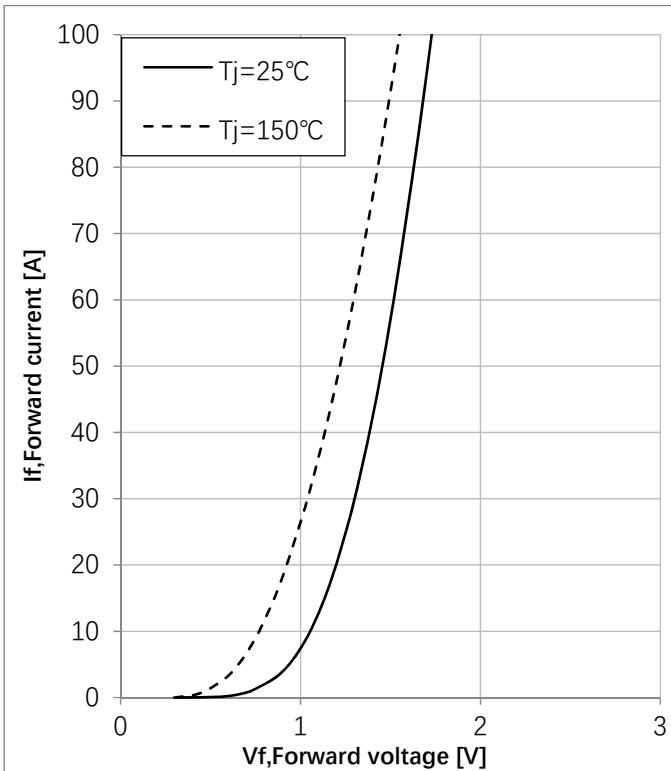


Fig23. Diode forward current as a function of forward voltage

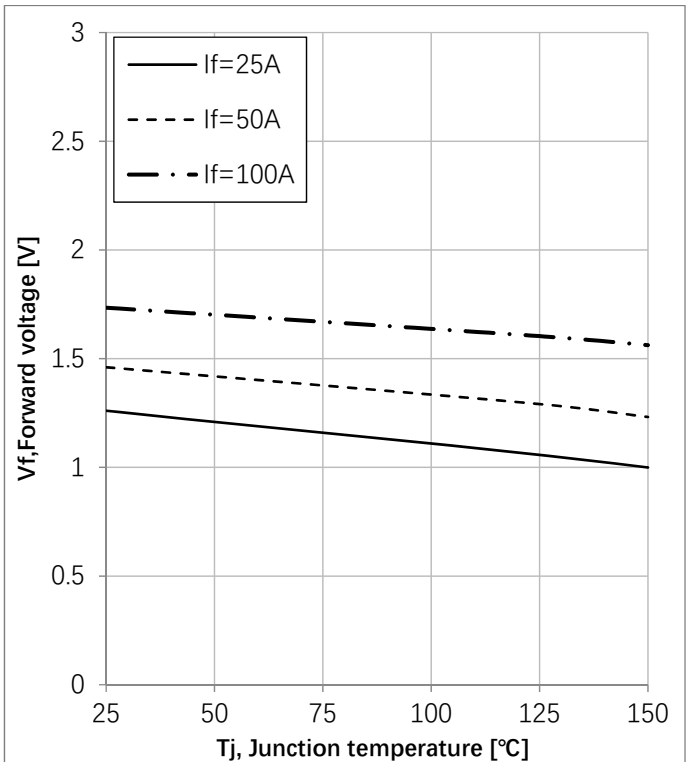
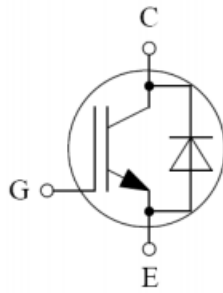


Fig24. Typical diode forward voltage as a function of Junction temperature

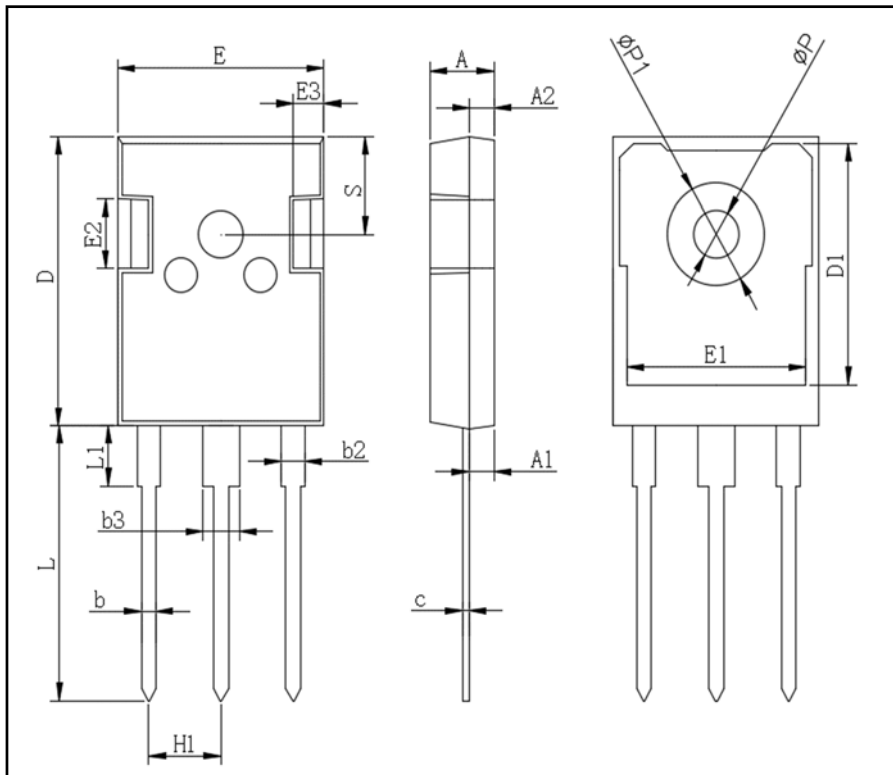


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■Circuit Diagram



■Package Outline Information



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