

## IGBT Discrete

$V_{CE}$	650	V
$I_C$	75	A
$V_{CE(SAT)}$ $I_C=75A$	1.65	V

### Circuit



### 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
- Positive temperature coefficient
- High ruggedness, temperature stable
- Pb-free lead plating; RoHS compliant

### 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 80	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 80	A
Continuous Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Transient Gate-Emitter Voltage ( $t_p \leq 10\mu s, D < 0.010$ )	$V_{GE}$	$\pm 30$	V
Turn off Safe Operating Area $V_{CE} \leq 650V$ , $T_j \leq 150^{\circ}C$		300	A
Pulsed Collector Current, $V_{GE}=15V$ , $t_p$ limited by $T_{jmax}$	$I_{CM}$	300	A
Diode Pulsed Current, $t_p$ limited by $T_{jmax}$	$I_{Fpuls}$	300	A
Power Dissipation, $T_j=175^{\circ}C, T_C=25^{\circ}C$	$P_{tot}$	395	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	$^{\circ}C$



## Electrical Characteristics of the IGBT $T_j=25$ unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	$V_{GE}=0V, I_C=250\mu A$	650		-	V
Gate Threshold Voltage	V <sub>GE(th)</sub>	$V_{GE}=V_{CE}, I_C=0.75mA$	4.25	5.05	5.85	V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	$V_{GE}=15V, I_C=75A$ $T_j=25^\circ C,$ $T_j=125^\circ C,$ $T_j=150^\circ C$	1.45	1.65 2.05 2.15	1.95	V
Zero Gate Voltage Collector Current	I <sub>CES</sub>	$V_{CE}=650V, V_{GE}=0V$ $T_j=25^\circ C,$ $T_j=150^\circ C$			0.25 3.00	mA
Gate-Emitter Leakage Current	I <sub>GES</sub>	$V_{CE}=0V, V_{GE}=\pm 20V$			200	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic</b>						
Input Capacitance	C <sub>ies</sub>	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz$	-	8.15	-	nF
Reverse Transfer Capacitance	C <sub>res</sub>		-	0.24	-	
Gate Charge	Q <sub>G</sub>	$V_{CC}=300V, I_C=75A, V_{GE}=15V$	-	0.58	-	uC



## Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at T<sub>j</sub>= 25</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =75A, V <sub>GE</sub> = 0V~15V, R <sub>g</sub> =10Ω,L <sub>s</sub> =60nH	-	75	-	ns
Rise Time	t <sub>r</sub>		-	91	-	ns
Turn-on Energy	E <sub>on</sub>		-	2.5	-	mJ
Turn-off Delay Time	t <sub>d(off)</sub>		-	468	-	ns
Fall Time	t <sub>f</sub>		-	41	-	ns
Turn-off Energy	E <sub>off</sub>		-	1.3	-	mJ
Total switching energy	E <sub>ts</sub>				3.8	
<b>Dynamic , at T<sub>j</sub>= 125</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =75A, V <sub>GE</sub> = 0V~15V, R <sub>g</sub> =10Ω,L <sub>s</sub> =60nH	-	70	-	ns
Rise Time	t <sub>r</sub>		-	79	-	ns
Turn-on Energy	E <sub>on</sub>		-	3.5	-	mJ
Turn-off Delay Time	t <sub>d(off)</sub>		-	508	-	ns
Fall Time	t <sub>f</sub>		-	48	-	ns
Turn-off Energy	E <sub>off</sub>		-	1.6	-	mJ
Total switching energy	E <sub>ts</sub>				5.1	
<b>Dynamic , at T<sub>j</sub>= 150</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =75A, V <sub>GE</sub> = 0V~15V, R <sub>g</sub> =10Ω,L <sub>s</sub> =60nH	-	68	-	ns
Rise Time	t <sub>r</sub>		-	76	-	ns
Turn-on Energy	E <sub>on</sub>		-	3.7	-	mJ
Turn-off Delay Time	t <sub>d(off)</sub>		-	519	-	ns
Fall Time	t <sub>f</sub>		-	52	-	ns
Turn-off Energy	E <sub>off</sub>		-	1.7	-	mJ
Total switching energy	E <sub>ts</sub>				5.4	

## Electrical Characteristics of the Diode T<sub>j</sub>= 25 unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Diode Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 75A T <sub>j</sub> = 25°C, T <sub>j</sub> = 125°C T <sub>j</sub> = 150°C	1.30	1.61 1.45 1.41	1.90	V

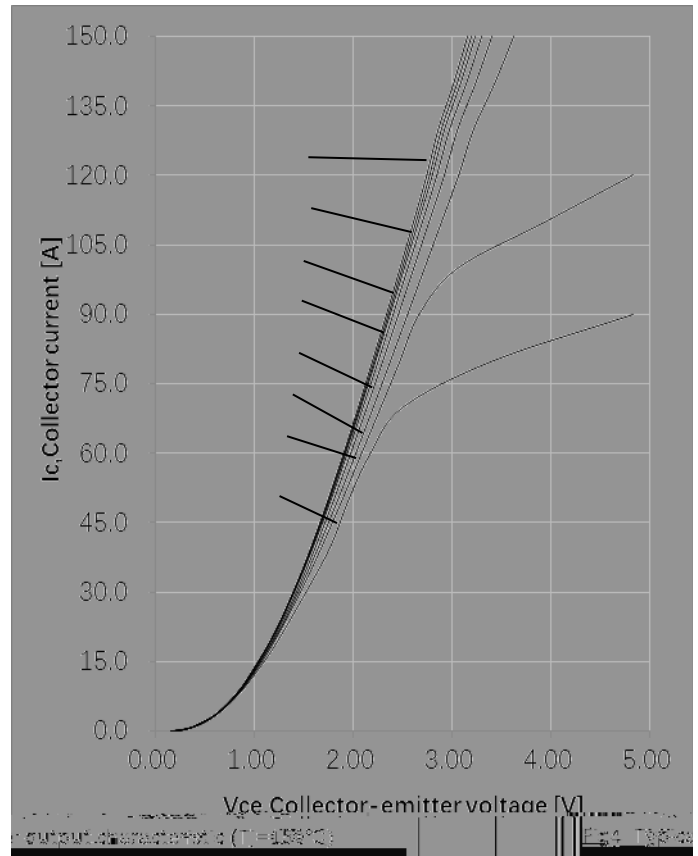
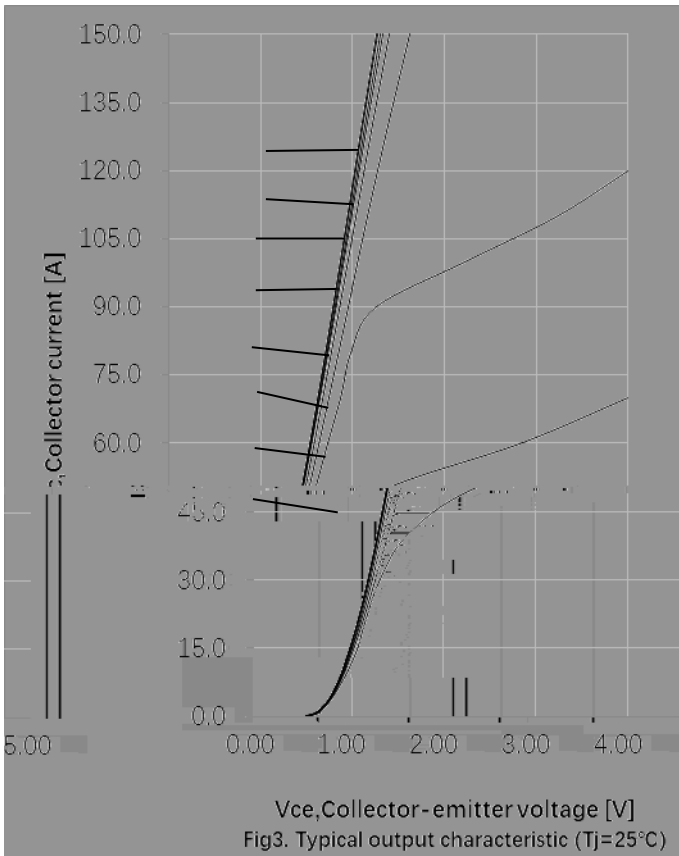
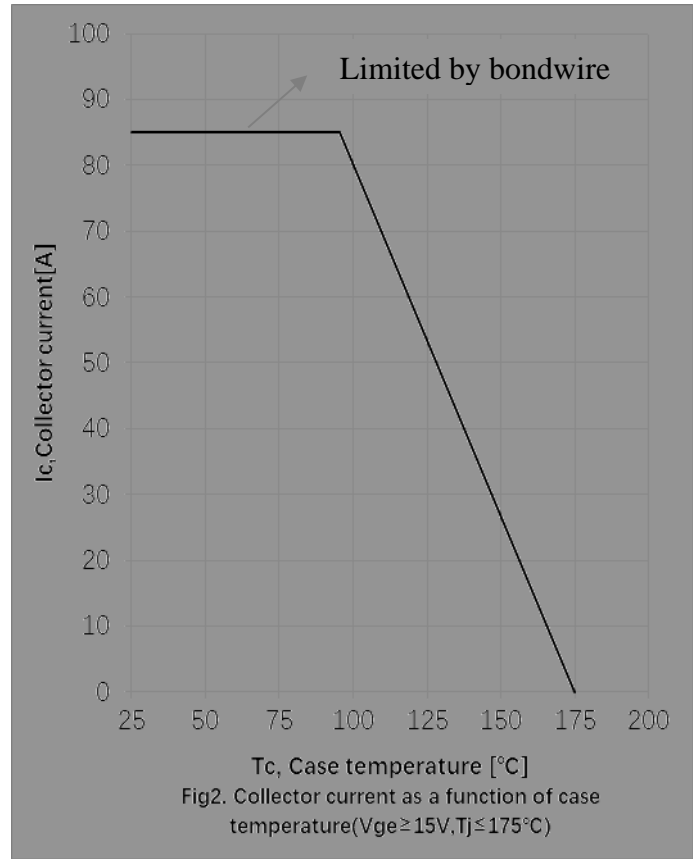
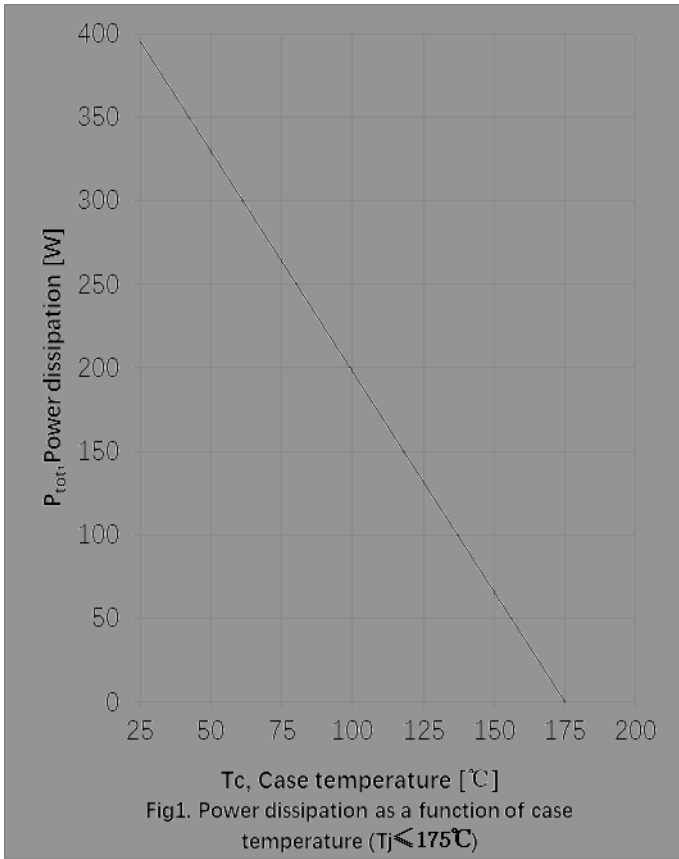


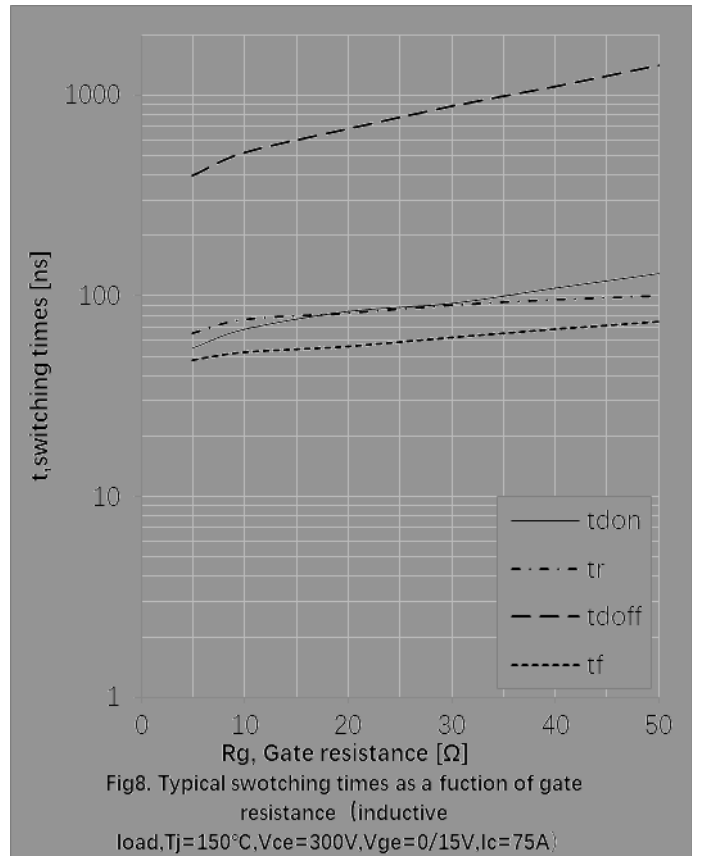
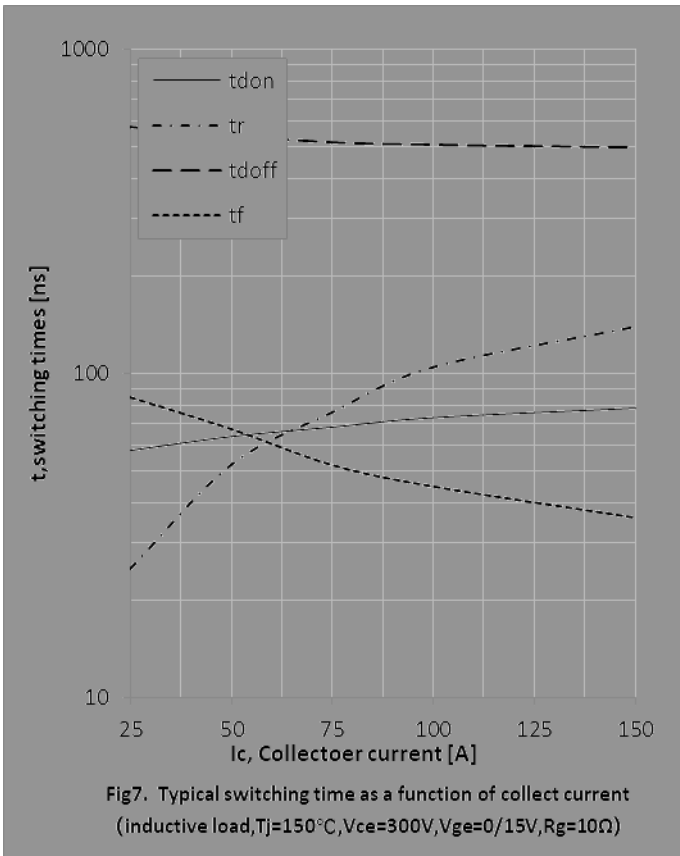
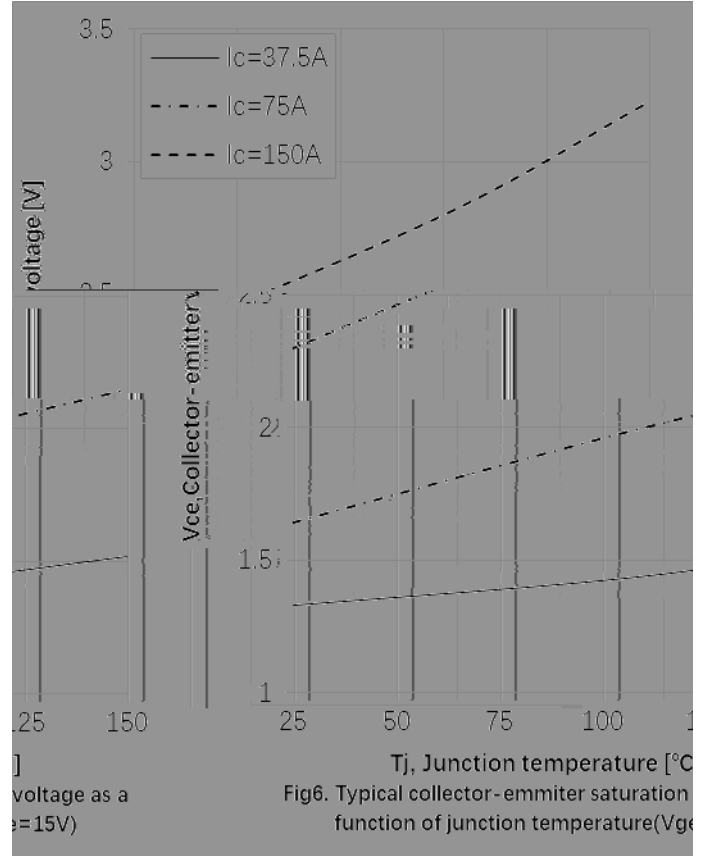
## Electrical Characteristics of the Diode

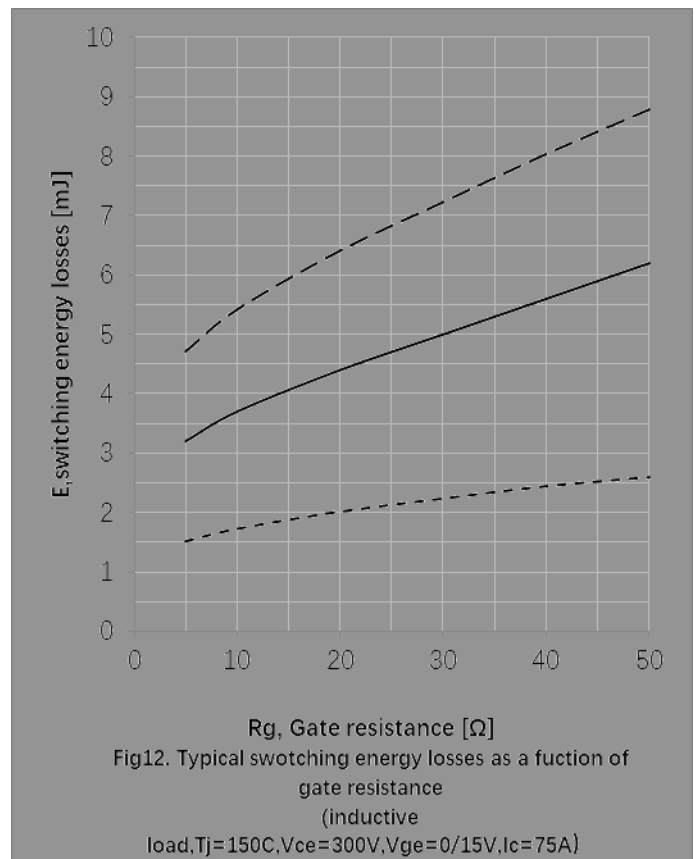
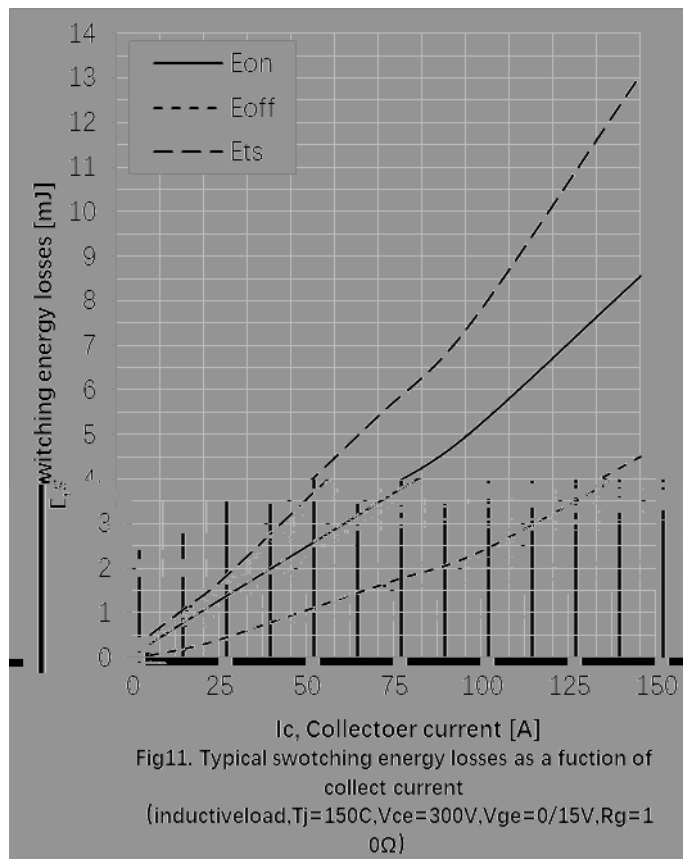
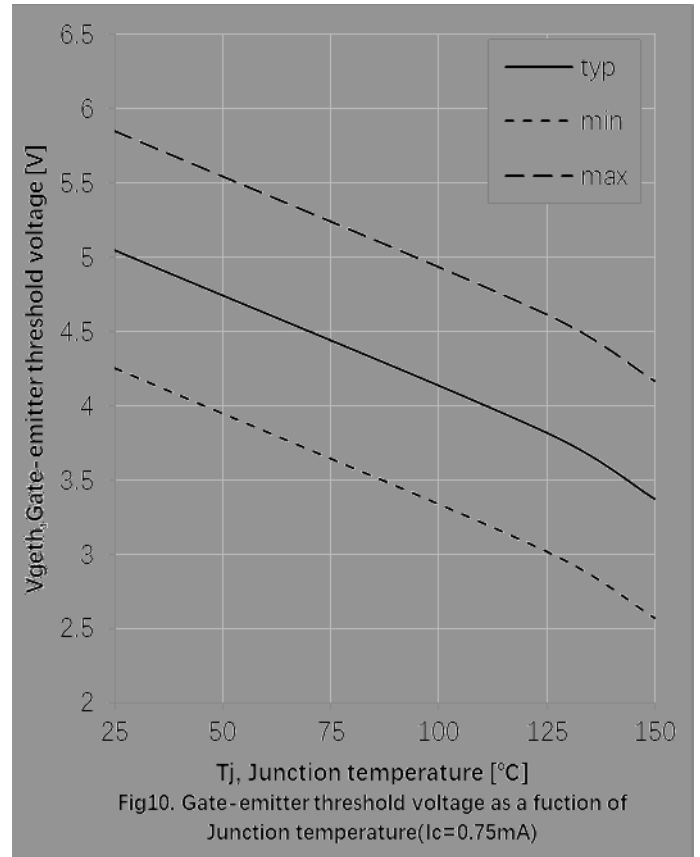
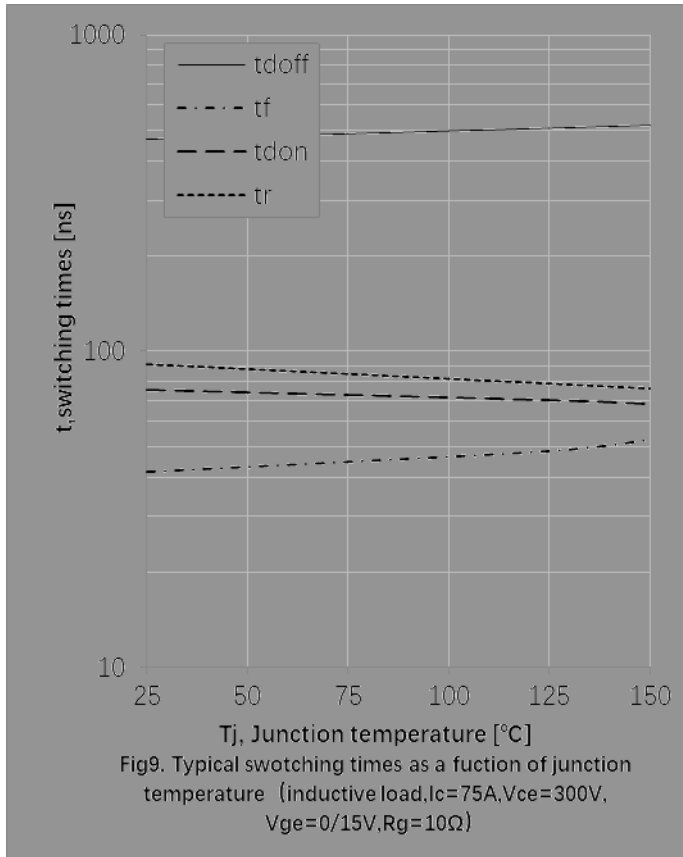
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at T<sub>j</sub>= 25</b>						
Reverse Recovery Current	I <sub>rr</sub>	I <sub>F</sub> =75A, V <sub>R</sub> =300V -di/dt=550A/μs,	-	13	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.73	-	uC
Diode reverse recovery time	t <sub>rr</sub>		-	100	-	ns
Reverse Recovery Energy	E <sub>rec</sub>		-	0.12	-	mJ
<b>Dynamic , at T<sub>j</sub>= 125</b>						
Reverse Recovery Current	I <sub>rr</sub>	I <sub>F</sub> =75A, V <sub>R</sub> =300V -di/dt=550A/μs,	-	32	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	3.4	-	uC
Diode reverse recovery time	t <sub>rr</sub>		-	140	-	ns
Reverse Recovery Energy	E <sub>rec</sub>		-	0.4	-	mJ
<b>Dynamic , at T<sub>j</sub>= 150</b>						
Reverse Recovery Current	I <sub>rr</sub>	I <sub>F</sub> =75A, V <sub>R</sub> =300V -di/dt=550A/μs,	-	38	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	3.58	-	uC
Diode reverse recovery time	t <sub>rr</sub>		-	160	-	ns
Reverse Recovery Energy	E <sub>rec</sub>		-	0.49	-	mJ

## Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R <sub>th(j-c)</sub>	0.38	K/W
Diode Thermal Resistance, Junction - Case	R <sub>th(j-c)</sub>	0.45	K/W
Thermal Resistance, Junction - Ambient	R <sub>th(j-a)</sub>	40	K/W







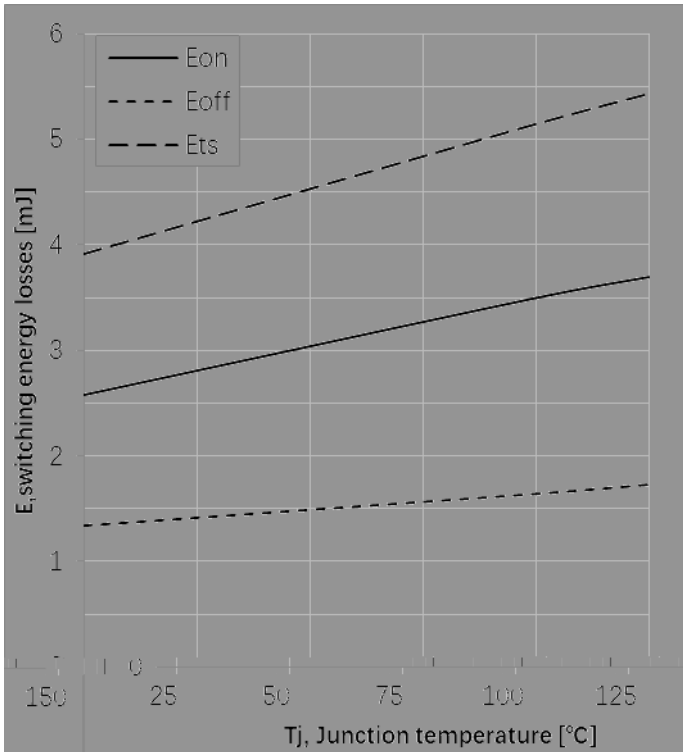


Fig13. Typical switching energy losses as a function of junction temperature

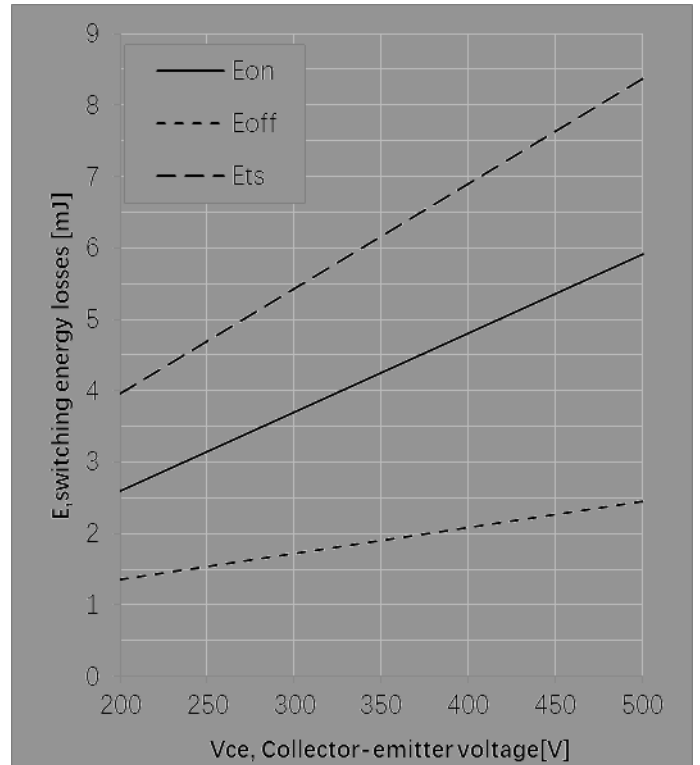


Fig14. Typical switching energy losses as a function of collector-emitter voltage (inductive load, T<sub>j</sub>=150°C, I<sub>c</sub>=75A, V<sub>ge</sub>=0/15V, R<sub>g</sub>=10Ω)

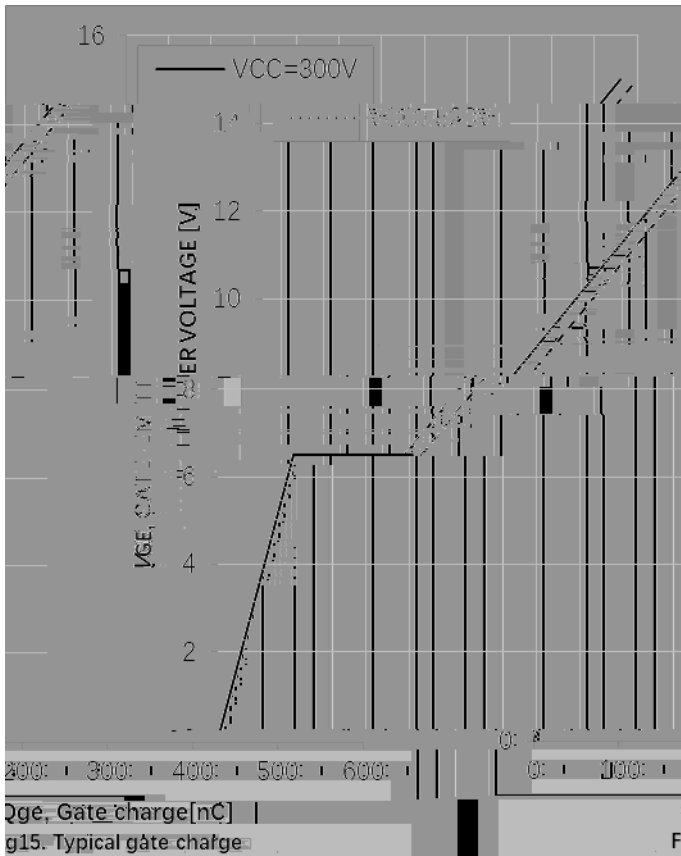


Fig15. Typical gate charge

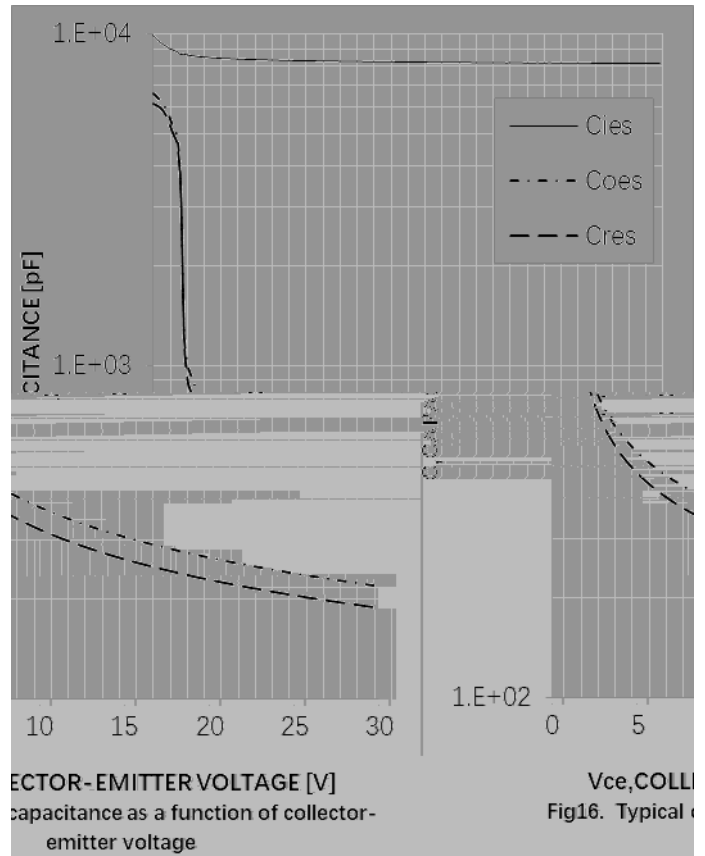


Fig16. Typical capacitance as a function of collector-emitter voltage



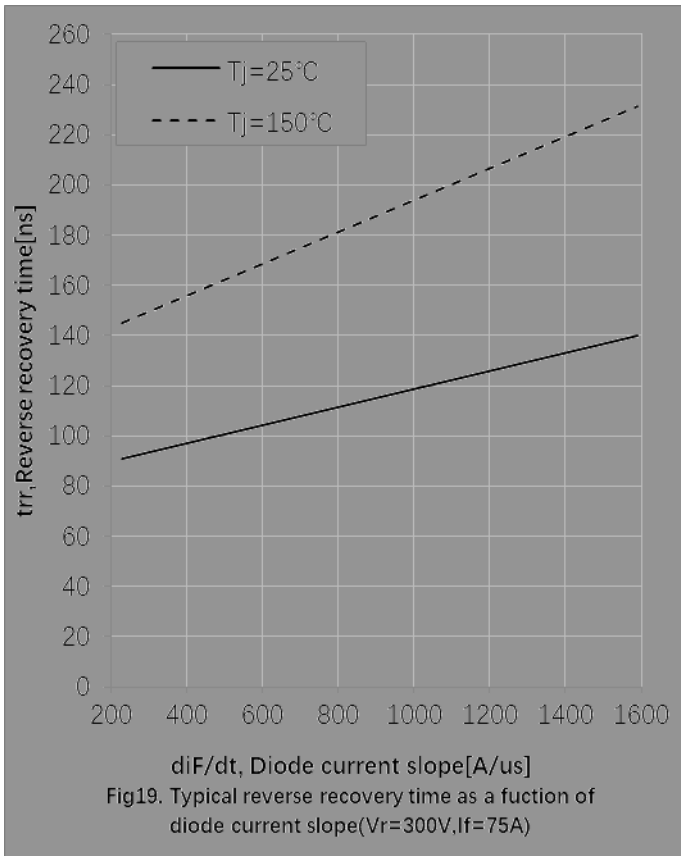
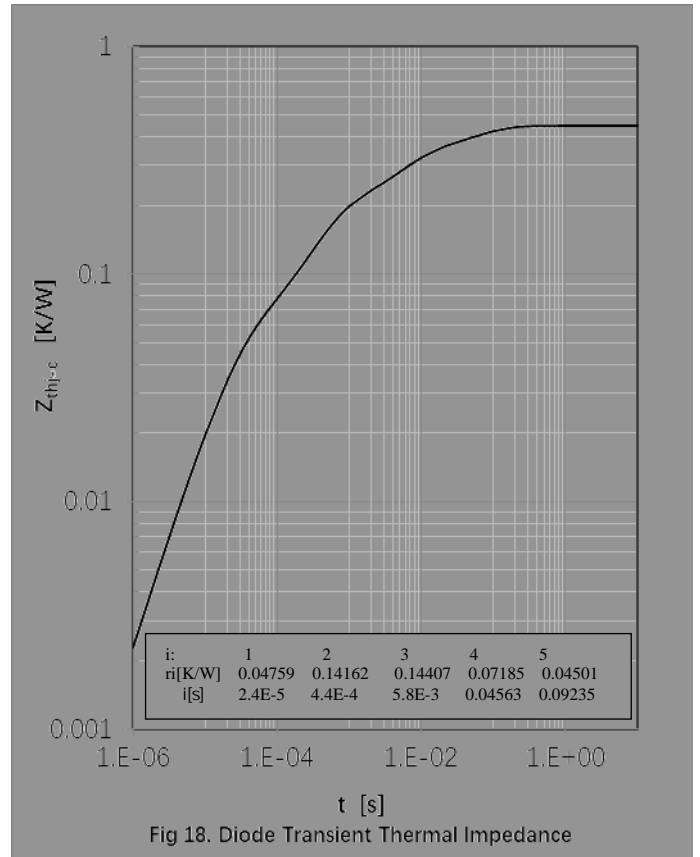
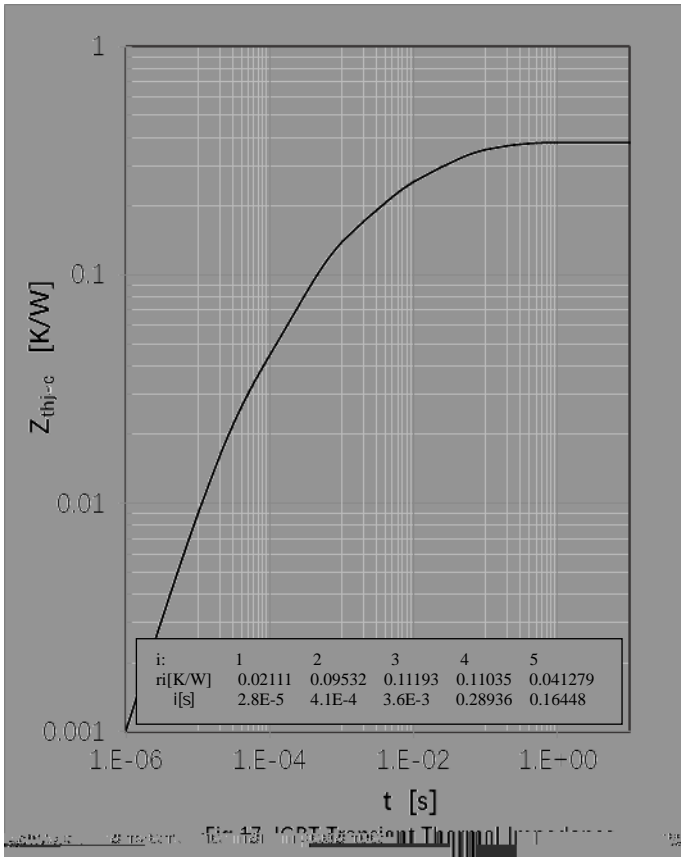


Fig19. Typical reverse recovery time as a function of diode current slope ( $V_r=300V, I_f=75A$ )

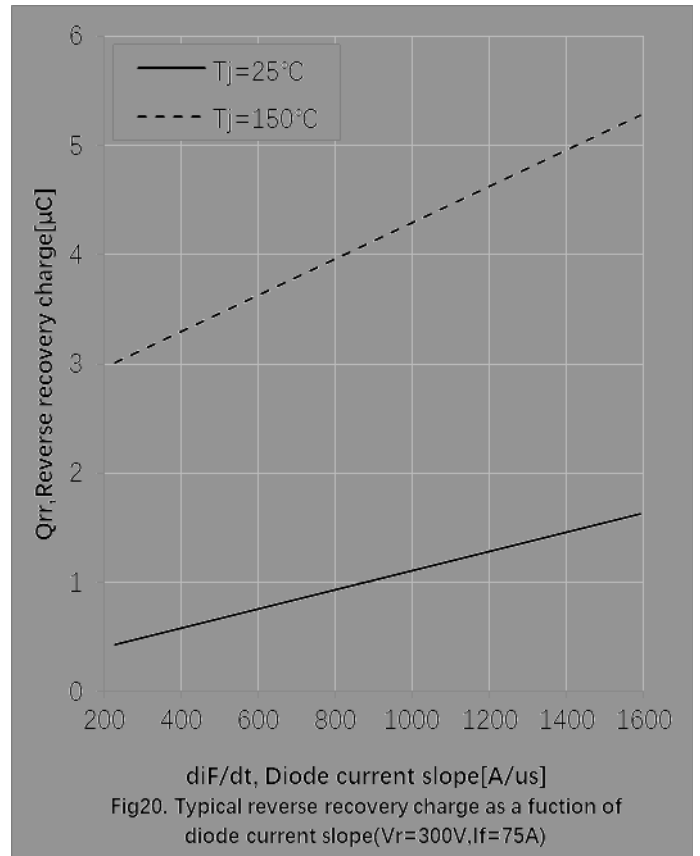
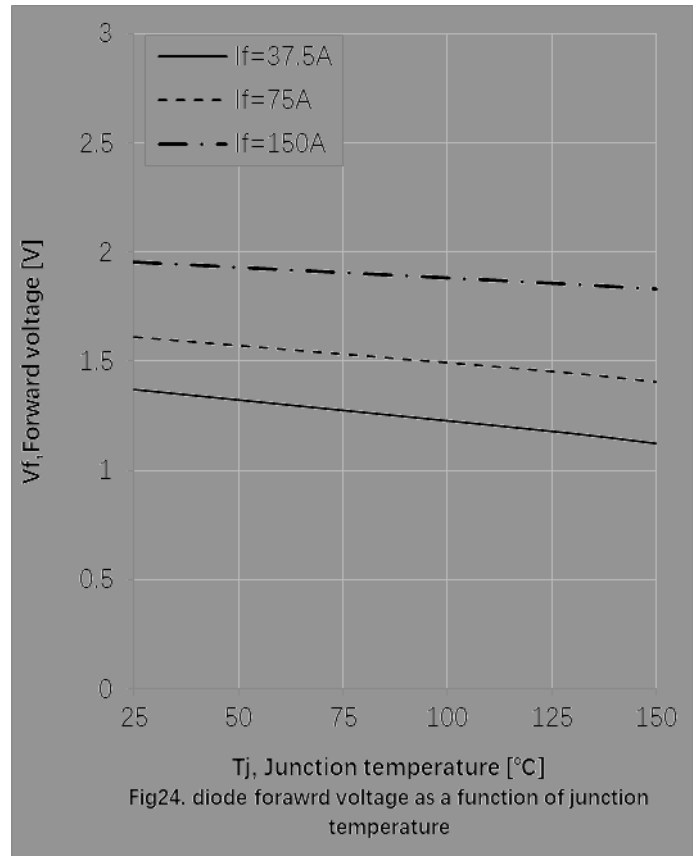
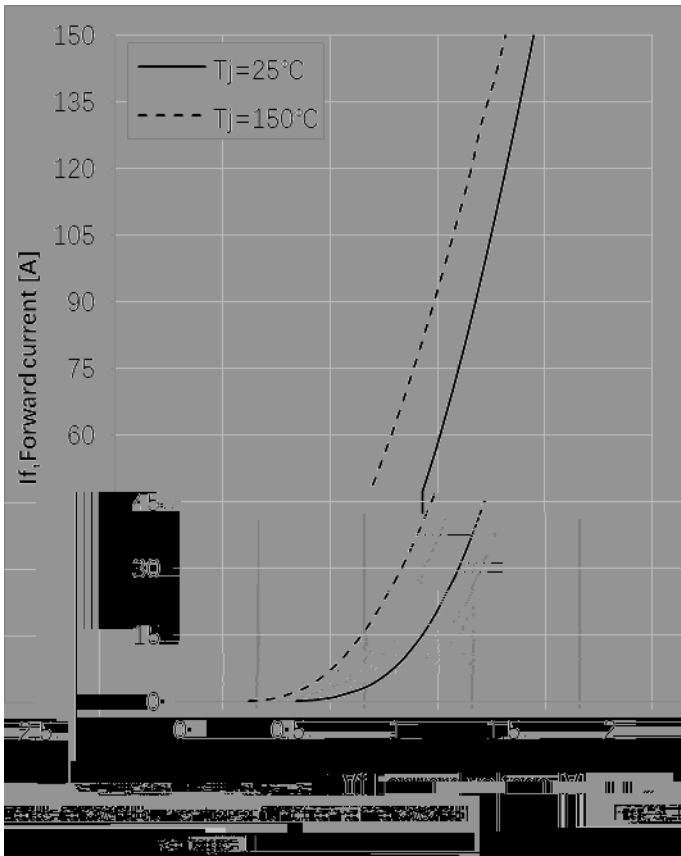
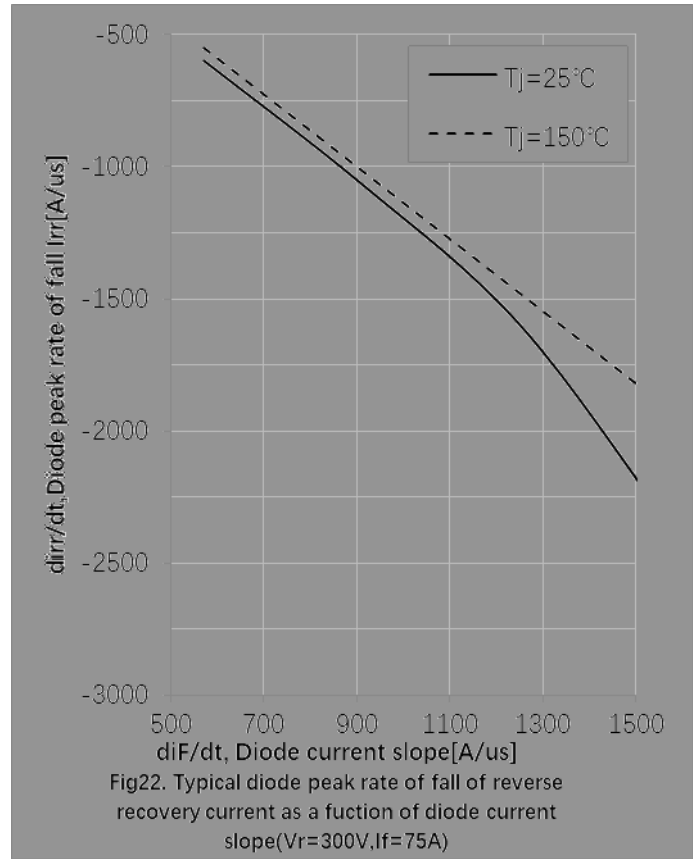
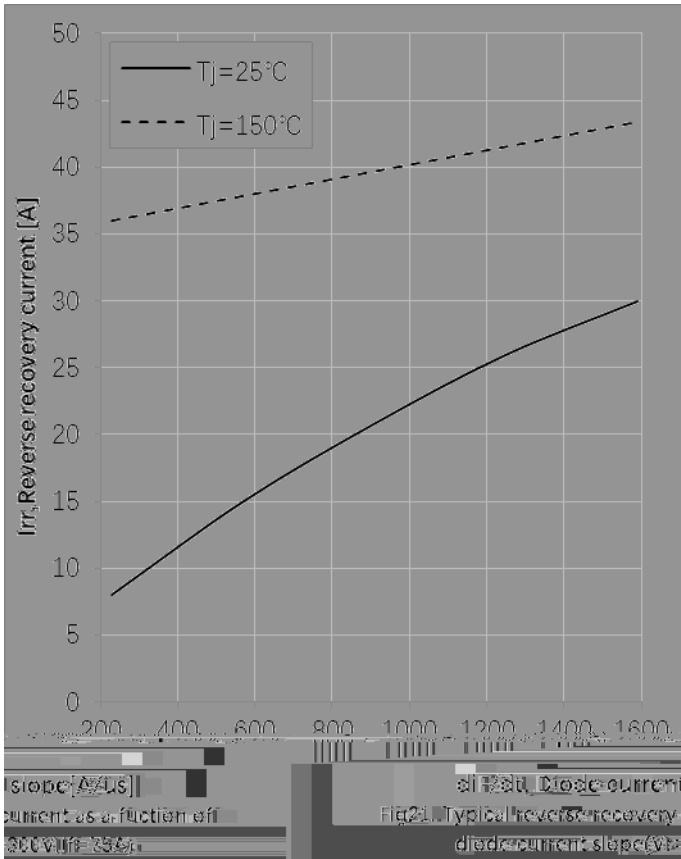
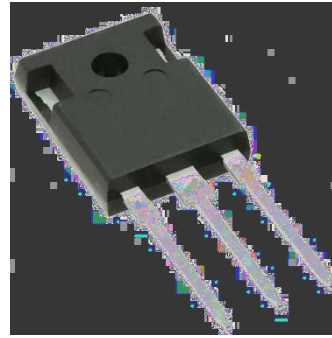
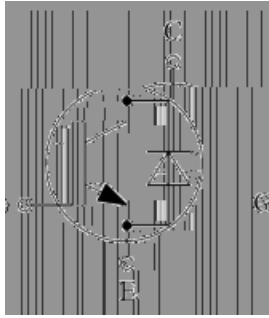


Fig20. Typical reverse recovery charge as a function of diode current slope ( $V_r=300V, I_f=75A$ )

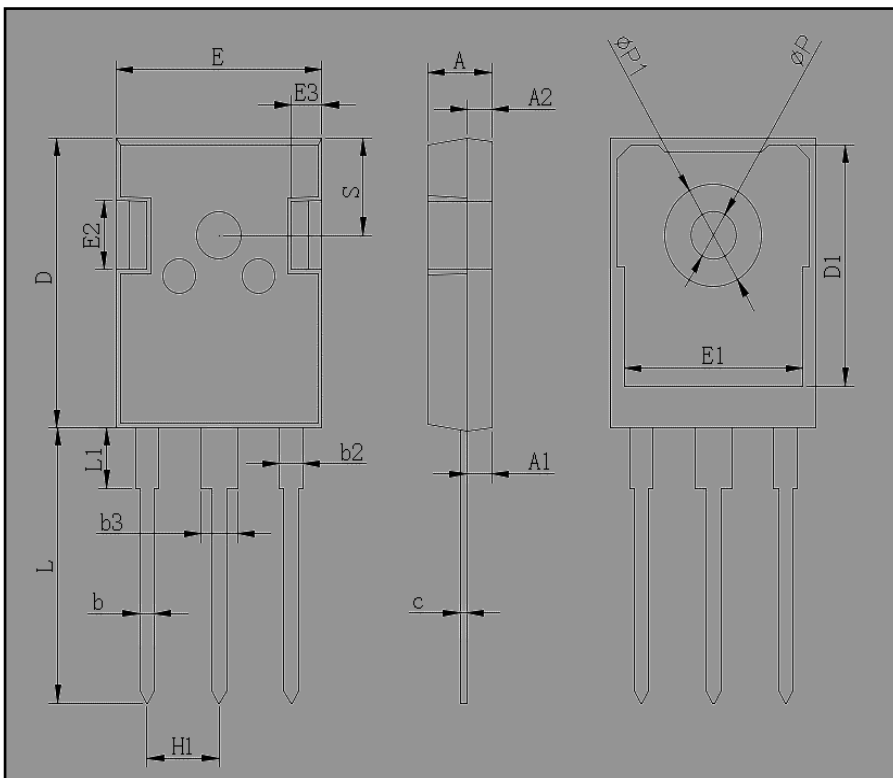




## Circuit Diagram



## 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