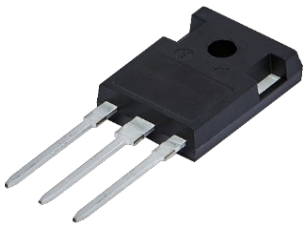
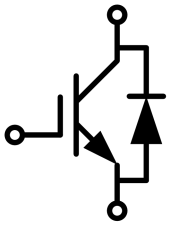
IGBT Discrete with Anti-Parallel Diode



TO-247



Features：

- 650V Trench /Field Stop type
- Low switching losses
- Vcesat has a positive temperature coefficient

Applications:

- Charging station
- Uninterruptible power supplies
- Inverters

IGBT

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	T_{vj}=25°C	V_{CES}	650	V
Continuous DC collector current	T_C=25°C, $T_{vj\ max}$=175°C T_C=100°C, $T_{vj\ max}$=175°C	I_C	80 75	A
Pulsed collector current, tp limited by $T_{vj\ max}$		I_{Cpuls}	225	A
Total power dissipation	T_C =25°C, $T_{vj\ max}$ =175°C T_C =100°C, $T_{vj\ max}$ =175°C	P_{tot}	441 220	W

Gate emitter Voltage	t_p ≤10μs, D<0.010	V_{GE}	±20 ±30	V
Temperature under switching conditions		$T_{vj\ op}$	-40…+175	℃
Storage temperature		T_{stg}	-40…+150	℃

Thermal Characteristics

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction-ambient		$R_{th(j-a)}$			65	K/W
IGBT thermal resistance, junction - case		$R_{th(j-C)}$		0.34		K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$		0.49		K/W

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Collector-emitter breakdown voltage	VGE=0V, IC=0.25mA		$V_{(BR)CES}$	650			V
Collector-Emitter saturation Voltage	V_{GE}=15V, I_C=75A V_{GE}=15V, I_C=75A V_{GE}=15V, I_C=75A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		1.63 2.03 2.13	2.10	
Gate-Emitter threshold Voltage	I_C=0.75mA,V_{GE}=V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	4.2	5.1	6.0	
Transconductance	V_{CE}=20V， I_C=75A		G_{fs}		91		S
Input capacitance	f=1 MHz,V_{CE}=25V,V_{GE}=0V	T_{vj}=25°C	C_{ies}		7.44		nF
Output capacitance			C_{oes}		0.24		
Reverse transfer capacitance			C_{res}		0.13		
Gate charge	I_C =75A,V_{GE} =15V, V_{CE} =520V	T_{vj}=25°C	Q_G		0.74		μC
Collector-emitter cut-off current	V_{CE}=650V ,V_{GE}=0V	T_{vj}=25°C T_{vj}=175°C	I_{CES}		2400	50	μA
Gate-emitter leakage current	V_{CE}=0V,V_{GE}=20V	T_{vj}=25°C	I_{GES}			100	nA

Turn-on delay time	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ on}$		34 37 40		ns
Rise time	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		153 157 163		
Turn-off delay time	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ off}$		183 198 208		
Fall time	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		67 68 73		
Turn-on energy loss per pulse	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		4.28 4.35 4.57		mJ
Turn-off energy loss per pulse	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		1.08 1.12 1.20		mJ
Total switching energy	I_C=75A,V_{CE}=400V V_{GE}=±15V, R_G=8Ω (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{ts}		5.36 5.47 5.77		

Diode

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse Voltage	T_{vj}=25°C	V_{RRM}	650	V
Continuous DC forward current	T_C=25°C, $T_{vj\ max}$=175°C T_C=100°C, $T_{vj\ max}$=175°C	I_F	80 75	A
Diode pulsed current, tp limited by $T_{vj\ max}$		I_{Fpuls}	180	A

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward Voltage	I_F=75A,V_{GE}=0V I_F=75A,V_{GE}=0V I_F=75A,V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		1.48 1.61 1.62	2.0	V
Peak reverse recovery current	I_F=75A, -di$_F$/dt=460A/μs(T_{vj}=150°C) V_R=400V,V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		17 23 25		A

Reverse Recovered charge	I_F=75A, -di_F/dt=460A/μs(T_{vj}=150°C) V_R=400V,V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_{rr}		2.43 3.37 3.72		μC
Reverse Recovery Time	I_F=75A, -di_F/dt=460A/μs(T_{vj}=150°C) V_R=400V,V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_{rr}		200 211 227		ns
Reverse recovered energy	I_F=75A, -di_F/dt=460A/μs(T_{vj}=150°C) V_R=400V,V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		0.68 0.91 0.99		mJ

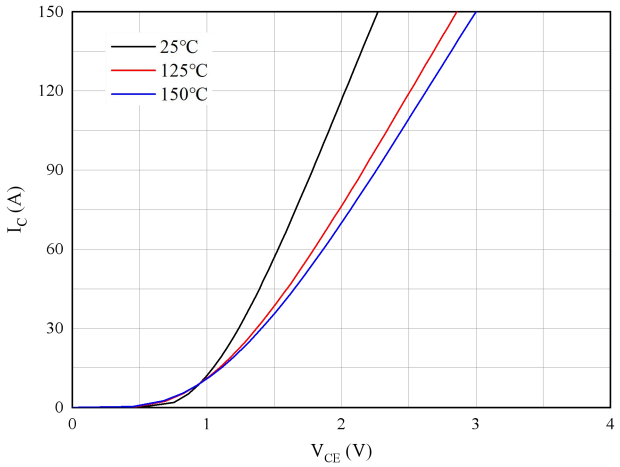


Fig 1. Typical output characteristics (V_{GE}=15V)

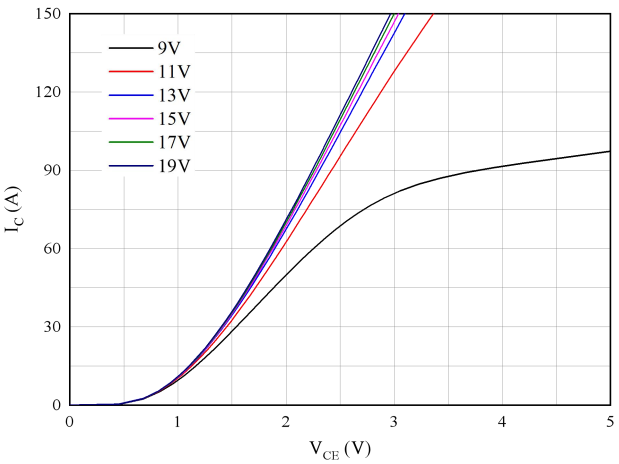


Fig 2. Typical output characteristics (T_{vj}=150℃)

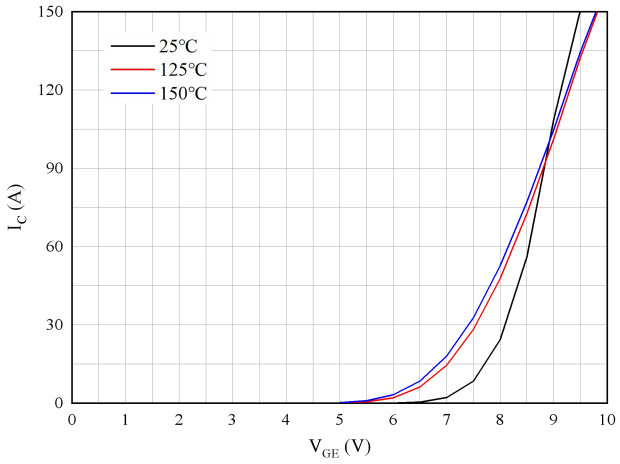


Fig 3. Typical transfer characteristic(V_{CE}=20V)

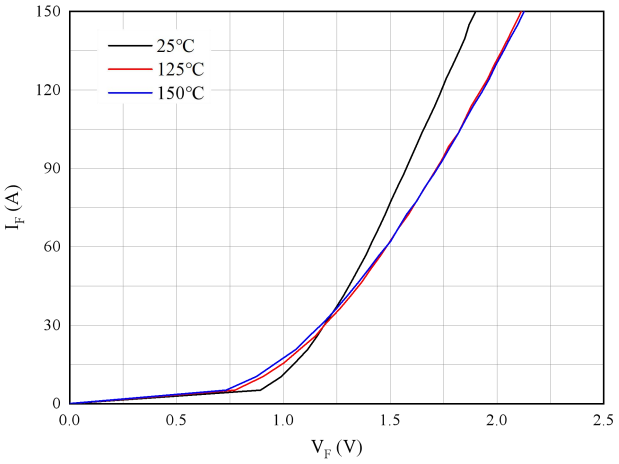


Fig 4. Forward characteristic of Diode

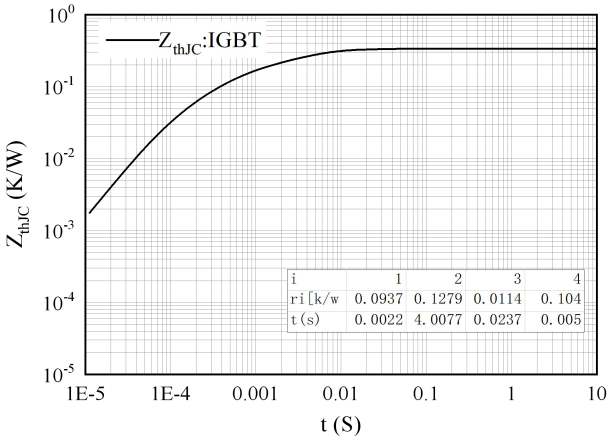


Fig 5. Transient thermal impedance IGBT, Z_{thJC}=f(t)

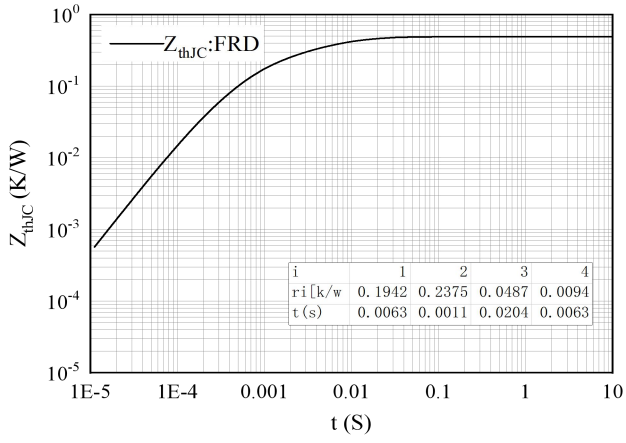


Fig 6. Transient thermal impedance FRD, Z_{thJC}=f(t)

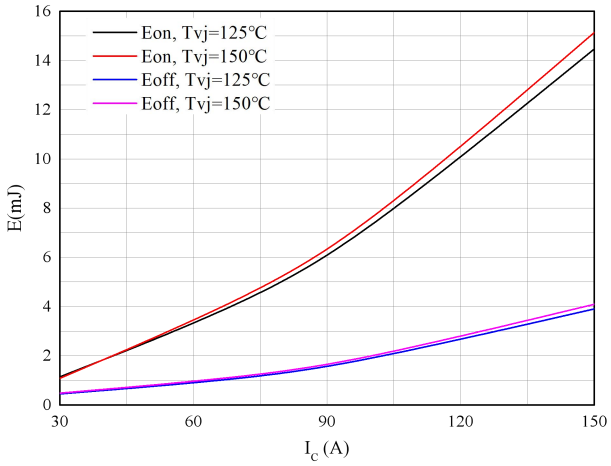


Fig 7. Switching losses of IGBT

VGE=±15V, RGon=8Ω, Rgoff=8Ω,VCE=400V

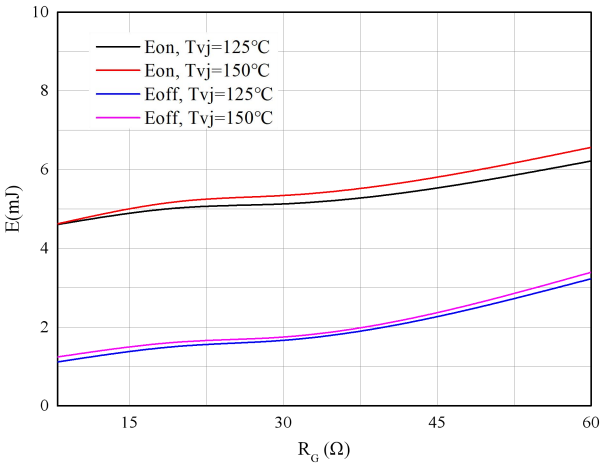


Fig 8. Switching losses of IGBT

VGE=±15V, IC=75A,VCE=400V

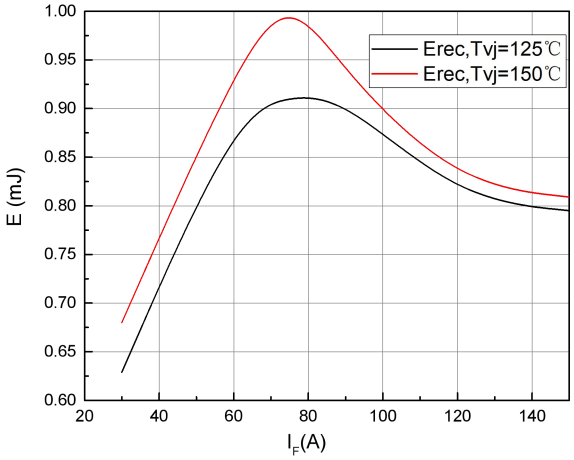


Fig 9. Switching losses of Diode

Rgon=8Ω,VCE=400V

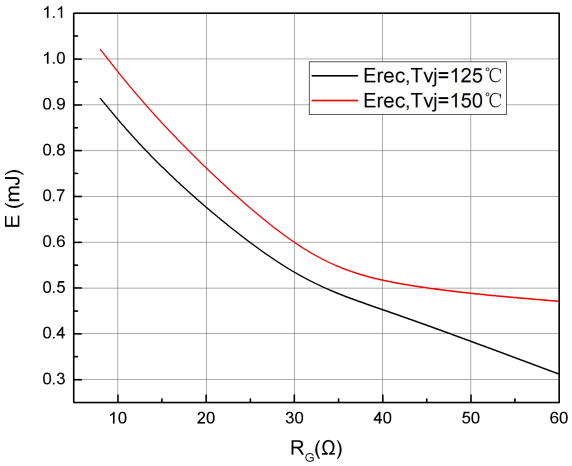


Fig 10. Switching losses of Diode

IF=75A,VCE=400V

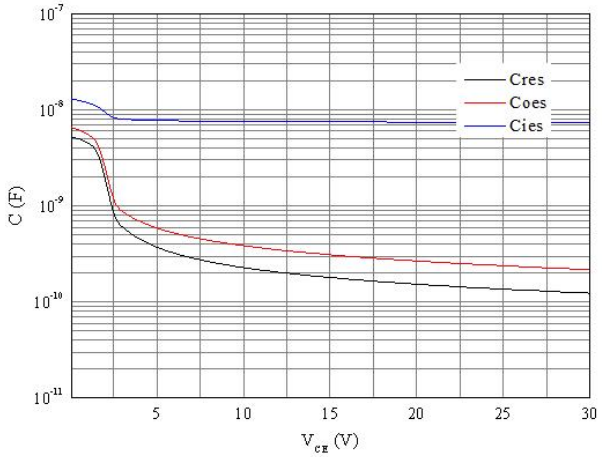
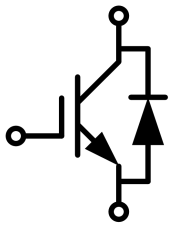
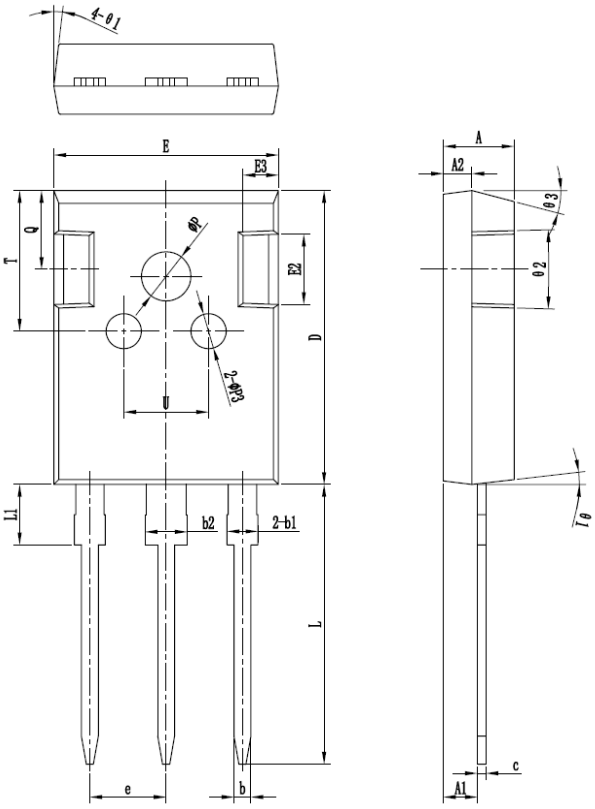


Fig 11. Capacitance characteristic

Circuit diagram



Package outlines



symbol	unit: mm		
	MIN	NOM	MAX
*A	4.90	5.00	5.10
*A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
*b	1.15	1.20	1.25
*b1	1.95	2.10	2.25
*b2	2.95	3.10	3.25
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
*E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
*e	5.40	5.44	5.48
*L	19.80	19.92	20.10
*L1	-	-	4.30
*ΦP	3.70	3.80	3.90
*ΦP1	3.50	3.60	3.70
ΦP2	7.00	7.20	7.40
ΦP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°