

34mm Module with Trench/Feldstopp IGBT and Fast recovery diode.

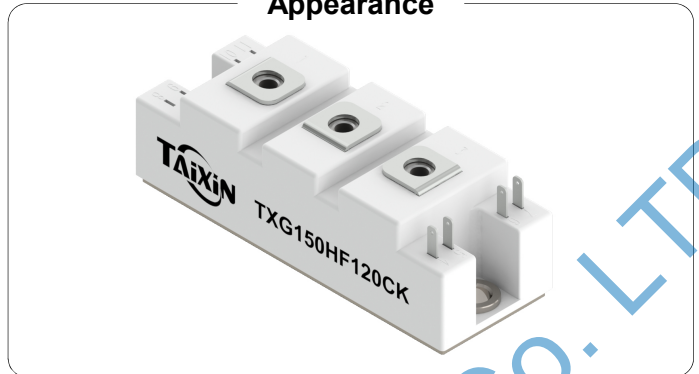
Feature

- 150A/1200V, $V_{CE(sat)(typ.)} = 2.10V @ 150A$
- Trench/Feldstopp IGBT
- Excellent short circuit ruggedness

Applications

- High Power Converters
- Motor Drives
- Uninterrupted Power Supply(UPS)

Appearance



Maximum Ratings of IGBT ($T_{vj}=25^{\circ}C$ unless otherwise noted)

Items	Symbol	Conditions	Maximum Rating	Units
Collector-emitter voltage	V_{CES}		1200	V
Gate-emitter voltage	V_{GES}		± 30	V
Collector current	I_C	$T_{vj}=25^{\circ}C$	300	A
		$T_{vj}=100^{\circ}C$	150	A
Pulsed collector current	I_{CM}	$t_p=1ms$	300	A
Short circuit current	I_{sc}	$V_{GE} \leq 15V, V_{CC}=600V, t_p=10\mu s$ $V_{CEmax}=V_{CES}-L_s \cdot di/dt$	600	A
Maximum power dissipation	P_D	$T_c=25^{\circ}C, T_{vj}=150^{\circ}C$	785	W

Electrical Characteristics of IGBT ($T_{vj}=25^{\circ}C$ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Collector-emitter breakdown voltage	V_{CES}	$V_{GE}=0V, I_C=250\mu A$	1200			V
Collector -emitter leakage current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$			1.0	mA
Gate leakage current, forward	I_{GES}	$V_{GE}=30V, V_{CE}=0V$			200	nA
		$V_{GE}=-30V, V_{CE}=0V$			-200	nA
Gate threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=250\mu A$	5.00	5.80	6.60	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=150A, T_{vj}=25^{\circ}C$		1.80	2.20	V
		$V_{GE}=15V, I_C=150A, T_{vj}=125^{\circ}C$		2.10		V
Integrated gate resistor	R_{Gint}	$f=1M; V_{pp}=1V$		5.00		Ω
Input capacitance	C_{ies}	$V_{CE}=25V$		9.35		nF
Output capacitance	C_{oes}	$V_{GE}=0V$		tdb.		nF
Reverse transfer capacitance	C_{res}	$f=1MHz$		0.35		nF
Total gate charge	Q_g	$V_{CC}=600V, V_{GE}=15V, I_C=150A$		1.25		μC
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V$		130		ns
Rise time	t_r	$V_{GE}=\pm 15V$		20		ns
Turn-off delay time	$t_{d(off)}$	$I_C=150A$		300		ns
Fall time	t_f	$R_G=1.2\Omega$		45		ns
Turn-on energy loss per pulse	E_{on}	Inductive Load $T_{vj}=25^{\circ}C$		8.50		mJ
Turn-off energy loss per pulse	E_{off}			8.50		mJ
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V$		150		ns
Rise time	t_r	$V_{GE}=\pm 15V$		30		ns
Turn-off delay time	$t_{d(off)}$	$I_C=150A$		380		ns
Fall time	t_f	$R_G=1.2\Omega$		80		ns
Turn-on energy loss per pulse	E_{on}	Inductive Load $T_{vj}=125^{\circ}C$		13.5		mJ
Turn-off energy loss per pulse	E_{off}			13.5		mJ
Temperature under switching conditions	$T_{vj op}$		-55		150	$^{\circ}C$

Maximum Ratings of Diode

Items	Symbol	Conditions	Maximum Rating	Units
Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1200	V
Diode continuous forward current	I_F	$T_{vj}=25^{\circ}C$	300	A
		$T_{vj}=100^{\circ}C$	150	A
Diode maximum forward current	I_{FM}	$t_p=1ms, T_{vj}=25^{\circ}C$	300	A

Electrical Characteristics of Diode ($T_{vj}=25^{\circ}C$ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Diode forward voltage	V_F	$I_F=150A, T_{vj}=25^{\circ}C$		1.75	2.20	V
		$I_F=150A, T_{vj}=125^{\circ}C$		1.70		V
Diode reverse recovery time	t_{rr}	$V_{CE}=600V$		tb.		ns
Diode peak reverse recovery current	I_{rr}	$I_F=150A$		120		A
Diode reverse recovery charge	Q_{rr}	$dI_F/dt=1900A/\mu s$		14.0		μC
Reverse recovery energy	E_{rec}	$T_{vj}=25^{\circ}C$		5.00		mJ
Diode reverse recovery time	t_{rr}	$V_{CE}=600V$		tb.		ns
Diode peak reverse recovery current	I_{rr}	$I_F=150A$		140		A
Diode reverse recovery charge	Q_{rr}	$dI_F/dt=1900A/\mu s$		24.0		nC
Reverse recovery energy	E_{rec}	$T_{vj}=125^{\circ}C$		8.50		mJ

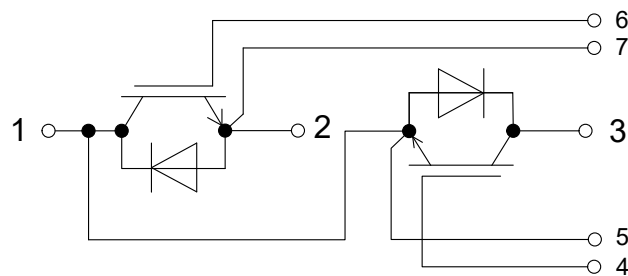
Thermal Characteristics

Items	Symbol	Min.	typ.	Max.	Units
Thermal resistance, junction to case for IGBT	R_{thj-c}			0.31	$^{\circ}C/W$
Thermal resistance, case to sink	R_{thc-s}		0.13		$^{\circ}C/W$

Module Characteristics

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Material of module baseplate				Cu		
Internal isolation		terminal to terminal		Al_2O_3		
Isolation test voltage	V_{isol}	RMS, $f = 50 Hz, t = 1 min.$	2.5			kV
Stray inductance module	L_{sCE}			30		nH
Mounting torque for modul mounting	M	Screw M6	3.0		5.0	Nm
Terminal connection torque	M	Screw M5	4.0		6.0	Nm
Storage temperature range	T_{STG}		-55		150	$^{\circ}C$
Weight of Module	W_t			160		g

Internal Circuit:



Representative Characteristics

Fig 1. Output characteristic IGBT

$$I_C = f(V_{CE}), V_{GE} = 15V$$

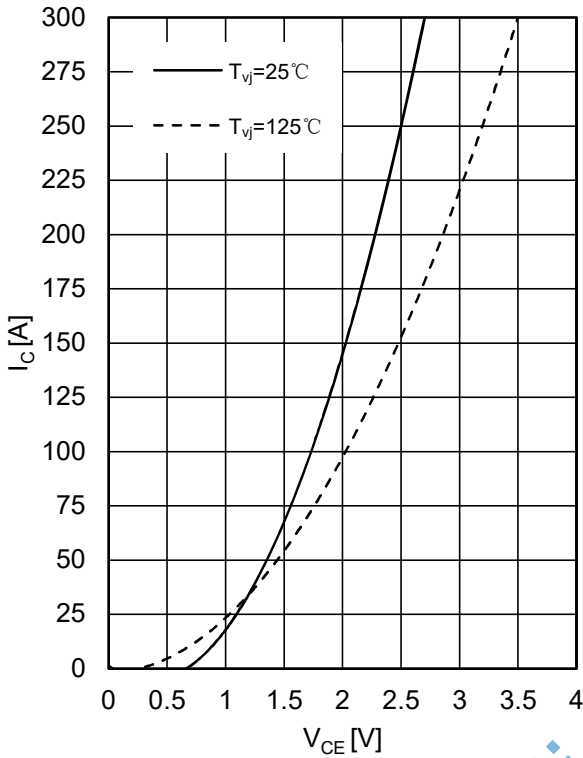


Fig 2. Output characteristic IGBT

$$I_C = f(V_{CE})$$

$$T_{vj} = 125^\circ C$$

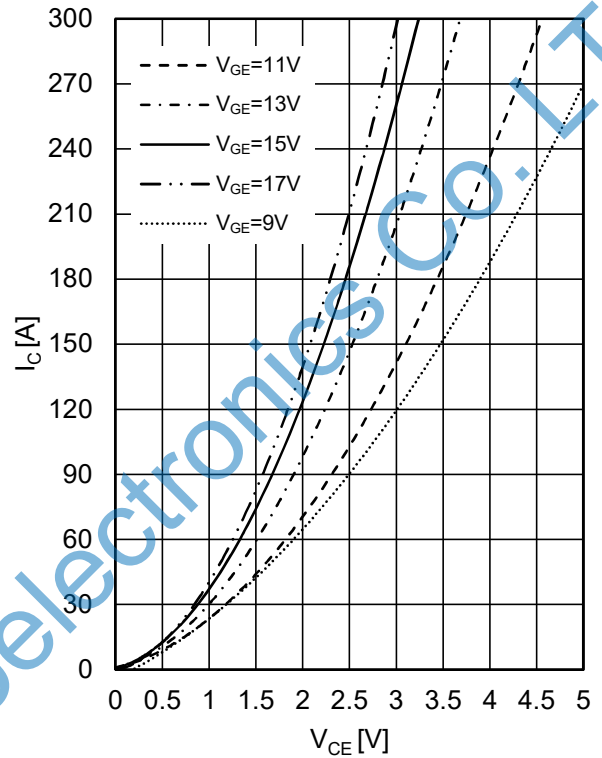


Fig 3. Transfer characteristic IGBT

$$I_C = f(V_{GE})$$

$$V_{CE} = 20V$$

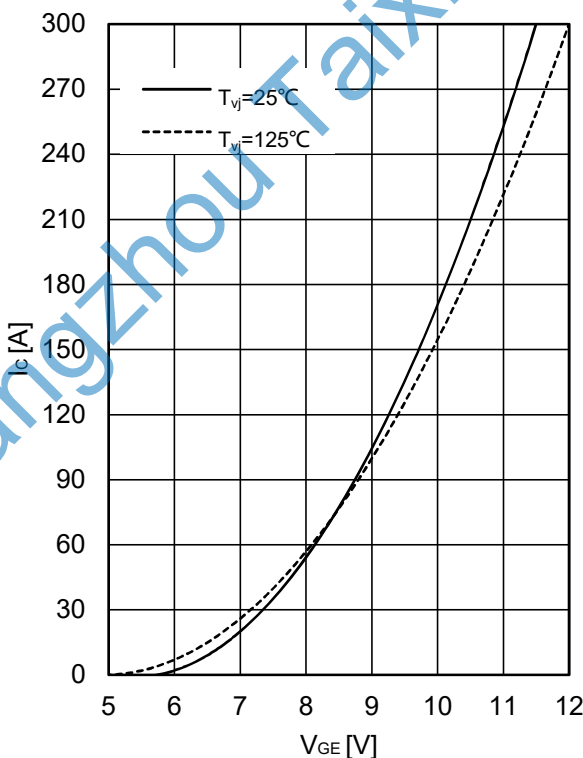


Fig 4. Switching losses IGBT

$$E_{on} = f(I_C), E_{off} = f(I_C)$$

$$V_{GE} = \pm 15V, R_G = 1.2\Omega, V_{CE} = 600V$$

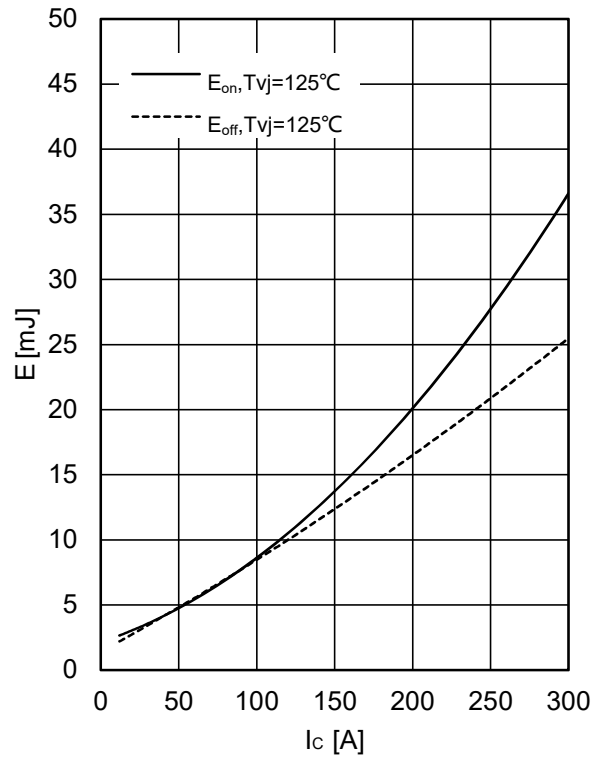


Fig 5. Switching losses IGBT

$$E_{on}=f(R_G), E_{off}=f(R_G),$$

$$V_{GE}=\pm 15V, I_C=150A, V_{CE}=600V$$

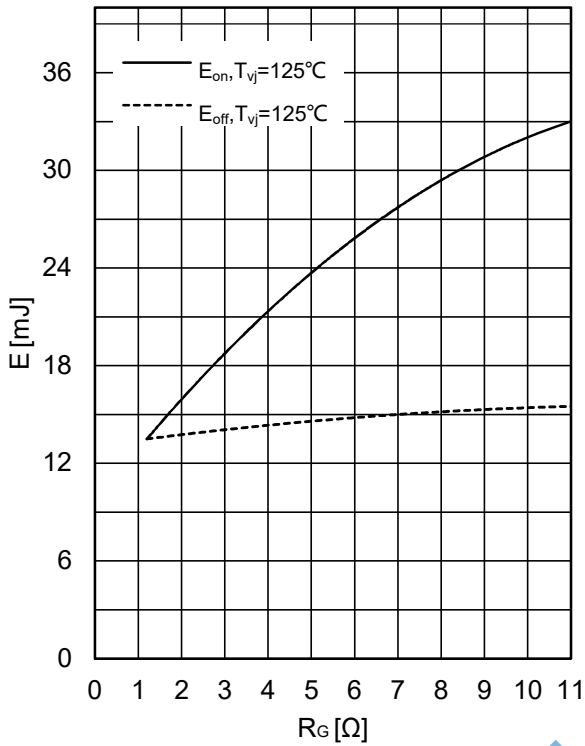


Fig 6. Transient thermal impedance IGBT

$$Z_{thjc}=f(t)$$

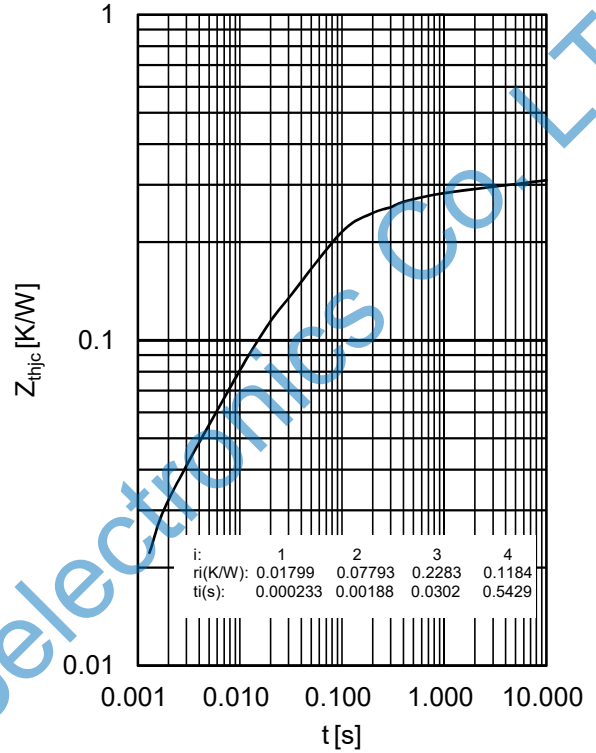


Fig 7. Reverse bias safe operating area IGBT,

$$I_C=f(V_{CE})$$

$$V_{GE}=\pm 15V, R_{Goff}=1.2\Omega, T_{vj}=125^\circ C$$

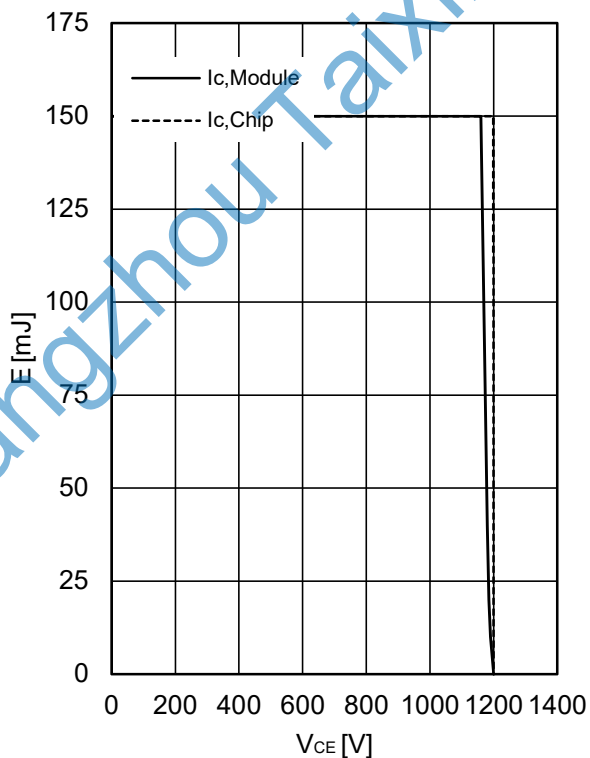


Fig 8. Forward characteristic of Diode

$$I_F=f(V_F)$$

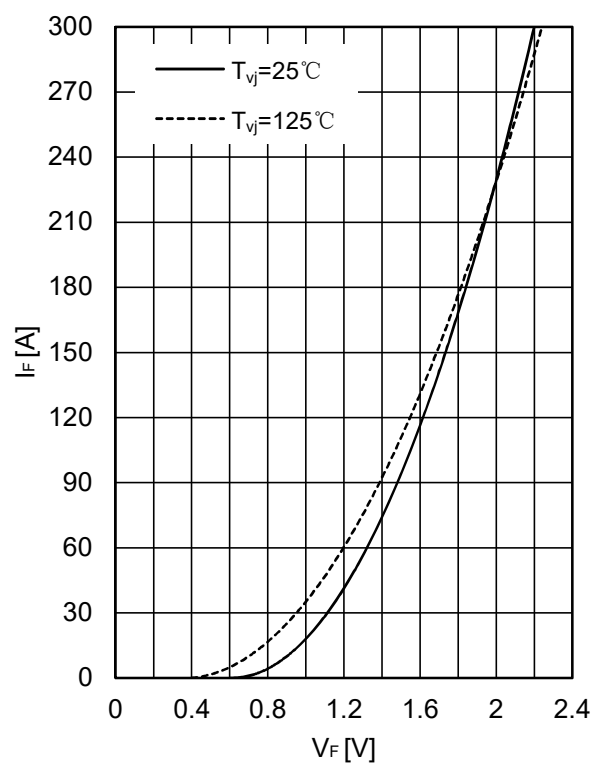


Fig 9. Switching losses Diode

$$E_{rec} = f(I_F)$$

$R_G = 1.2\Omega, V_{CE} = 600V$

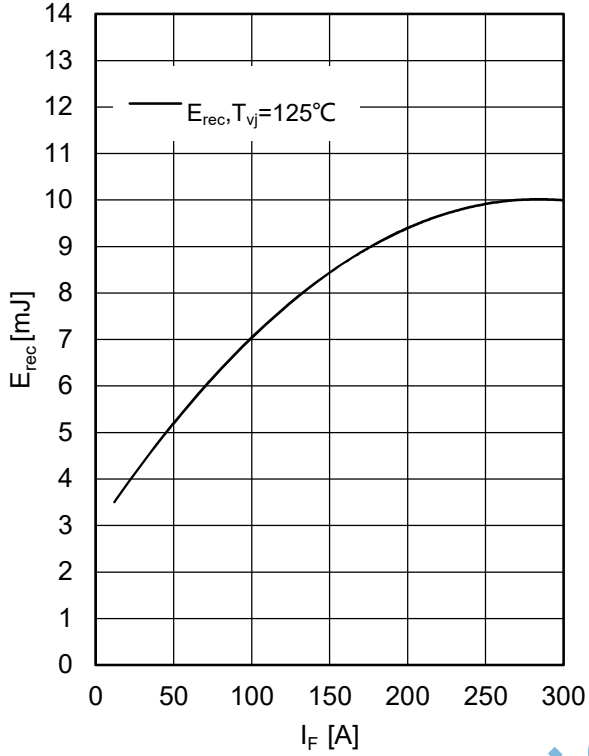
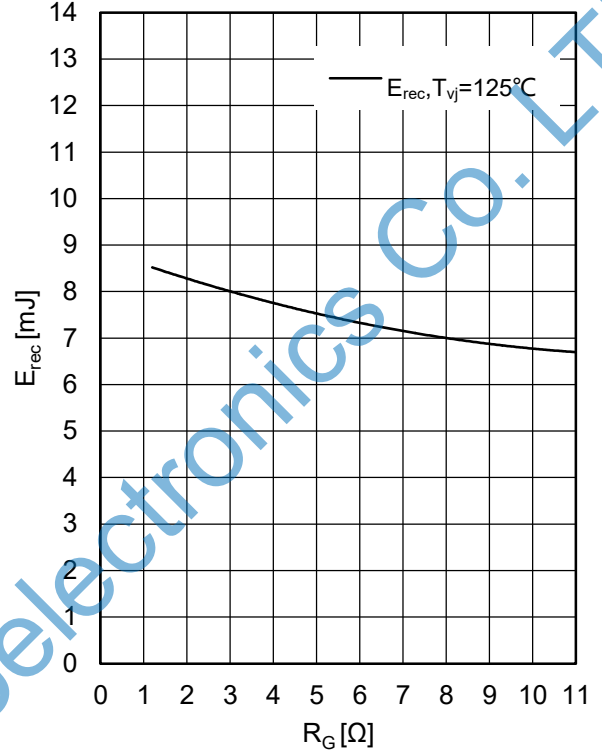


Fig 10. Switching losses Diode

$$E_{rec} = f(R_G)$$

$I_F = 150A, V_{CE} = 600V$



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