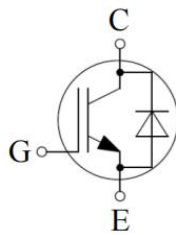


IGBT Discrete

V_{CE}	650	V
I_C	10	A
$V_{CE(SAT)} I_C=10A$	1.65	V

Circuit



Applications

- Inverter for motor drive
- Air conditioning
- Uninterruptible power supply

Features

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175°C
- Positive temperature coefficient
- High short circuit capability(5us)
- High ruggedness, temperature stable

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	20 10	A
Diode Forward Current, limited by T_{jmax} $T_C=25^{\circ}C$ $T_C=100^{\circ}C$	I_F	20 10	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 $V_{CE} \leq 650V$, $T_j \leq 150^{\circ}C$		30	A
Pulsed Collector Current, $V_{GE}=15V$, t_p limited by T_{jmax}	I_{CM}	30	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	30	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}	35	W

* Limited by maximum junction temperature. Applicable for TO220 standard package.



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}	$V_{GE}=0V, I_C=1mA$	650		-	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=250\mu A$	4.0	5.5	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=10A$ $T_j=25^\circ\text{C}$, $T_j=125^\circ\text{C}$ $T_j=150^\circ\text{C}$		1.65 1.80 1.85	2.15	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 5	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			± 200	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz$	-	0.56	-	nF
Reverse Transfer Capacitance	C_{res}		-	0.01	-	
Gate Charge	Q_G	$V_{CC}=400V, I_C=10A,$ $V_{GE}=15V$	-	0.06	-	uC

**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	$I_F = 10\text{A}$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$		1.50 1.40 1.35	2.00	V

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _j = 25°C						
Turn-on Delay Time	t _{d(on)}	T _j =25°C V _{CC} = 400V, I _C =10A, V _{GE} =-5V~15V, R _g =10Ω	-	7	-	ns
Rise Time	t _r		-	17	-	ns
Turn-on Energy	E _{on}		-	0.19	-	mJ
Turn-off Delay Time	t _{d(off)}		-	23	-	ns
Fall Time	t _f		-	106	-	ns
Turn-off Energy	E _{off}		-	0.17	-	mJ
Dynamic , at T _j = 125°C						
Turn-on Delay Time	t _{d(on)}	T _j =125°C V _{CC} = 400V, I _C =10A, V _{GE} =-5V~15V, R _g =10Ω	-	6	-	ns
Rise Time	t _r		-	18	-	ns
Turn-on Energy	E _{on}		-	0.21	-	mJ
Turn-off Delay Time	t _{d(off)}		-	28	-	ns
Fall Time	t _f		-	161	-	ns
Turn-off Energy	E _{off}		-	0.25	-	mJ
Dynamic , at T _j = 150°C						
Turn-on Delay Time	t _{d(on)}	T _j =150°C V _{CC} = 400V, I _C =10A, V _{GE} =-5V~15V, R _g =10Ω	-	6	-	ns
Rise Time	t _r		-	18	-	ns
Turn-on Energy	E _{on}		-	0.23	-	mJ
Turn-off Delay Time	t _{d(off)}		-	31	-	ns
Fall Time	t _f		-	189	-	ns
Turn-off Energy	E _{off}		-	0.30	-	mJ

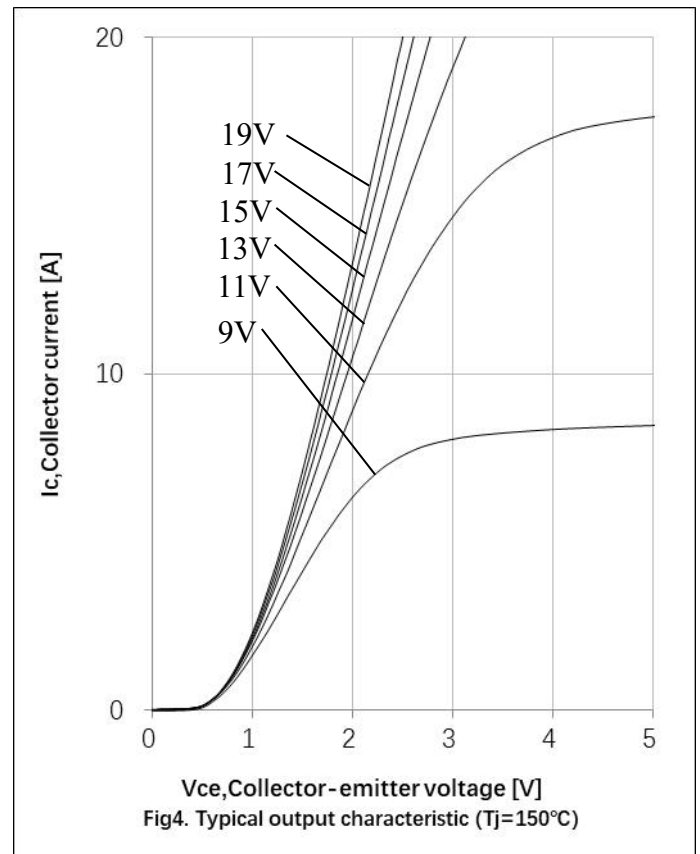
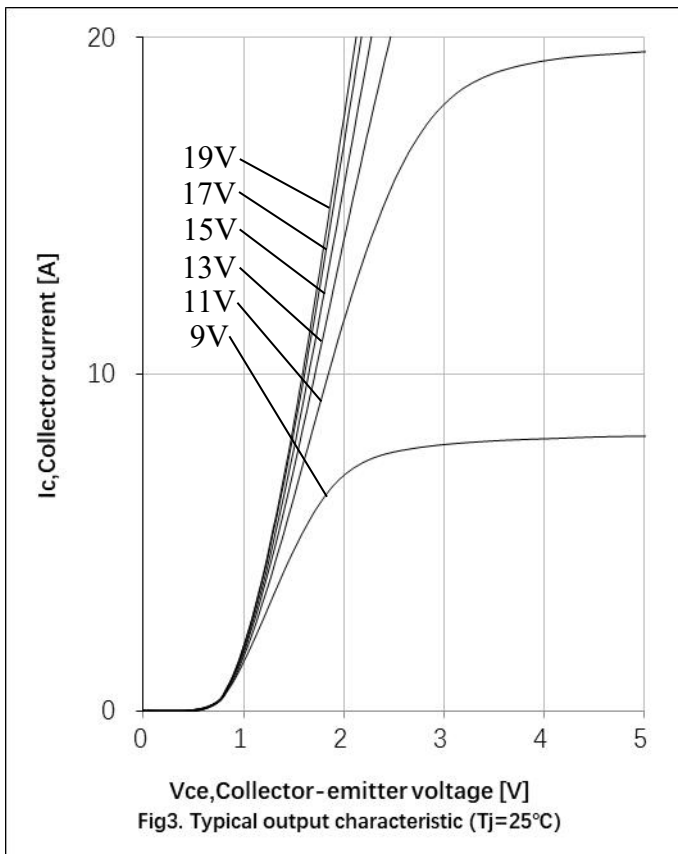
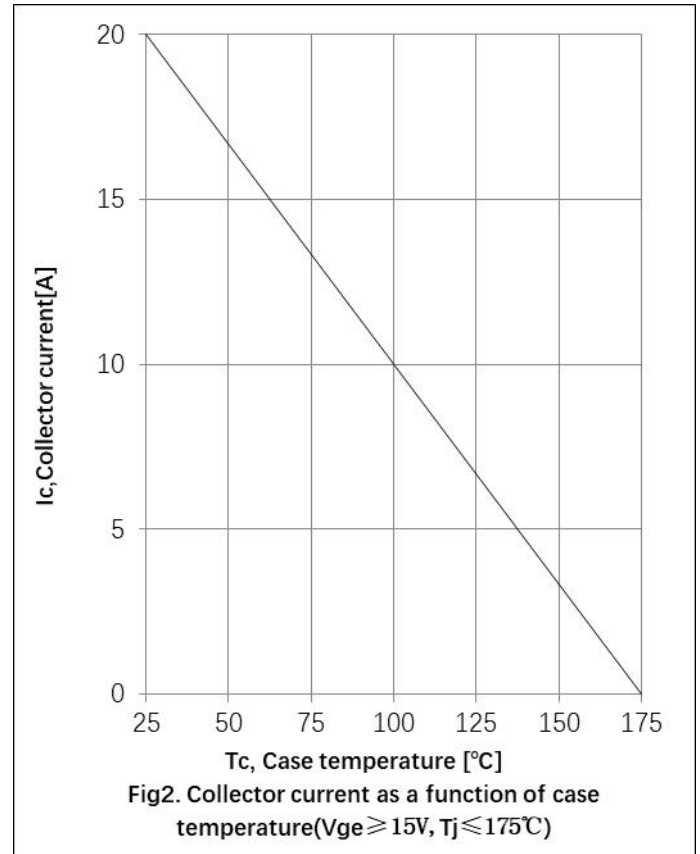
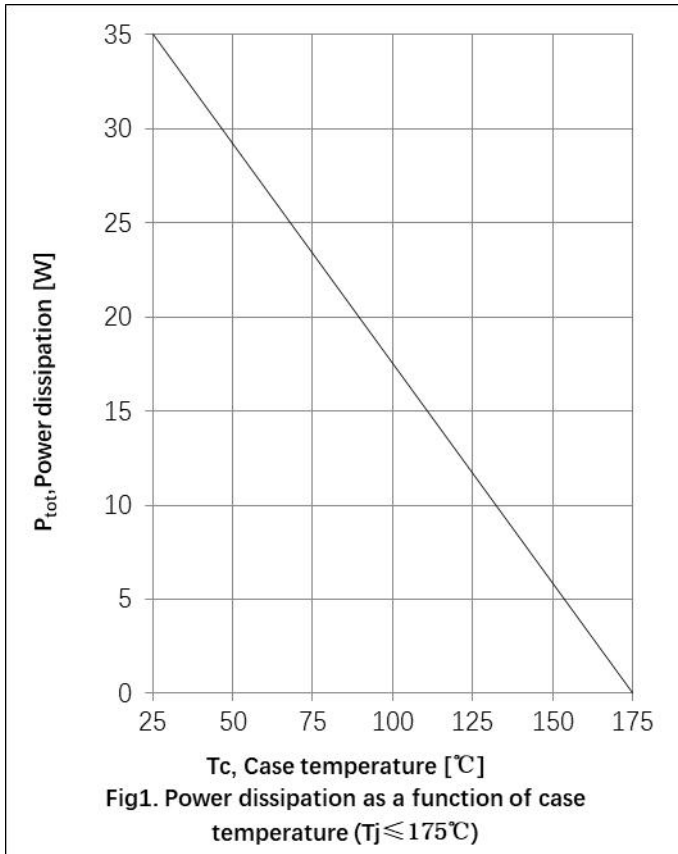


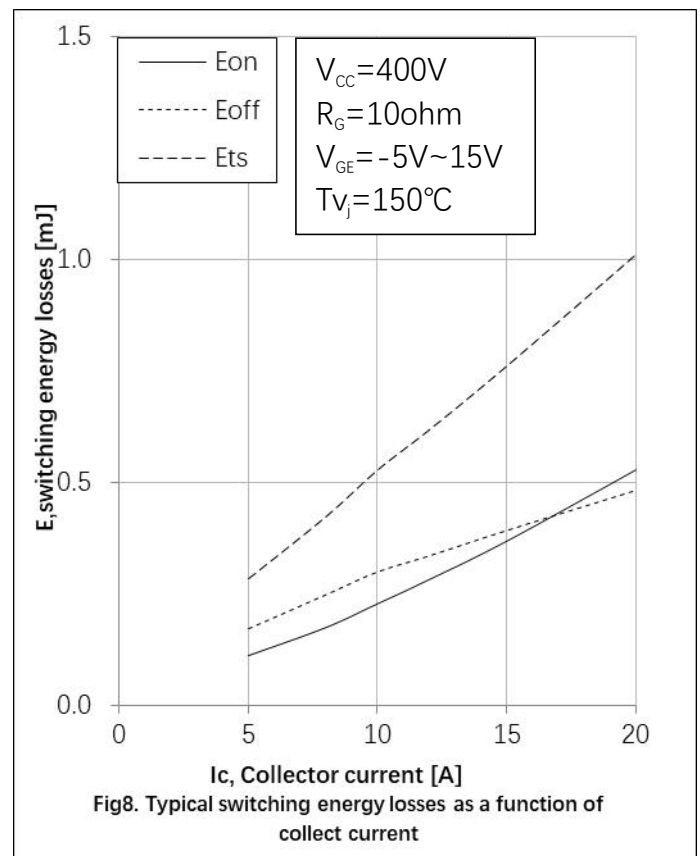
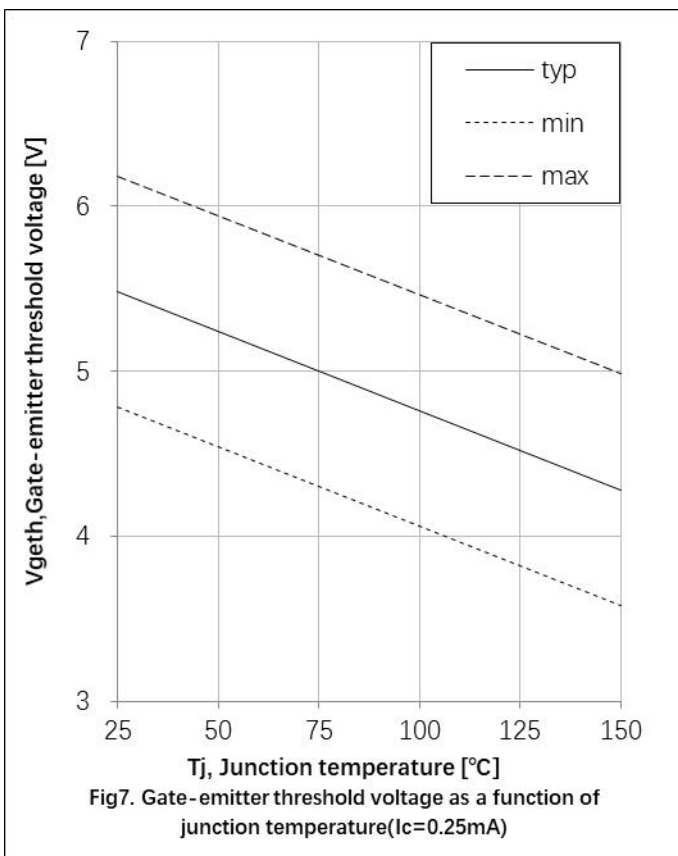
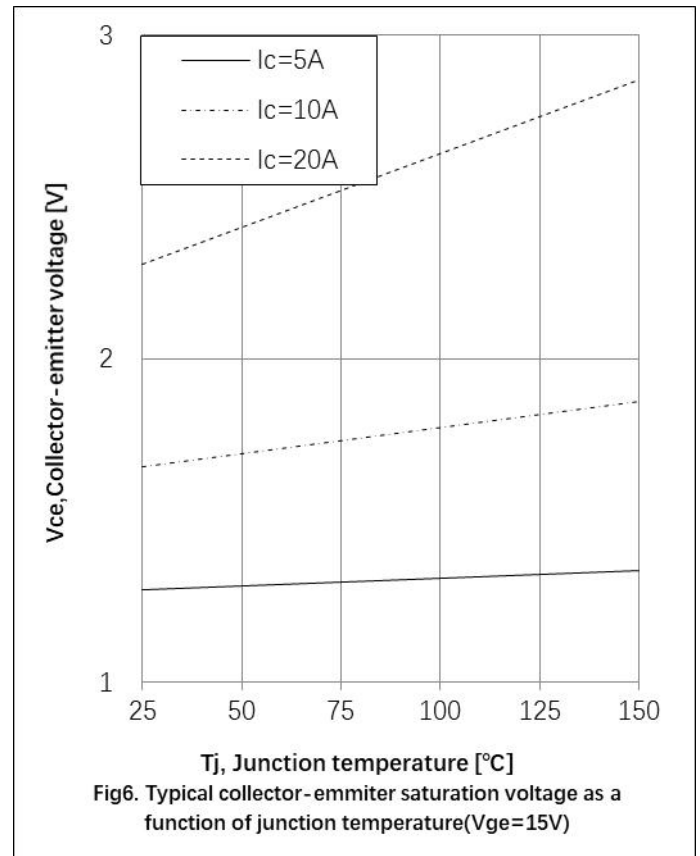
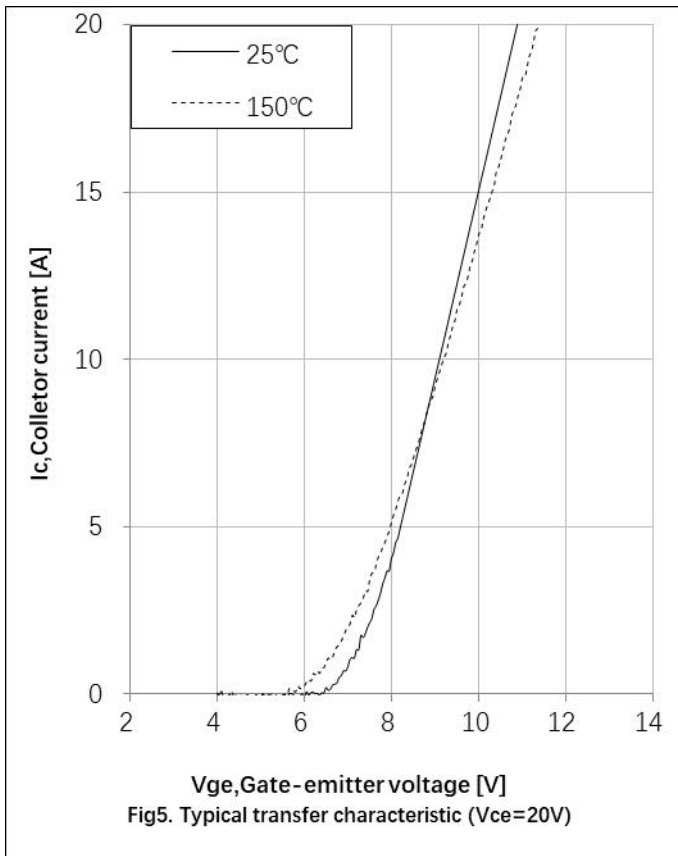
Electrical Characteristics of the DIODE

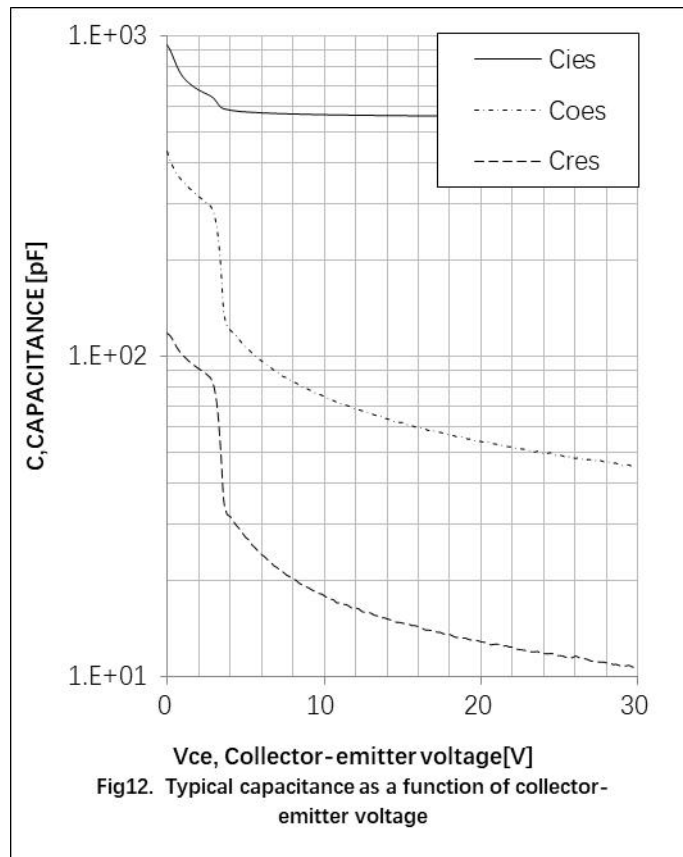
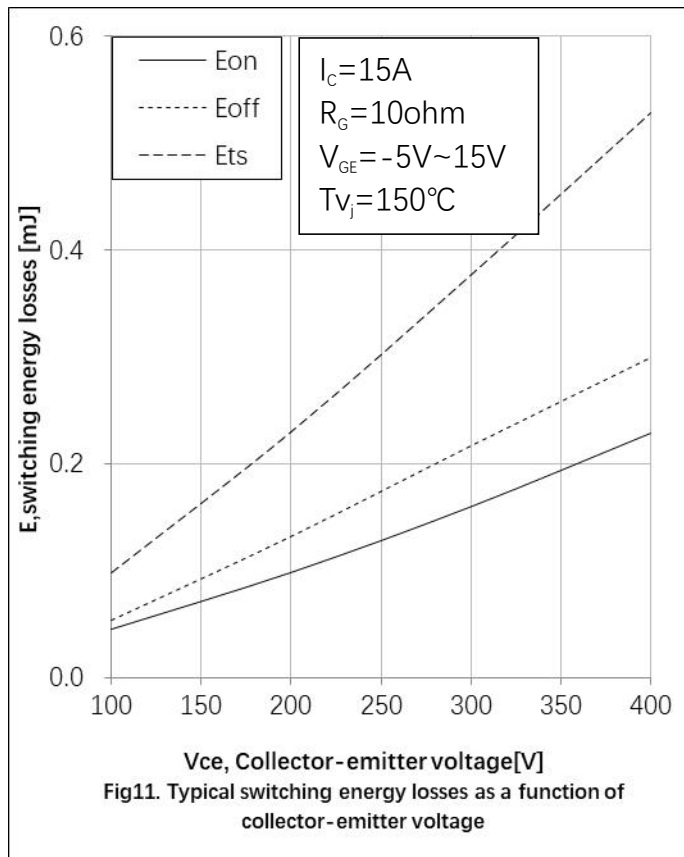
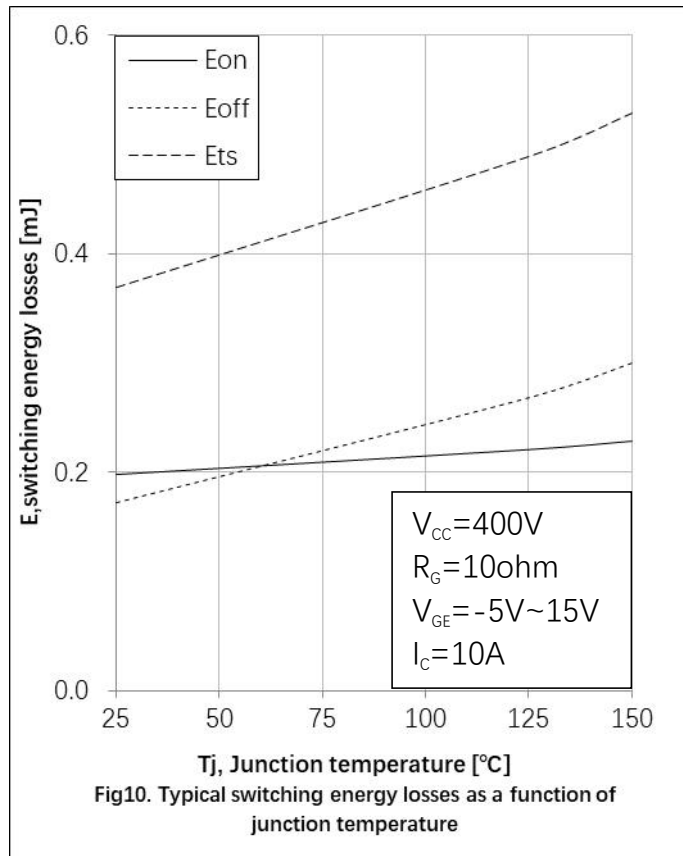
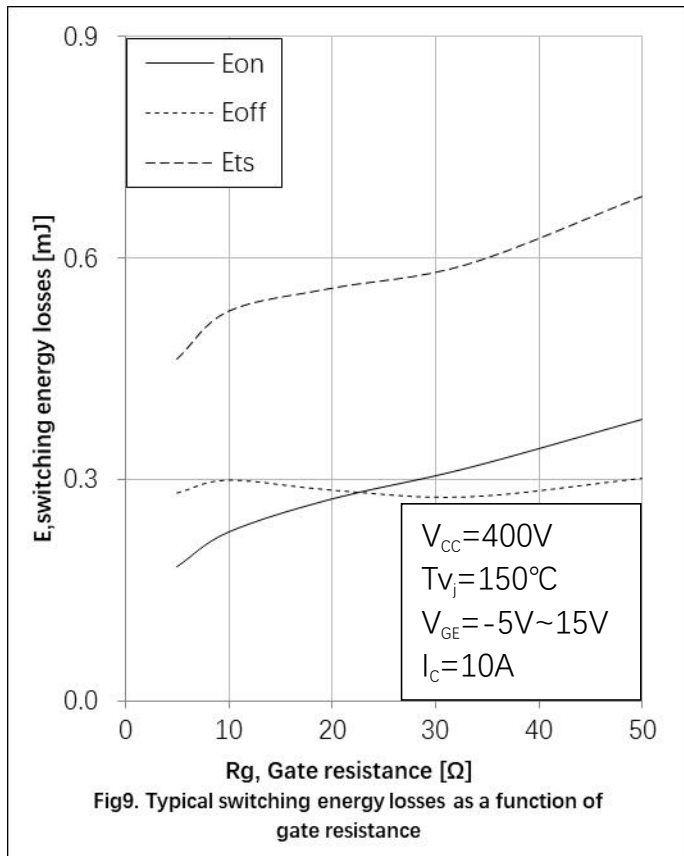
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T _j = 25°C						
Reverse Recovery Current	I _{rr}	I _F =10A, V _R =400V, -di/dt= 320A/μs,	-	9	-	A
Diode reverse recovery time	trr		-	81	-	ns
Reverse Recovery Charge	Q _{rr}		-	0.33	-	uC
Reverse Recovery Energy	E _{rec}		-	0.06	-	mJ
Dynamic , at T _j = 125°C						
Reverse Recovery Current	I _{rr}	I _F =10A, V _R =400V, -di/dt= 320A/μs,	-	11	-	A
Diode reverse recovery time	trr		-	99	-	ns
Reverse Recovery Charge	Q _{rr}		-	0.52	-	uC
Reverse Recovery Energy	E _{rec}		-	0.14	-	mJ
Dynamic , at T _j = 150°C						
Reverse Recovery Current	I _{rr}	I _F =10A, V _R =400V, -di/dt= 320A/μs,	-	12	-	A
Diode reverse recovery time	trr		-	106	-	ns
Reverse Recovery Charge	Q _{rr}		-	0.77	-	uC
Reverse Recovery Energy	E _{rec}		-	0.17	-	mJ

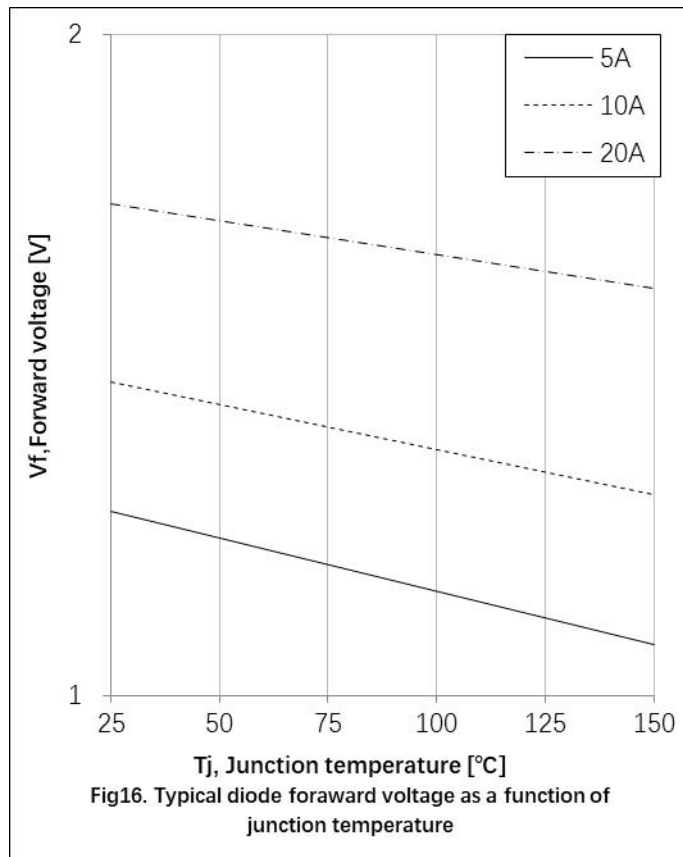
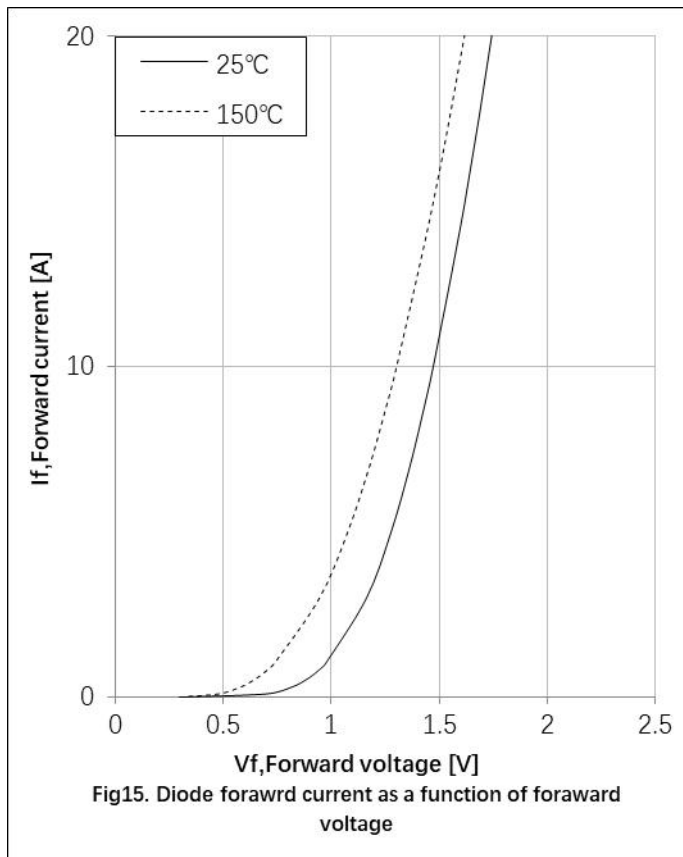
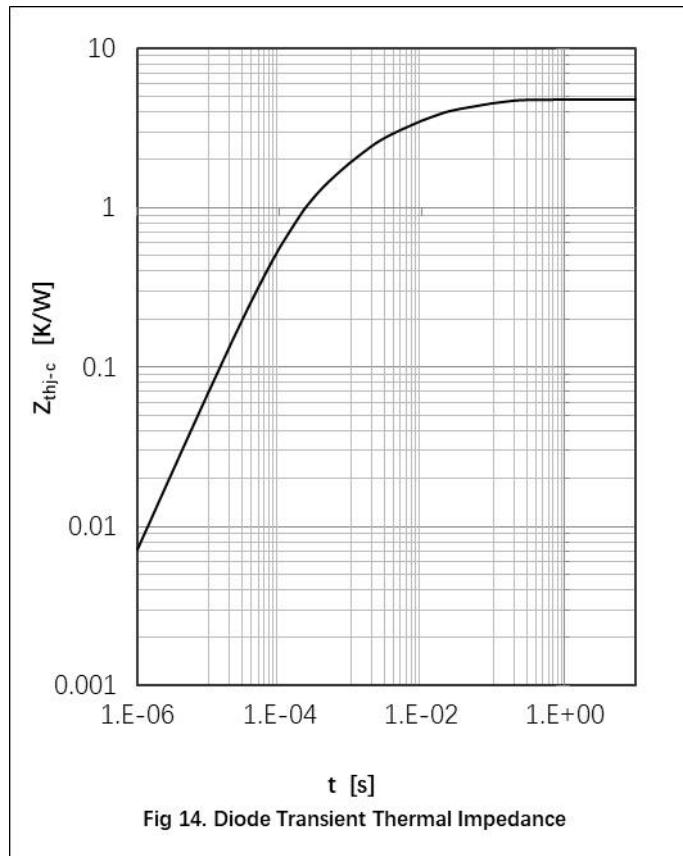
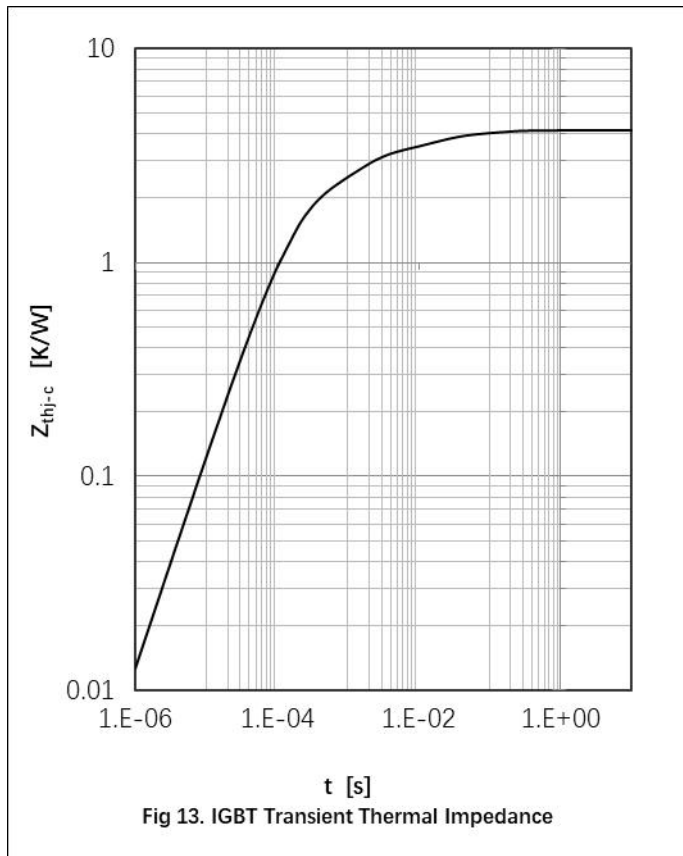
Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R _{th(j-c)}	4.2	K/W
Diode Thermal Resistance, Junction - Case	R _{th(j-c)}	4.8	K/W
Thermal Resistance, Junction - Ambient	R _{th(j-a)}	40	K/W

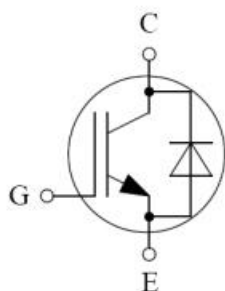






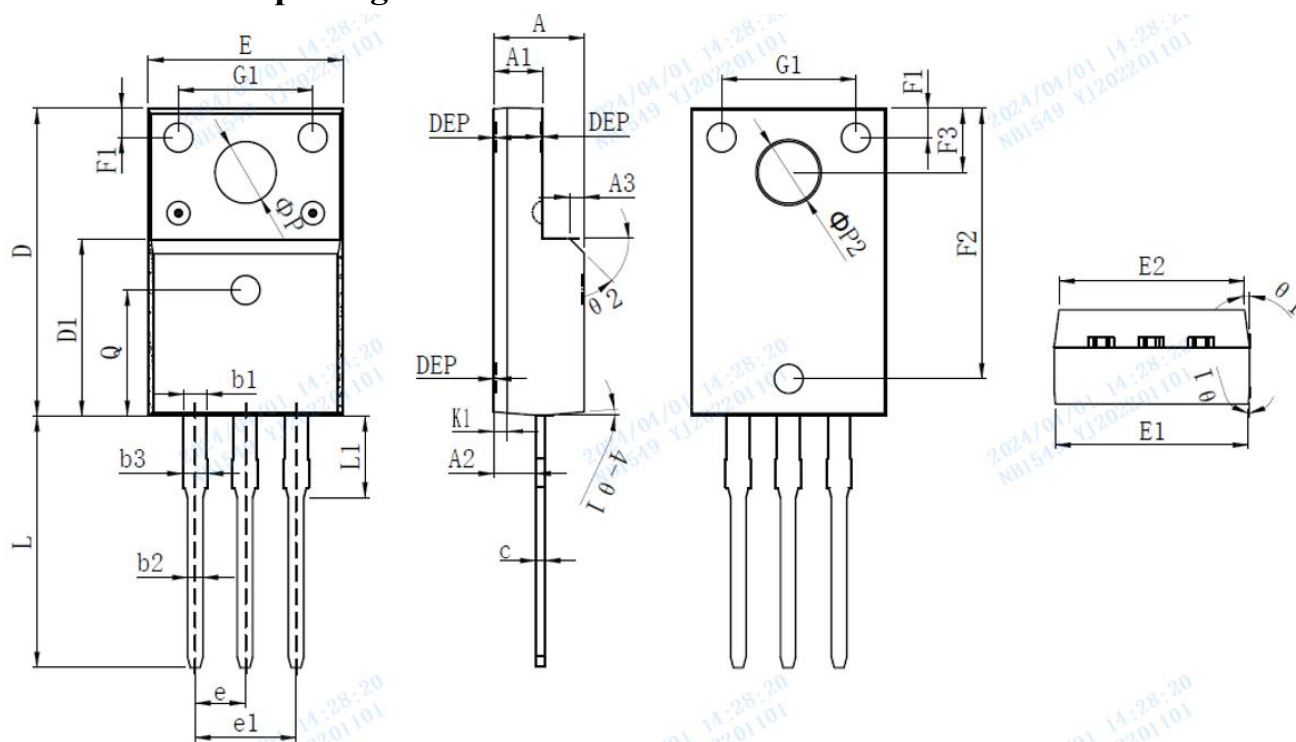


- **Circuit Diagram**



● Package Outline Information

CASE: TO-220F package information



SYMBOL	单位: mm			SYMBOL	单位: mm			SYMBOL	单位: mm		
	MIN	NOM	MAX		MIN	NOM	MAX		MIN	NOM	MAX
A	4.40	4.50	4.60	E	10.00	10.16	10.30	ΦP2	3.30	3.40	3.50
A1	2.34	2.54	2.74	E1	9.94	10.06	10.20	θ1	3°	5°	7°
A2	2.66	2.76	2.86	E2	9.40	9.50	9.60	θ2	42°	45°	48°
A3	1.0REF			F1	1.40	1.50	1.60				
b1	1.18	1.20	1.24	F2	13.80	13.90	14.00				
b2	0.75	0.80	0.85	F3	3.20	3.30	3.40				
b3	1.22	1.30	1.38	G1	6.90	7.00	7.10				
C	0.45	0.50	0.55	K1	0.65	0.70	0.75				
D	15.67	15.87	16.07	L	12.78	12.98	13.18				
D1	9.04	9.12	9.20	L1	3.40	3.50	3.60				
e	2.50	2.54	2.58	Q	6.50REF						
e1	5.08REF			ΦP	3.08	3.18	3.28				



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