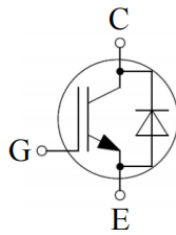


IGBT Discrete

V_{CE}	650	V
I_C	40	A
$V_{CE(SAT)} I_C=40A$	1.60	V

Circuit



Applications

- AC and DC servo drive amplifier
- Uninterruptible power supply
- Motion/servo control

Features

- Low switching losses
- Maximum junction temperature 175°C
- 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} $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	I_C	80 40	A
Diode Forward Current, limited by T_{jmax} $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	I_F	80 40	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 $V_{CE} \leq 650V$, $T_j \leq 150^{\circ}C$		120	A
Pulsed Collector Current, $V_{GE}=15V$, t_p limited by T_{jmax}	I_{CM}	120	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	120	A
Short Circuit Withstand Time, $V_{GE}=15V, V_{CC}=400V, V_{CEM} \leq 650V$	T_{sc}	5	μs
Power Dissipation, $T_j=175^{\circ}C, T_C=25^{\circ}C$	P_{tot}	187	W



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

Electrical Characteristics of the IGBT ($T_j = 25^\circ\text{C}$ unless otherwise specified):

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Collector-Emitter Breakdown Voltage	BV_{CES}	$V_{GE}=0V, I_C=250\mu A$	650		-	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1mA$	4.1	5.1	6.1	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$ $T_j=25^\circ\text{C}$ $T_j=125^\circ\text{C}$ $T_j=150^\circ\text{C}$		1.60 1.85 2.00	1.90	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$ $T_j=25^\circ\text{C},$ $T_j=150^\circ\text{C}$			0.25 4.00	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}= \pm 20V$			100	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz$	-	2.03	-	nF
Reverse Transfer Capacitance	C_{res}		-	0.02	-	
Gate Charge	Q_G	$V_{CC}=400V, I_C=40A,$ $V_{GE}=15V$	-	0.14	-	uC
Short Circuit Collector Current	I_{SC}	$V_{GE}=15V, t_{sc} \leq 5\mu s,$ $V_{CC}=400V, T_j \leq 150^\circ\text{C}$	-	185	-	A

**Electrical Characteristics of the Diode** ($T_j = 25^\circ\text{C}$ unless otherwise specified):

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Diode Forward Voltage	V_F	$I_F = 40\text{A}$ $T_j = 25^\circ\text{C}$, $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$		1.60 1.50 1.40	2.10	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} = -5V~15V, R _g =20Ω	-	55	-	ns
Rise Time	t _r		-	72	-	ns
Turn-on Energy	E _{on}		-	1.34	-	mJ
Turn-off Delay Time	t _{d(off)}		-	129	-	ns
Fall Time	t _f		-	116	-	ns
Turn-off Energy	E _{off}		-	0.91	-	mJ
Dynamic , at T _j = 125℃						
Turn-on Delay Time	t _{d(on)}	V _{CC} =400V, I _C =40A, V _{GE} = -5V~15V, R _g =20Ω	-	52	-	ns
Rise Time	t _r		-	74	-	ns
Turn-on Energy	E _{on}		-	1.47	-	mJ
Turn-off Delay Time	t _{d(off)}		-	140	-	ns
Fall Time	t _f		-	159	-	ns
Turn-off Energy	E _{off}		-	1.14	-	mJ
Dynamic , at T _j = 150℃						
Turn-on Delay Time	t _{d(on)}	V _{CC} =400V, I _C =40A, V _{GE} = -5V~15V, R _g =20Ω	-	50	-	ns
Rise Time	t _r		-	75	-	ns
Turn-on Energy	E _{on}		-	1.53	-	mJ
Turn-off Delay Time	t _{d(off)}		-	144	-	ns
Fall Time	t _f		-	178	-	ns
Turn-off Energy	E _{off}		-	1.24	-	mJ

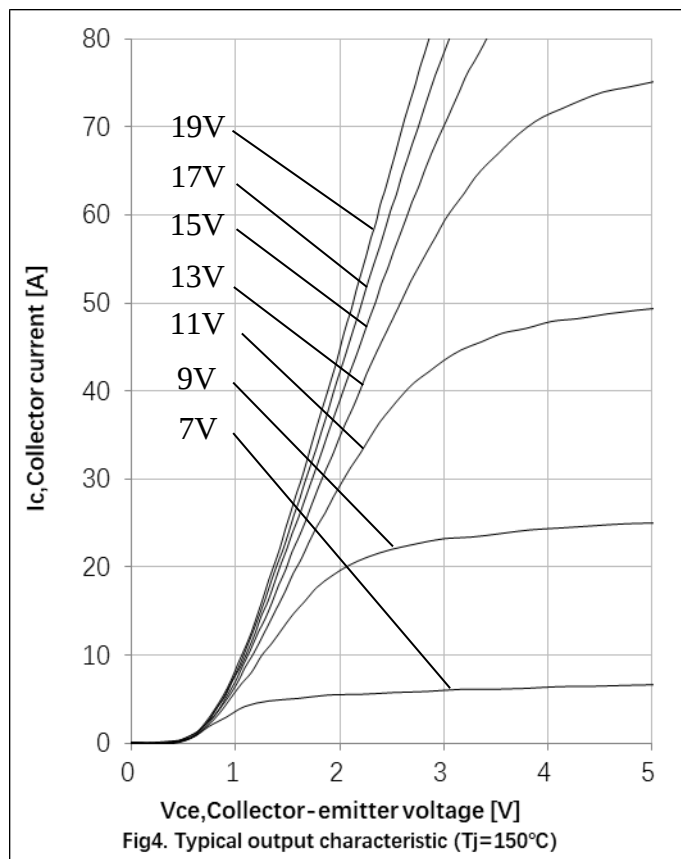
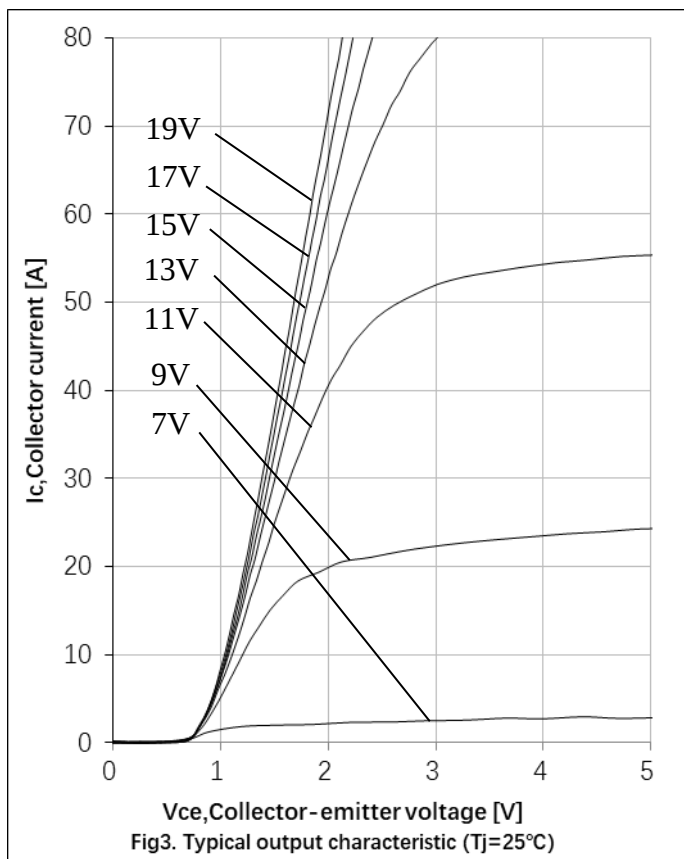
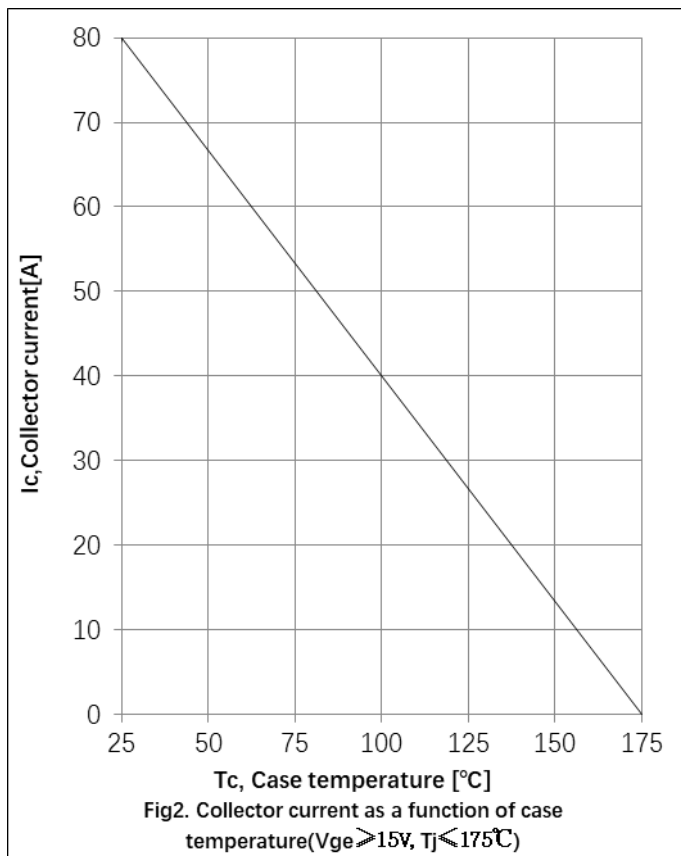
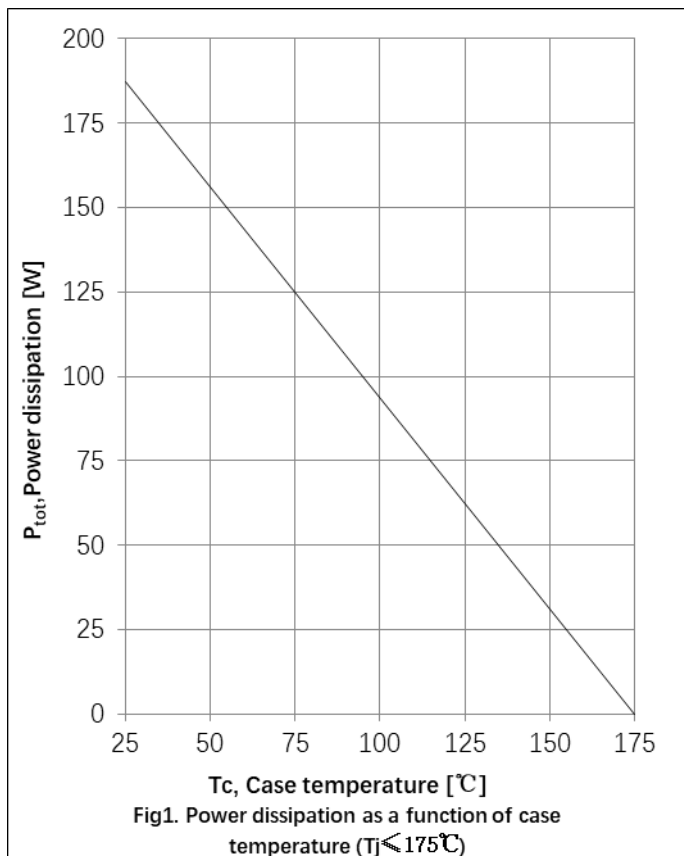


Electrical Characteristics of the DIODE

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _j = 25°C						
Reverse Recovery Current	I _{rr}	I _F =40A,V _R =400V -di/dt=450A/μs,	-	15	-	A
Reverse Recovery Charge	Q _{rr}		-	1.38	-	uC
Diode reverse recovery time	trr		-	133	-	ns
Reverse Recovery Energy	E _{rec}		-	0.23	-	mJ
Dynamic , at T _j = 125°C						
Reverse Recovery Current	I _{rr}	I _F =40A,V _R =400V -di/dt=450A/μs,	-	21	-	A
Reverse Recovery Charge	Q _{rr}		-	2.36	-	uC
Diode reverse recovery time	trr		-	171	-	ns
Reverse Recovery Energy	E _{rec}		-	0.58	-	mJ
Dynamic , at T _j = 150°C						
Reverse Recovery Current	I _{rr}	I _F =40A,V _R =400V -di/dt=450A/μs,	-	24	-	A
Reverse Recovery Charge	Q _{rr}		-	3.32	-	uC
Diode reverse recovery time	trr		-	205	-	ns
Reverse Recovery Energy	E _{rec}		-	0.69	-	mJ

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R _{th(j-c)}	0.8	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



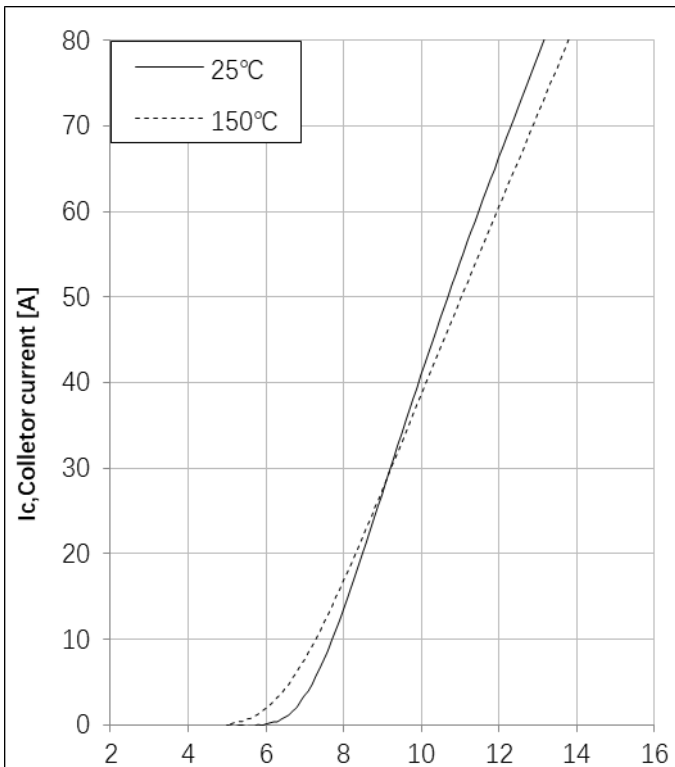


Fig5. Typical transfer characteristic ($V_{ce}=20V$)

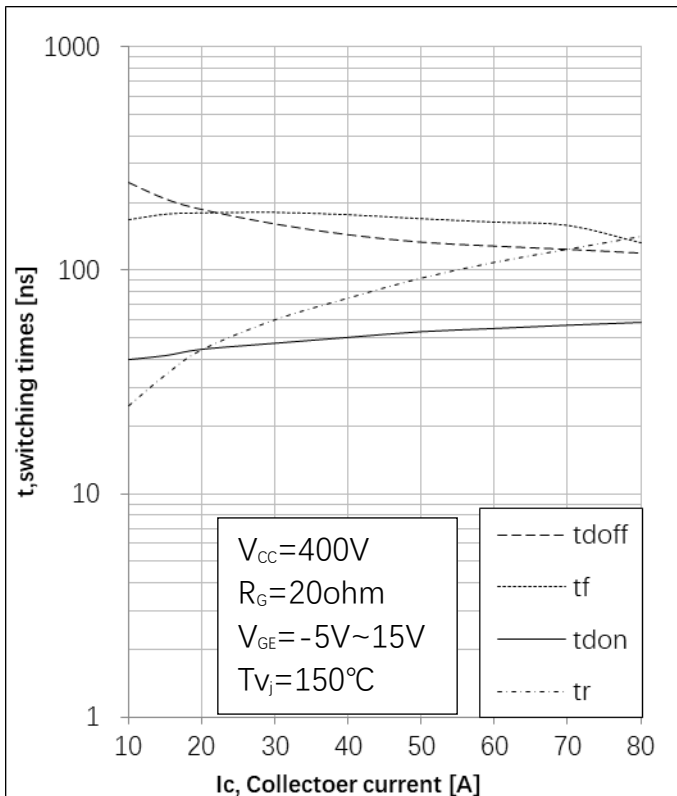


Fig6. Typical switching times as a function of collector current

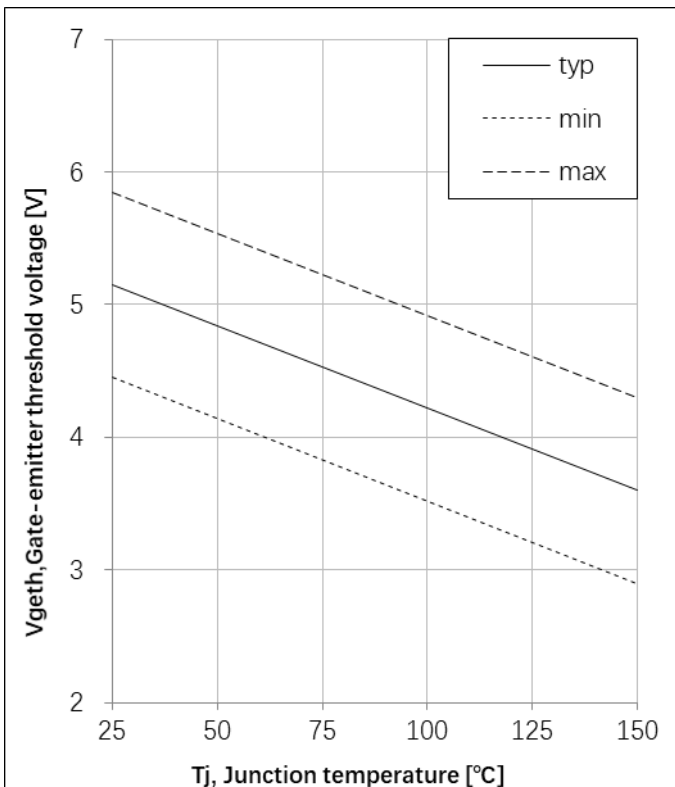


Fig7. Gate-emitter threshold voltage as a function of junction temperature ($I_c=1mA$)

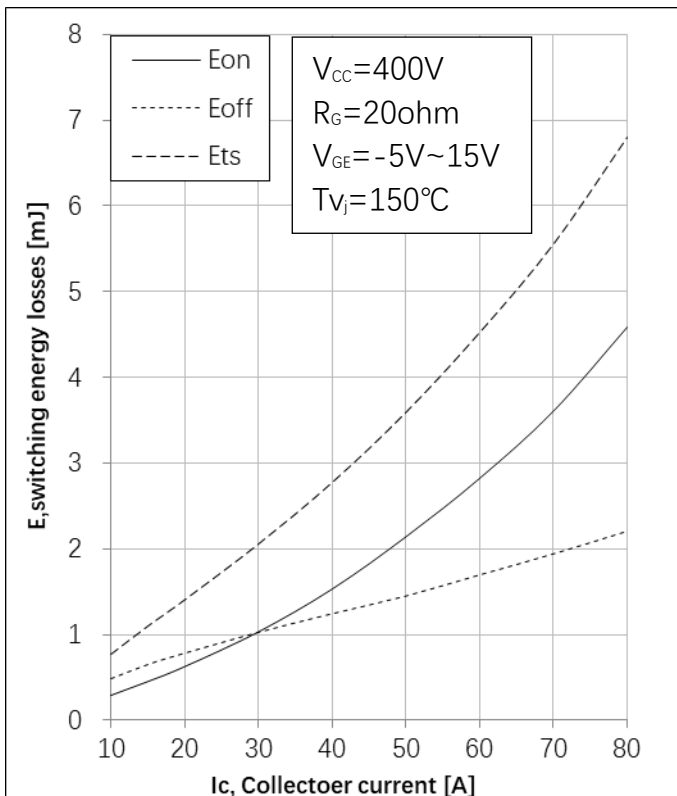
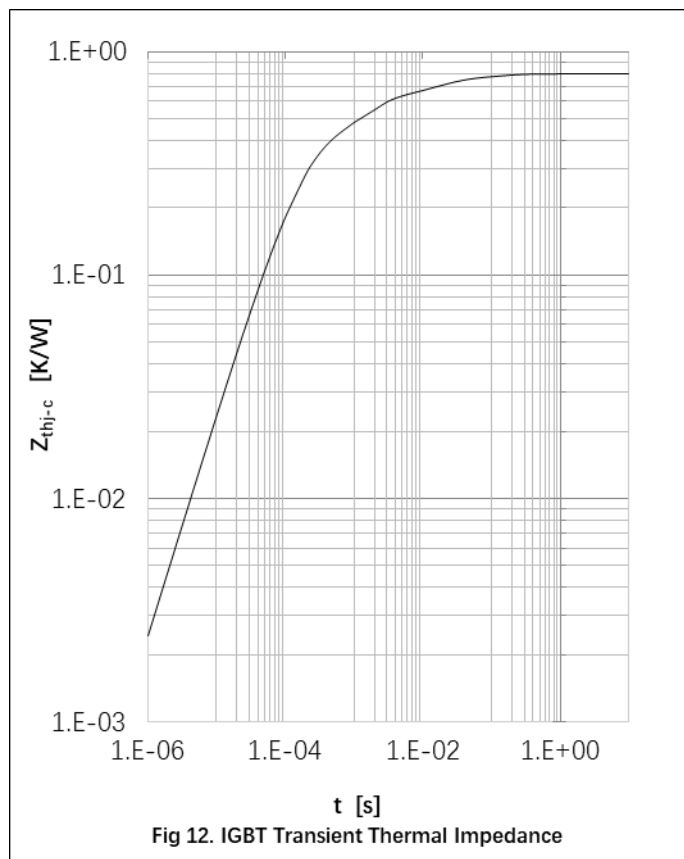
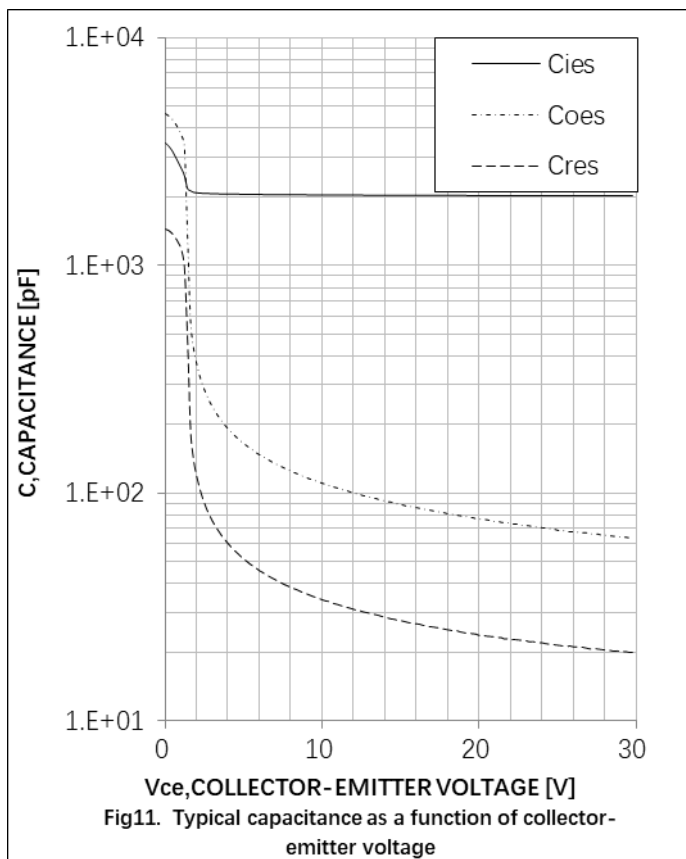
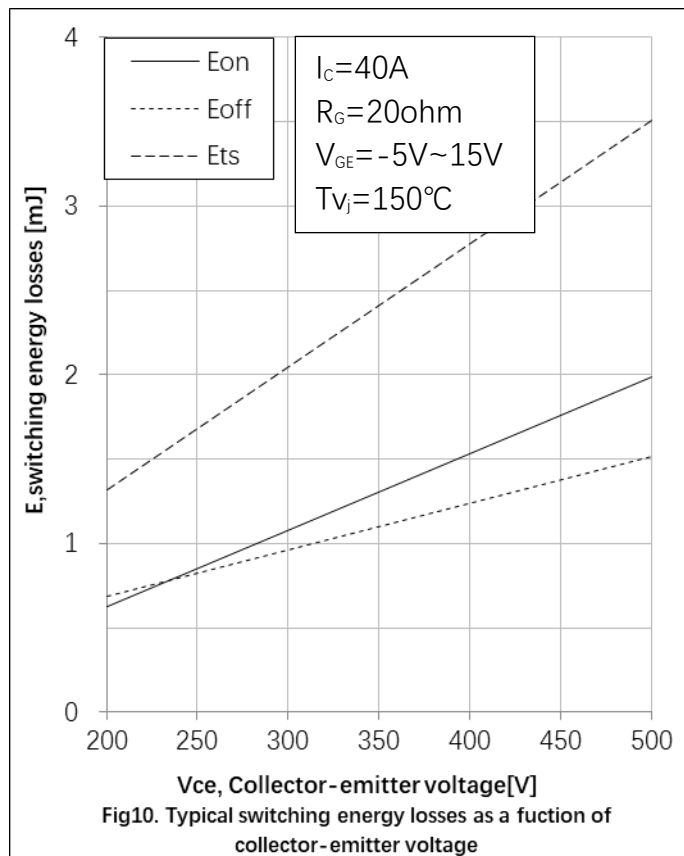
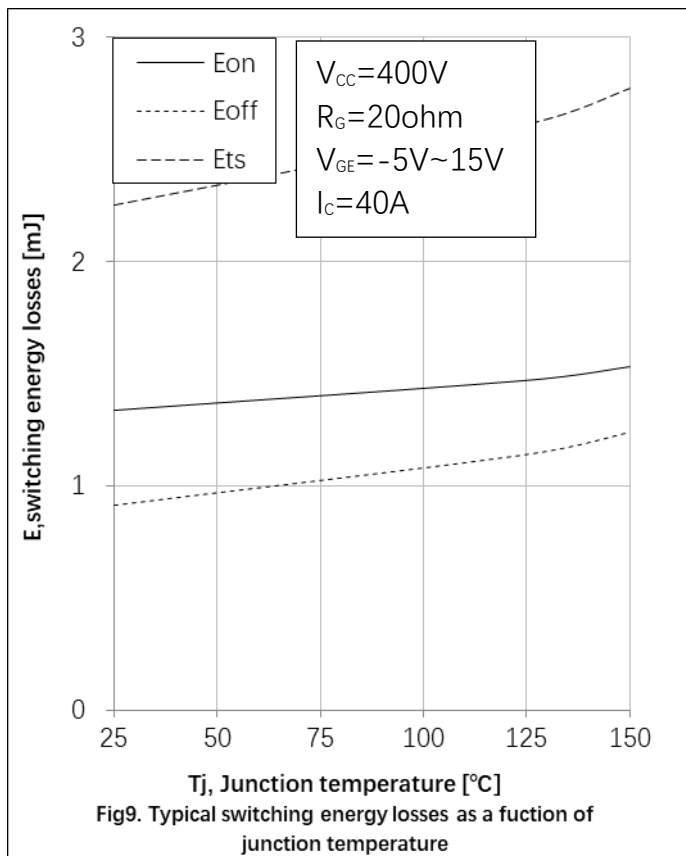
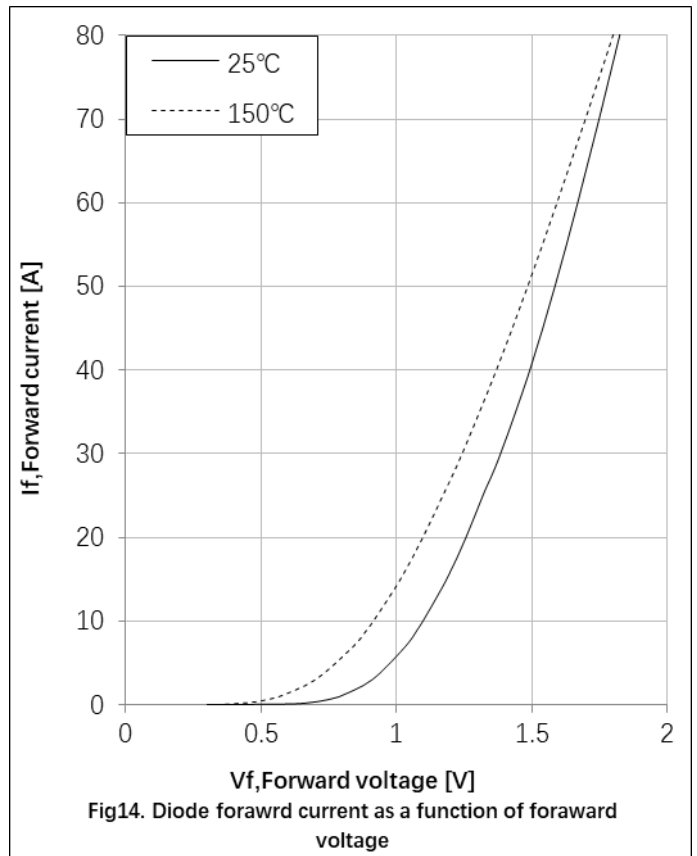
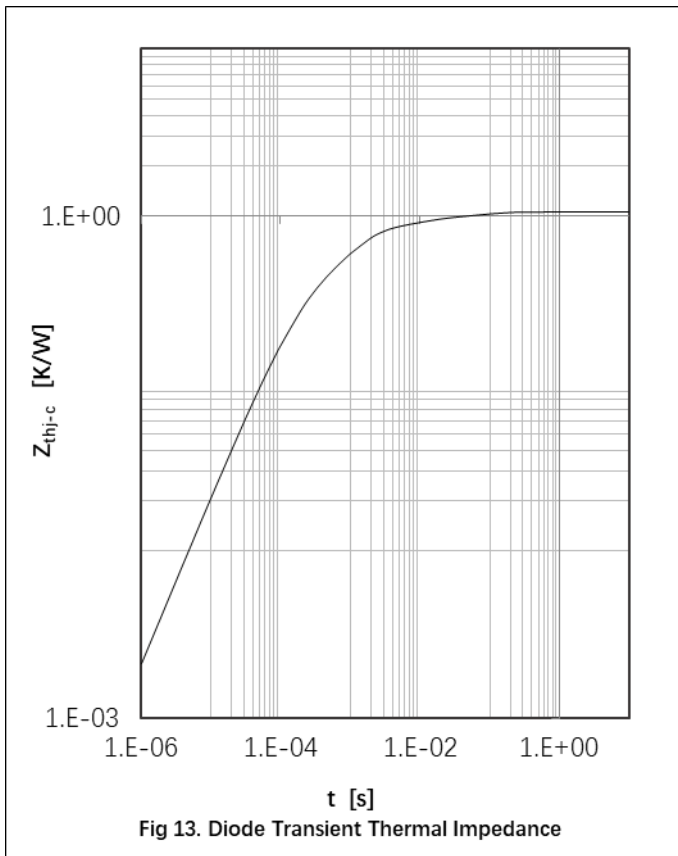
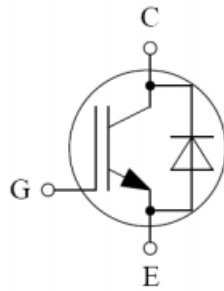


Fig8. Typical switching energy losses as a function of collector current



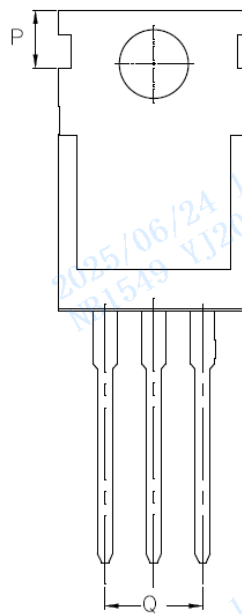
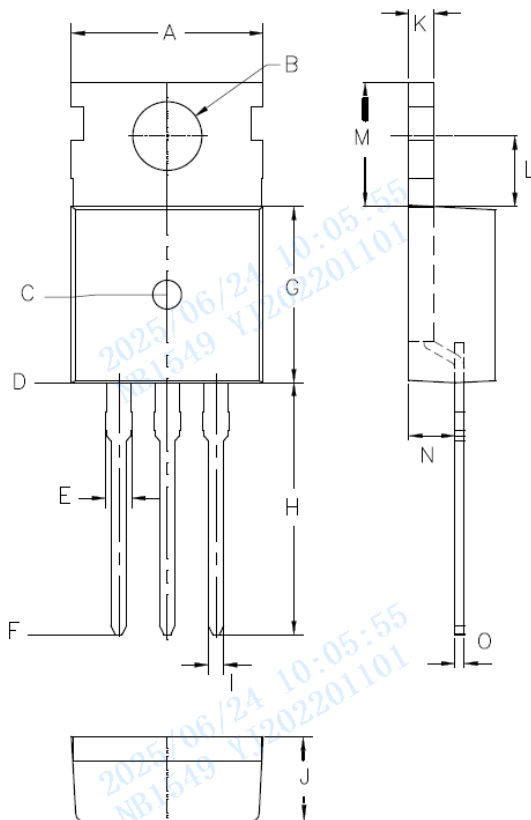


● Circuit Diagram



● Package Outline Information

CASE: TO-220 package information



SYMBOL	MIN	MAX
A	9.9	10.1
B	TYP3.6	
C	8.06	8.46
D	12.67	13.07
E	1.28	1.42
F	25.7	26.3
G	9	9.4
H	12.93	13.33
I	TYP0.8	
J	4.3	4.7
K	1.285	1.315
L	3.47	3.87
M	6.27	6.67
N	2.2	2.6
O	0.485	0.515
P	2.8	3.2
Q	TYP5.08	



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