IGBT Modules
FZ2400R17HE4P_B9

IHM-B module with fast Trench/Fieldstop IGBT4 and Emitter Controlled diode and pre-applied Thermal Interface Material

01

Typical Applications

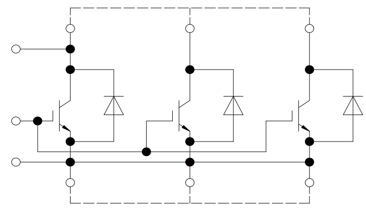
- High power converters
- Motor drives

Electrical Features

- Extended operating temperature $T_{vj\,op}$
- Low switching losses
- Low V_{CEsat}
- $T_{vj\,op}$ = 150°C

Mechanical Features

- 4 kV AC 1min insulation
- Package with CTI > 400
- High creepage and clearance distances
- High power density
- IHM B housing
- Copper base plate
- RoHS compliant
- Pre-applied Thermal Interface Material



external connection
(to be done)

V_{CES} = 1700V
$I_{C\,nom}$ = 2400A / I_{CRM} = 4800A

IGBT, Inverter

Maximum Rated Values

Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	1700	V
Continuous DC collector current	T_H = 80°C, $T_{vj\,max}$ = 175°C	$I_{C\,nom}$	2400	A
Repetitive peak collector current	t_p = 1 ms	I_{CRM}	4800	A
Gate-emitter peak voltage		V_{GES}	+/-20	V

Diode, Inverter

Maximum Rated Values

Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1700	V
Continuous DC forward current		I_F	2400	A
Repetitive peak forward current	t_p = 1 ms	I_{FRM}	4800	A
I^2t-value	V_R = 0 V, t_p = 10 ms, T_{vj} = 125°C	I^2t	1000	kA^2s
	V_R = 0 V, t_p = 10 ms, T_{vj} = 150°C		940	kA^2s

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Characteristic Values

Parameter	Test Conditions		Symbol	min.	typ.	max.	Unit
Collector-emitter saturation voltage	$I_c = 2400$ A, $V_{GE} = 15$ V	$T_{vj} = 25°C$	$V_{CE\ sat}$		1.95	2.3	V
	$I_c = 2400$ A, $V_{GE} = 15$ V	$T_{vj} = 125°C$			2.35	2.75	V
	$I_c = 2400$ A, $V_{GE} = 15$ V	$T_{vj} = 150°C$			2.45	2.9	V
Gate threshold voltage	$I_c = 96{,}0$ mA, $V_{CE} = V_{GE}$, $T_{vj} = 25°C$		$V_{GE(th)}$	5.20	5.8	6.4	V
Gate charge	$V_{GE} = -15$ V ... +15 V		Q_G		25		μC
Internal gate resistor	$T_{vj} = 25°C$		R_{Gint}		0.65		Ω
Input capacitance	f = 1 MHz, $T_{vj} = 25°C$, $V_{CE} = 25$ V, $V_{GE} = 0$ V		C_{ies}		195		nF
Reverse transfer capacitance	f = 1 MHz, $T_{vj} = 25°C$, $V_{CE} = 25$ V, $V_{GE} = 0$ V		C_{res}		6.3		nF
Collector-emitter cut-off current	$V_{CE} = 1700$ V, $V_{GE} = 0$ V, $T_{vj} = 25°C$		I_{CES}			5.0	mA
Gate-emitter leakage current	$V_{CE} = 0$ V, $V_{GE} = 20$ V, $T_{vj} = 25°C$		I_{GES}			400	nA
Turn-on delay time, inductive load	$I_c = 2400$ A, $V_{CE} = 900$ V	$T_{vj} = 25°C$	$t_{d\ on}$		0.46		μs
	$V_{GE} = \pm 15$ V	$T_{vj} = 125°C$			0.5		μs
	$R_{Gon} = 0{,}8\ \Omega$	$T_{vj} = 150°C$			0.53		μs
Rise time, inductive load	Ic = 2400 A, VCE = 900 V	$T_{vj} = 25°C$	t_r		0.21		μs
	VGE = ±15 V	$T_{vj} = 125°C$			0.22		μs
	$R_{Gon} = 0{,}8\ \Omega$	$T_{vj} = 150°C$			0.23		μs
Turn-off delay time, inductive load	$I_c = 2400$ A, $V_{CE} = 900$ V	$T_{vj} = 25°C$	$t_{d\ off}$		1.40		μs
	$V_{GE} = \pm 15$ V	$T_{vj} = 125°C$			1.55		μs
	$R_{Goff} = 0{,}8\ \Omega$	$T_{vj} = 150°C$			1.60		μs
Fall time, inductive load	$I_c = 2400$ A, $V_{CE} = 900$ V	$T_{vj} = 25°C$	t_f		0.16		μs
	$V_{GE} = \pm 15$ V	$T_{vj} = 125°C$			0.41		μs
	$R_{Goff} = 0{,}8\ \Omega$	$T_{vj} = 150°C$			0.50		μs
Turn-on energy loss per pulse	$I_c = 2400$ A, $V_{CE} = 900$ V, $L_S = 50$ nH	$T_{vj} = 25°C$	E_{on}		510		mJ
	$V_{GE} = \pm 15$ V, di/dt = 11500 A/μs ($T_{vj} = 150°C$)	$T_{vj} = 125°C$			620		mJ
	$R_{Gon} = 0{,}8\ \Omega$	$T_{vj} = 150°C$			650		mJ

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Turn-off energy loss per pulse	I_c = 2400 A, V_{CE} = 900 V, L_S = 50 nH	T_{vj} = 25°C	E_{off}		630		mJ
	V_{GE} = ±15 V, du/dt = 2500 V/µs (T_{vj} = 150°C)	T_{vj} = 125°C			920		mJ
	R_{Goff} = 0,8 Ω	T_{vj} = 150°C			1000		mJ
SC data	V_{GE} ≤ 15 V, V_{CC} = 1000 V V_{CEmax} = V_{CES} -L_{SCE} · di/dt	t_P ≤ 10 µs, T_{vj} = 150°C	I_{sc}		11000		A
Thermal resistance, junction to heatsink	pro IGBT / per IGBT valid with IFX pre-applied thermal interface material		R_{thJH}			13.1	K/kW
Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

Characteristic Values

Parameter	Test Conditions		Symbol	min.	typ.	max.	Unit
Forward voltage	I_F = 2400 A, V_{GE} = 0 V	T_{vj} = 25°C	V_F		1.80	2.20	V
	I_F = 2400 A, V_{GE} = 0 V	T_{vj} = 125°C			1.90	2.30	V
	I_F = 2400 A, V_{GE} = 0 V	T_{vj} = 150°C			1.95	2.40	V
Peak reverse recovery current	I_F = 2400 A, -di_F/dt = 11500 A/µs (T_{vj}=150°C)	T_{vj} = 25°C	I_{RM}		1950		A
	V_R = 900 V	T_{vj} = 125°C			2450		A
	V_{GE} = -15 V	T_{vj} = 150°C			2600		A
Recovered charge	I_F = 2400 A, -di_F/dt = 11500 A/µs (T_{vj}=150°C)	T_{vj} = 25°C	Q_r		530		µC
	V_R = 900 V	T_{vj} = 125°C			960		µC
	V_{GE} = -15 V	T_{vj} = 150°C			1100		µC
Reverse recovery energy	I_F = 2400 A, -di_F/dt = 11500 A/µs (T_{vj}=150°C)	T_{vj} = 25°C	E_{rec}		330		mJ
	V_R = 900 V	T_{vj} = 125°C			660		mJ
	V_{GE} = -15 V	T_{vj} = 150°C			790		mJ
Thermal resistance, junction to heatsink	per diode valid with IFX pre-applied thermal interface material		R_{thJH}			20.2	K/kW
Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

Module

Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	4.0	kV
Material of module baseplate			Cu	
Internal isolation	basic insulation (class 1, IEC 61140)		Al_2O_3	
Creepage distance	terminal to heatsink		32.2	mm
	terminal to terminal		32.2	mm
Clearance	terminal to heatsink		19.1	mm
	terminal to terminal		19.1	mm
Comparative tracking index		CTI	> 400	

Parameter	Test Conditions	Symbol	min.	typ.	max.	Unit
Stray inductance module		L_{SCE}		6.0		nH
Module lead resistance, terminals-chip	T_H = 25°C, per switch	$R_{CC'+EE'}$		0.10		mΩ
Storage temperature		T_{stg}	-40		125	°C
Maximum baseplate operation temperature		T_{BPmax}			125	°C
Mounting torque for modul mounting	Screw M6 - Mounting according to valid application note	M	4.25		5.75	Nm
Terminal connection torque	Screw M4 - Mounting according to valid application note	M	1.8	-	2.1	Nm
	Screw M8 - Mounting according to valid application note		8.0	-	10	Nm
Weight		G		1900		g

Storage and shipment of modules with TIM according to AN2012-07

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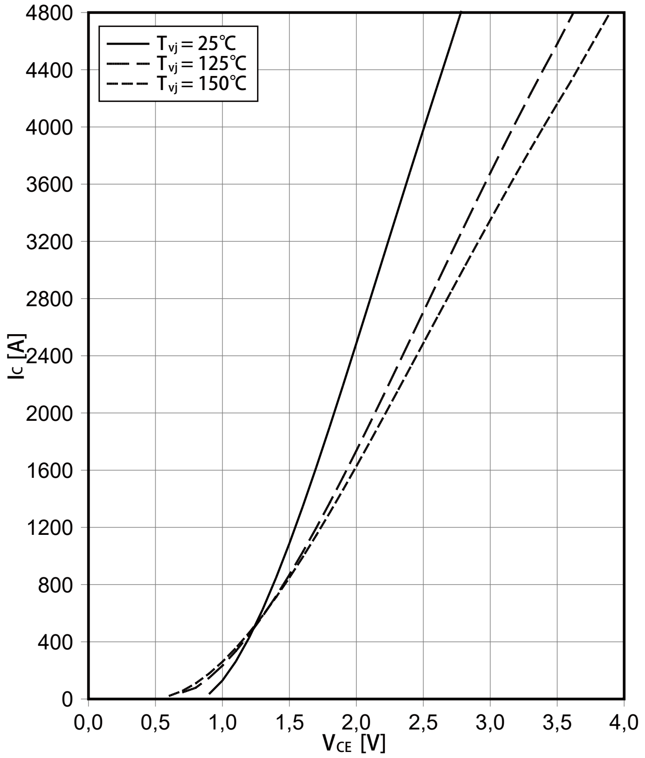
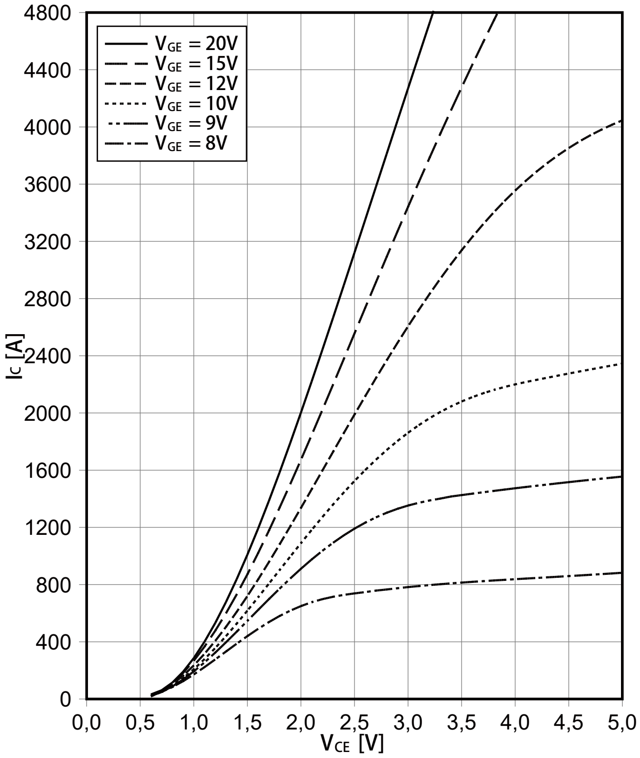
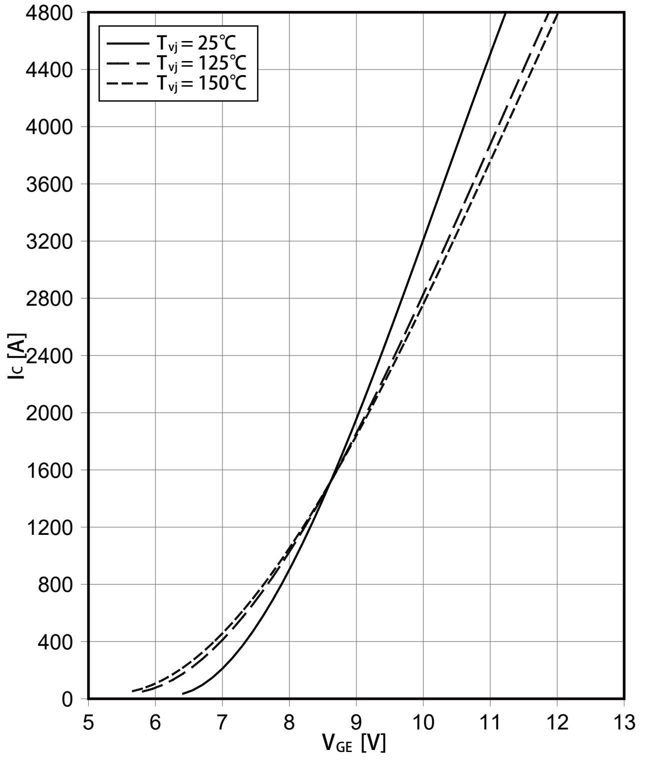
output characteristic IGBT,Inverter (typical)
$I_c = f(V_{CE})$
$V_{GE} = 15\ V$



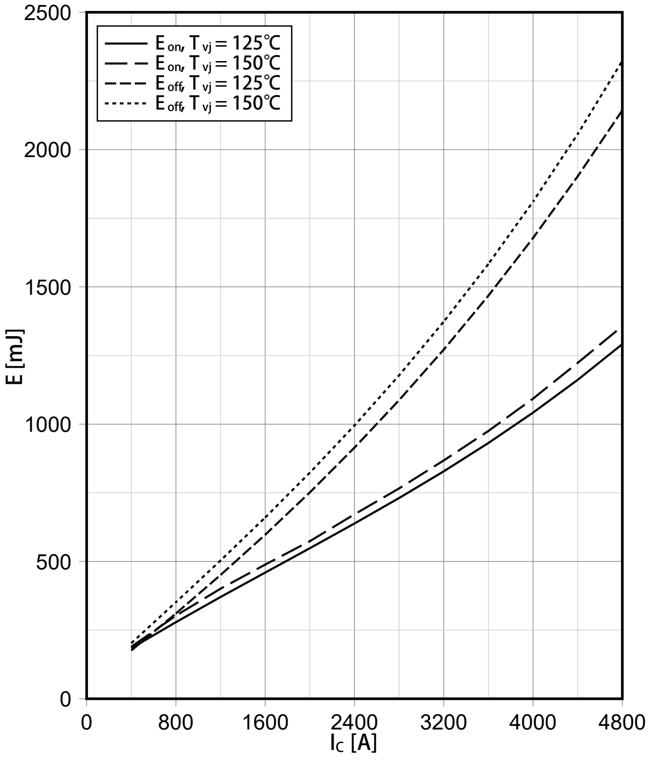
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$T_{vj} = 150°C$



transfer characteristic IGBT,Inverter (typical)
$I_C = f(V_{GE})$
$V_{CE} = 20\ V$



switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$V_{GE} = \pm 15\ V$, $R_{Gon} = 0.8\ \Omega$, $R_{Goff} = 0.8\ \Omega$, $V_{CE} = 900\ V$



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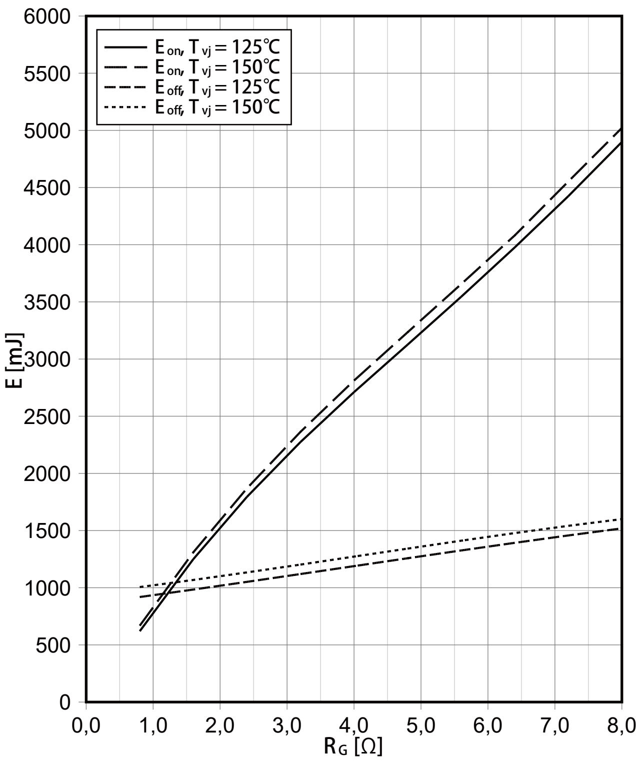
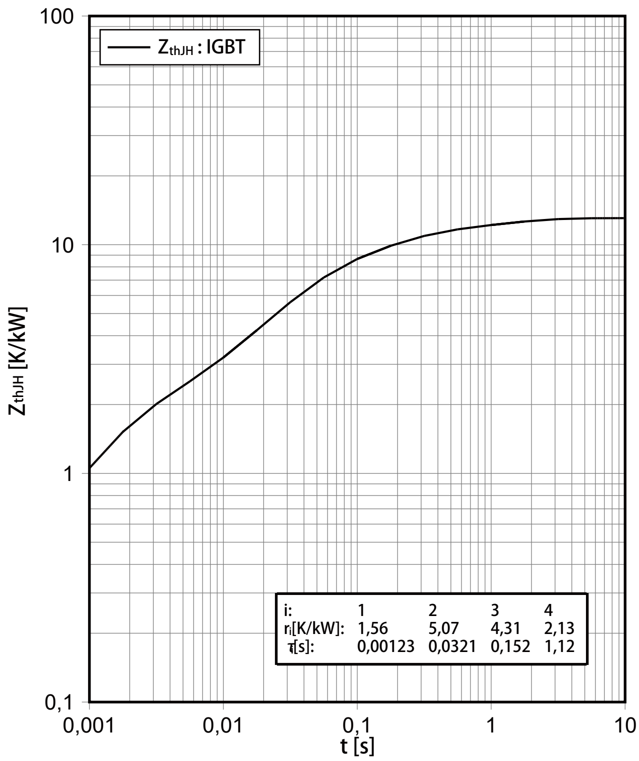
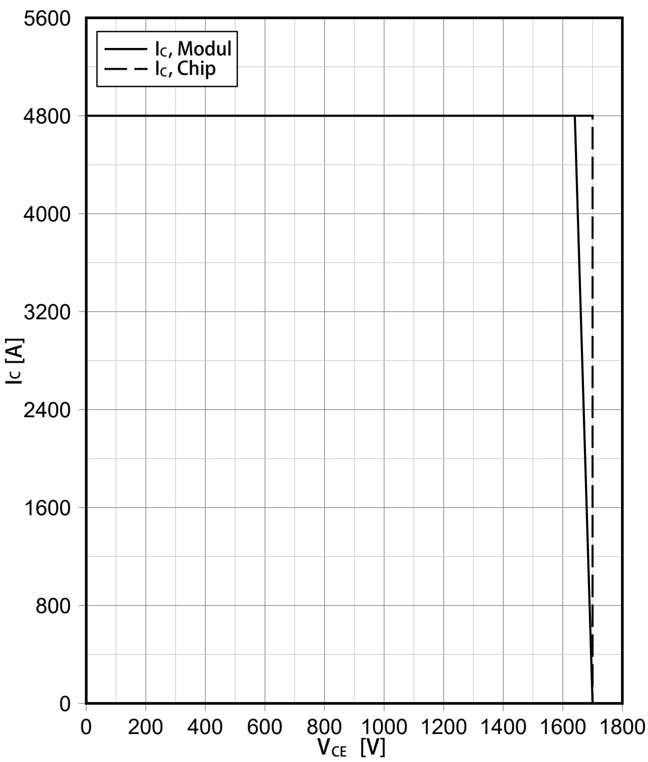
switching losses IGBT,Inverter (typical)
$E_{on} = f\,(R_G)$, $Eoff = f\,(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 2400$ A, $V_{CE} = 900$ V



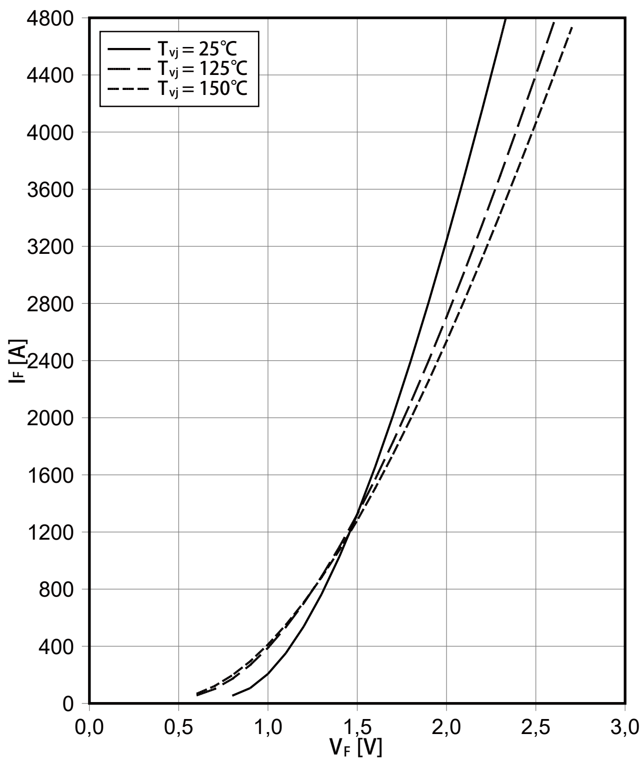
transient thermal impedance IGBT,Inverter
$Z_{thJH} = f\,(t)$



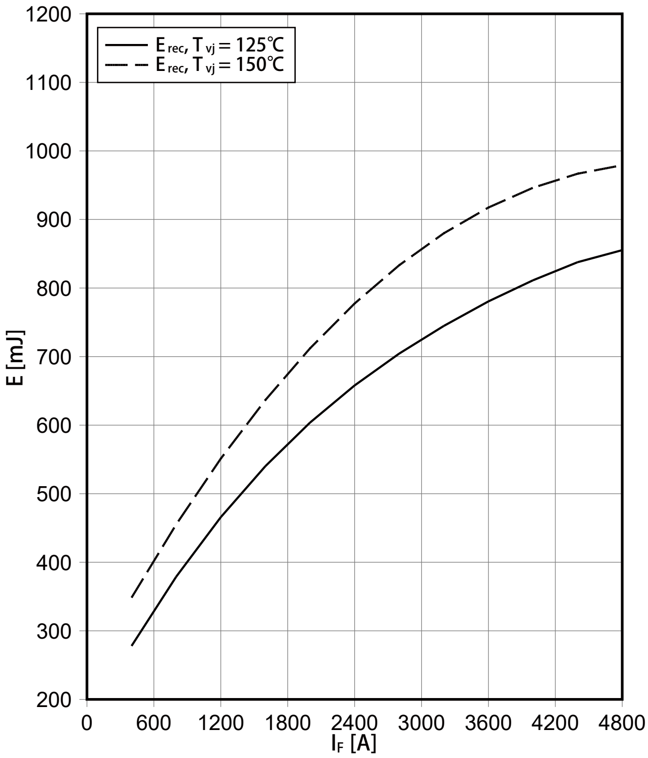
reverse bias safe operating area IGBT,Inverter (RBSOA)
$I_C = f\,(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 0.8\ \Omega$, $T = 150°C$



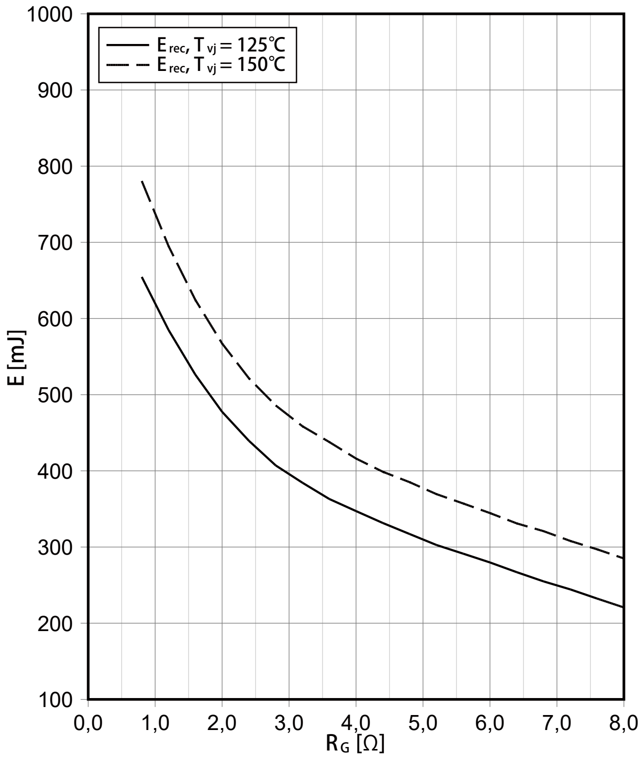
forward characteristic of Diode, Inverter (typical)
$I_F = f\,(V_F)$



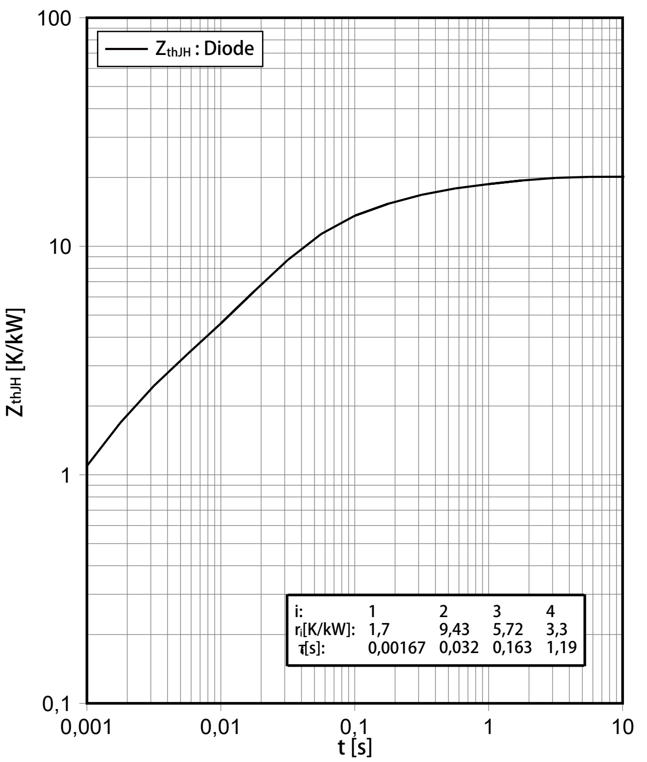
switching losses Diode, Inverter (typical)
$E_{rec} = f\ (I_F)$
$R_{Gon} = 0.8\ \Omega$, $V_{CE} = 900\ V$



switching losses Diode, Inverter (typical)
$E_{rec} = f\ (R_G)$
$I_F = 2400\ A$, $V_{CE} = 900\ V$



transient thermal impedance Diode, Inverter
$Z_{thJH} = f\ (t)$



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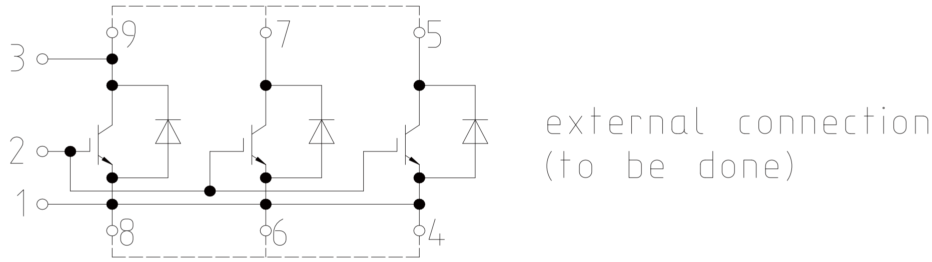
Circuit diagram



Package outlines