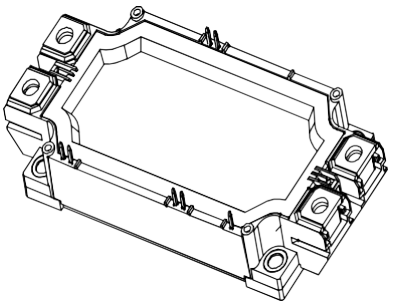
Econodual Module
1700V,600A
ED600X17T7A



PIM11, 152.00 x 62.15 x 20.80
CASE 180HT

General Description

Kunsemi IGBT power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS. Additionally, IGBT and copacked soft diode deliver a low power loss operation and soft switching simultaneously, which helps to improve overall system efficiency in applications.

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10us short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low Inductive Design
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterrupible power supply
- Wind Turbines

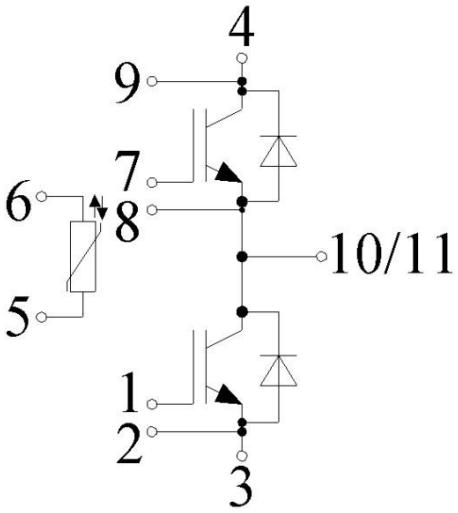
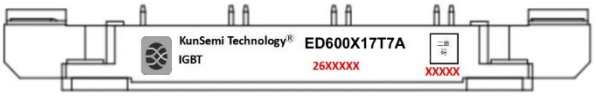
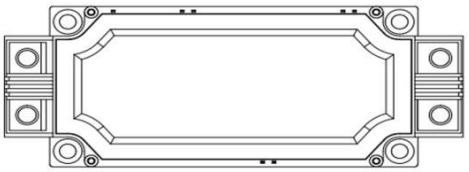


Figure 1. Schematic

MARKING DIAGRAM



PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
ED600X17T7A	Ecodual3

PIN DESCRIPTION

Pin	Name	Description
1	G2	T2 Gate
2	S2	T2 Emitter Sensing
3	DC-	DC Negative Bus Connection
4	DC+	DC Positive Bus Connection
5	TH2	Thermistor Connection 2
6	TH1	Thermistor Connection 1
7	G1	T1 Gate
8	S1	T1 Emitter Sensing
9	DS1	T1 Collector Sensing
10	OUT	Center Point of Half Bridge
11	OUT	Center Point of Half Bridge

IGBT,Inverter

Parameter	Test Conditions	Symbol	Value	Unit

Maximum Rated Values

Collector-emitter voltage	T_{vj} = 25℃	V_{CES}	1700	V
Implemented collector current		I_{CN}	600	A
Repetitive peak collector current	t_p = 1ms	I_{CRM}	1200	A
Total power dissipation	T_F = 25℃,$T_{vj\ max}$ = 175℃	P_{tot}	3570	W
Gate-emitter peak voltage		V_{GES}	±20	V

ELECTRICAL CHARACTERISTICS (T_{vj} = 25℃ unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 600A	T_{vj} = 25℃	V_{CEsat}	-	1.65	2.0	V
	V_{GE} = 15V, I_C = 600A	T_{vj} = 125℃		-	1.85	-	
	V_{GE} = 15V, I_C = 600A	T_{vj} = 150℃		-	2.05	-	
Gate−Source Threshold Voltage	V_{GE} = V_{CE}, I_C = 30mA	T_{vj} = 25℃	V_{GEth}	5.0	6.15	7.5	V
Gate charge	V_{GE} = -15V...15V, V_{CE} = 30V		Q_G	-	4.5	-	uC
Gate Resistance	V_{GS} = 0V, f = 100KHz	T_{vj} = 25℃	R_{Gint}	-	1.4	-	Ω
Input Capacitance	f = 100KHz,V_{CE} = 25V, V_{GE} = 0V	T_{vj} = 25℃	C_{ies}	-	45.9	-	nF
Output Capacitance			C_{oes}	-	2.66	-	nF
Reverse Transfer Capacitance			C_{res}	-	1.40	-	nF
Collector-emitter cut-off current	V_{CE} = 1700V,V_{GE} = 0V	T_{vj} = 25℃	I_{CES}	-	-	1	mA
	V_{CE} = 1700V,V_{GE} = 0V	T_{vj} = 175℃		-	-	13	
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V	T_{vj} = 25℃	I_{GES}	-0.5	-	0.5	uA
Turn-on delay time, inductive load	V_{CE} = 900V, I_C = 600A, V_{GE} = ±15V, R_G = 1.5 Ω, Ls = 35nH	T_{vj} = 25℃	$T_{d(on)}$	-	105	-	ns
		T_{vj} = 125℃		-	130	-	ns
		T_{vj} = 175℃		-	150	-	ns
Rise time, inductive load	V_{CE} = 900V, I_C = 600A, V_{GE} = ±15V, R_G = 1.5 Ω, Ls = 35nH	T_{vj} = 25℃	t_r	-	52	-	ns
		T_{vj} = 125℃		-	58	-	ns
		T_{vj} = 175℃		-	62	-	ns
Turn-off delay time, inductive load	V_{CE} = 900V, I_C = 600A, V_{GE} = ±15V, R_G = 1.5 Ω, Ls = 35nH	T_{vj} = 25℃	$T_{d(off)}$	-	590	-	ns
		T_{vj} = 125℃		-	720	-	ns
		T_{vj} = 175℃		-	775	-	ns
Fall time, inductive load	V_{CE} = 900V, I_C = 600A, V_{GE} = ±15V, R_G = 1.5 Ω, Ls = 35nH	T_{vj} = 25℃	t_f	-	360	-	ns
		T_{vj} = 125℃		-	570	-	ns
		T_{vj} = 175℃		-	660	-	ns
Turn-on energy loss per pulse	V_{CE} = 900V, I_C = 600A, V_{GE} = ±15V, R_G = 1.5 Ω, Ls = 35nH	T_{vj} = 25℃	E_{on}	-	164	-	mJ
		T_{vj} = 125℃		-	223	-	mJ
		T_{vj} = 175℃		-	261	-	mJ
Turn-off energy loss per pulse	V_{CE} = 900V, I_C = 600A, V_{GE} = ±15V, R_G = 1.5 Ω, Ls = 35nH	T_{vj} = 25℃	E_{off}	-	133	-	mJ
		T_{vj} = 125℃		-	192	-	mJ
		T_{vj} = 175℃		-	216	-	mJ
SC data	V_{GE} = 15V,V_{CC} = 1200V, $V_{CEM\ Chip}$ ≤ 1700V, t_p ≤ 10us	T_{vj} = 175℃	I_{SC}	-	2300	-	A
Thermal resistance, junction to cooling fluid	per IGBT; ΔV/Δt = 10 dm³/min, T_F = 75°C		R_{thJF}	-	0.042	-	K/W

Diode,Inverter

Parameter	Test Conditions	Symbol	Value	Unit

Maximum Rated Values

Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1700	V
Implemented forward current		I_{FN}	600	A
Repetitive peak forward current	t_p = 1ms	I_{FRM}	1200	A

ELECTRICAL CHARACTERISTICS (T_{vj} = 25°C unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Forward voltage	V_{GE} = 0V, I_C = 600A	T_{vj} = 25°C	V_F	-	1.7	2.15	V
	V_{GE} = 0V, I_C = 600A	T_{vj} = 125°C		-	1.9	-	
	V_{GE} = 0V, I_C = 600A	T_{vj} = 175°C		-	1.95	-	
Peak reverse recovery current	V_R = 900V, I_R = 600A, V_{GE} = −15V, R_G = 1.5Ω, Ls = 35nH, -di/dt = 10200A/us(T_{vj} = 175°C)	T_{vj} = 25°C	I_{RM}	-	635	-	A
		T_{vj} = 125°C		-	627	-	
		T_{vj} = 175°C		-	612	-	
Recovered charge	V_R = 900V, I_R = 600A, V_{GE} = −15V, R_G = 1.5Ω, Ls = 35nH, -di/dt = 10200A/us(T_{vj} = 175°C)	T_{vj} = 25°C	Q_r	-	149	-	uC
		T_{vj} = 125°C		-	224	-	
		T_{vj} = 175°C		-	272	-	
Reverse recovery energy	V_R = 900V, I_R = 600A, V_{GE} = −15V, R_G = 1.5Ω, Ls = 35nH, -di/dt = 10200A/us(T_{vj} = 175°C)	T_{vj} = 25°C	E_{rec}	-	75	-	mJ
		T_{vj} = 125°C		-	124	-	
		T_{vj} = 175°C		-	153	-	
Thermal resistance, junction to cooling fluid	per diode; ΔV/Δt = 10 dm³/min, T_F = 75°C		R_{thJF}	-	0.073	-	K/W

NTC

Rated Resistance	R_{25}			5.0		kΩ
Deviation of R_{100}	ΔR/R	T_C = 100°C, R_{100} = 493.3Ω	5		5	%
Power Dissipation	P_{25}				20.0	mW
B-value	$B_{25/50}$	$R_2 = R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K

MODULE

Storage Temperature Range	Tstg	−40 to 125	°C
Module Operating Junction Temperature	T_{vj}	−40 to 175	°C
Isolation Test Voltage, t = 1s, 50 Hz	V_{iso}	3400	V_{RMS}
Terminal Connection Torque:Screw M6	M	3.0~6.0	N.m
Mounting Torque:Screw M6	M	3.0~6.0	N.m
Stray Inductance	L_{sCE}	20	nH
Weight of Module	G	350	g

TYPICAL CHARACTERISTIC

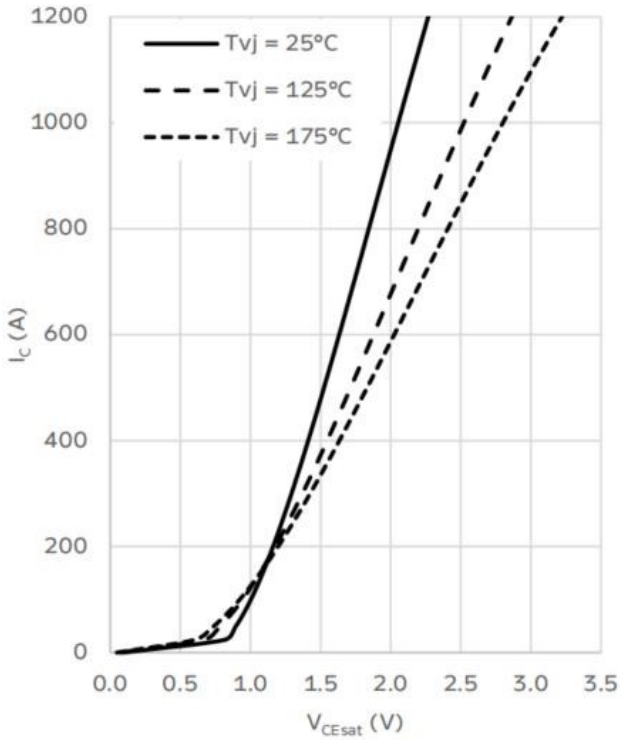


Figure 2. IGBT Typical Output Characteristic(V_{GE}=15V)

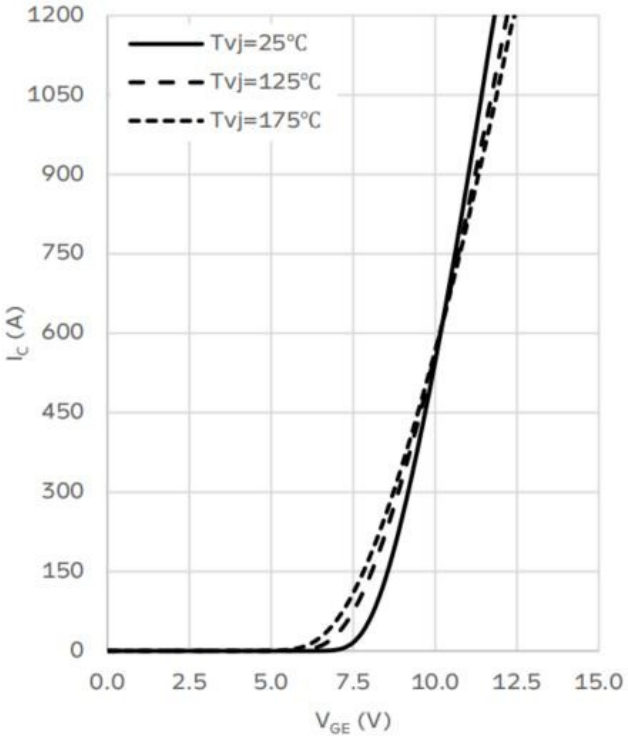


Figure 3. IGBT Typical Output Characteristic(V_{GE}=20V)

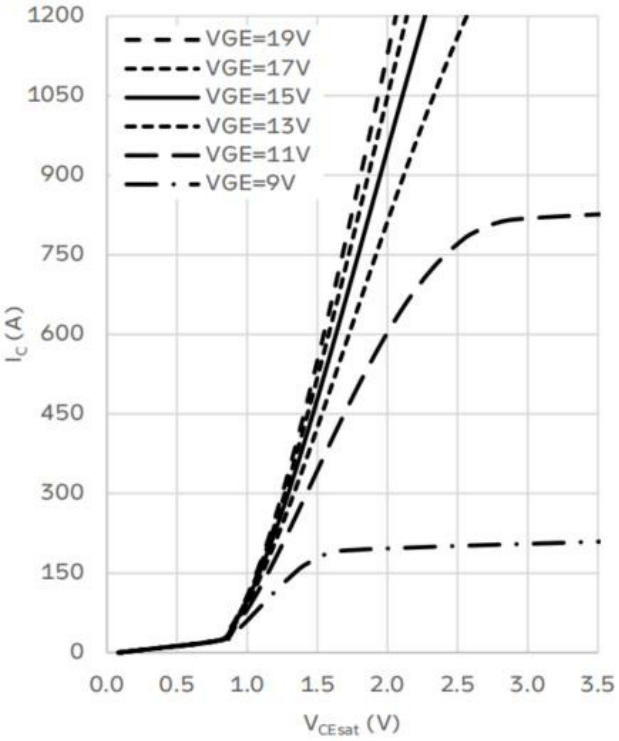


Figure 4. IGBT Typical Output Characteristic(T_{vj}=25℃)

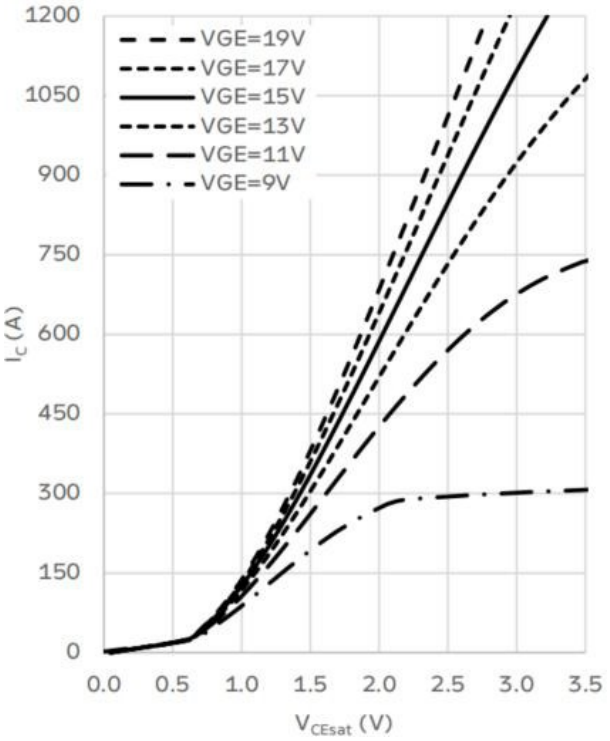


Figure 5. IGBT Typical Output Characteristic(T_{vj}=175℃)

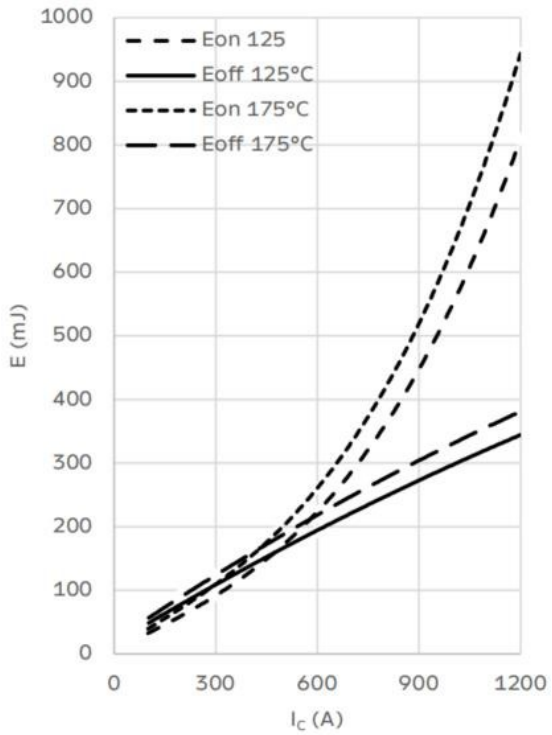


Figure 6. IGBT Switching losses vs. I_C
V_{CE}=900V,R_g=1.5Ω,V_{GE}=±15V

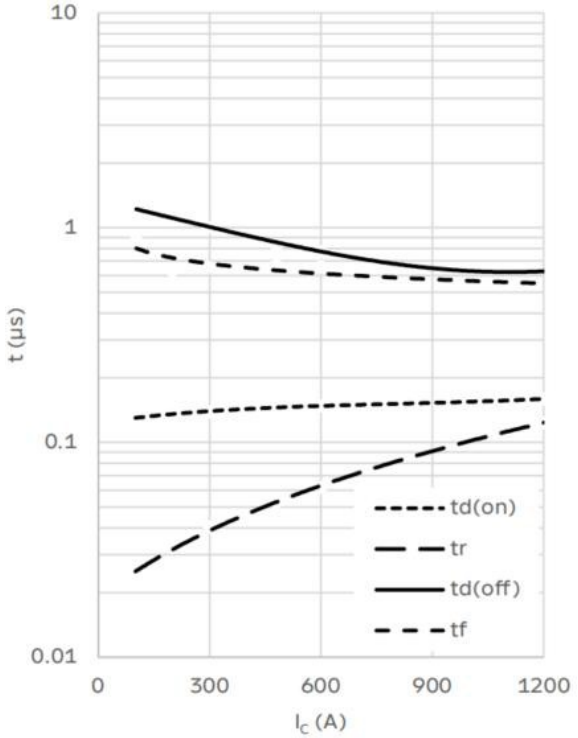


Figure 7. IGBT Switching losses vs. I_C
V_{CE}=900V,R_g=1.5Ω,V_{GE}=±15V,T_{vj}=175℃

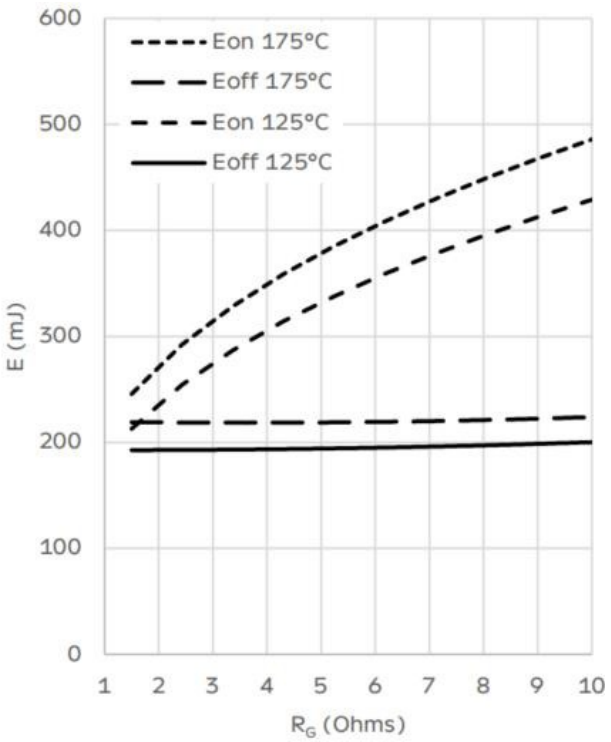


Figure 8. IGBT Switching losses vs. R_G
V_{CE}=900V,I_C=600A,V_{GE}=±15V

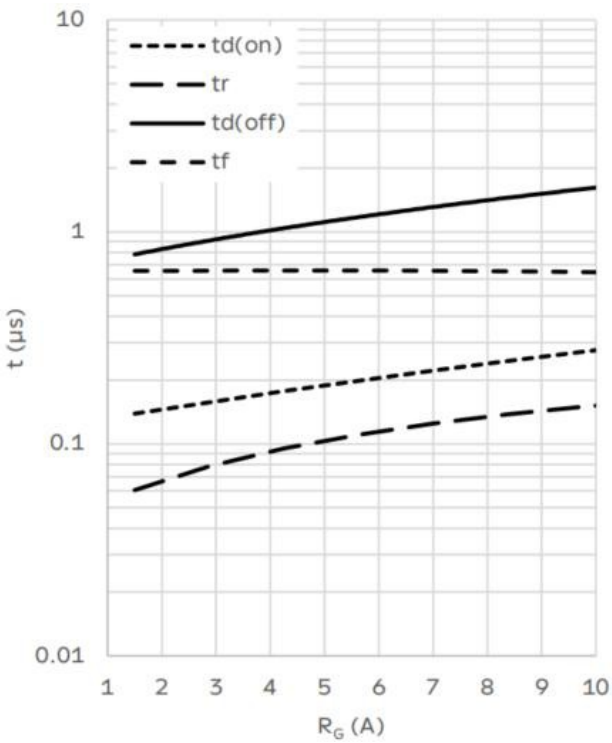


Figure 9. IGBT Switching losses vs. R_G
V_{CE}=900V,I_C=600A,V_{GE}=±15V,T_{vj}=175℃

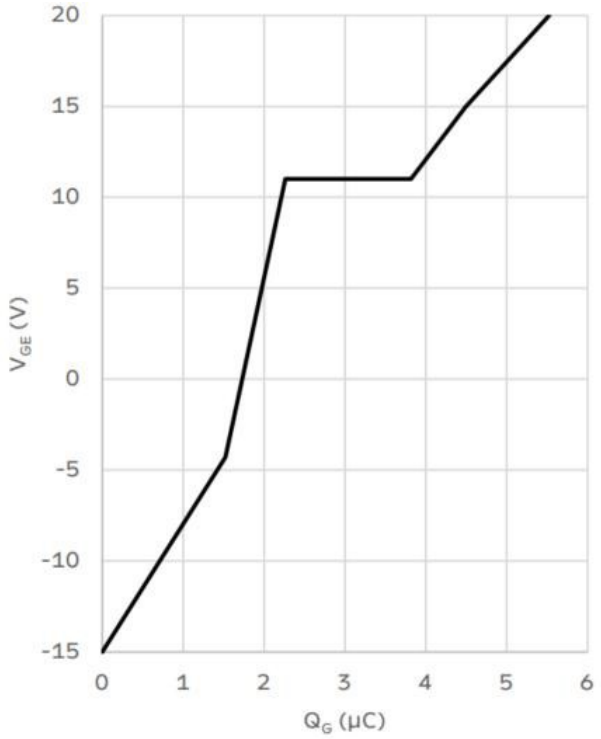


Figure 10. IGBT gate charge (typical)

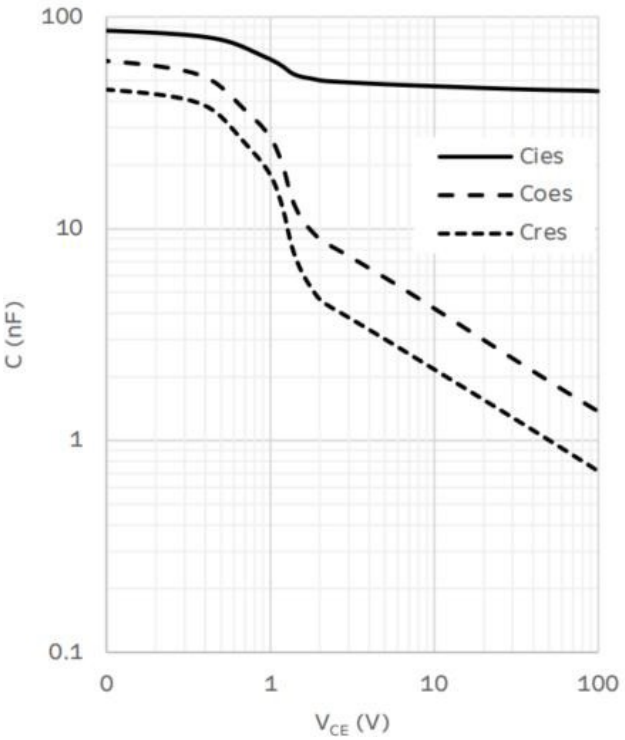


Figure 11. Capacitance characteristics (typical)

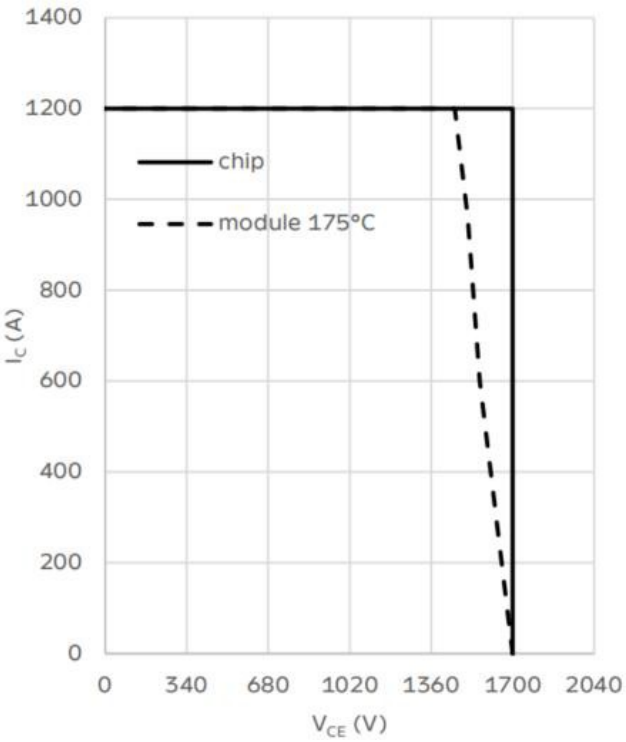


Figure 12. IGBT RBSOA
R_{Goff}=1.5Ω,V_{GE}=±15V

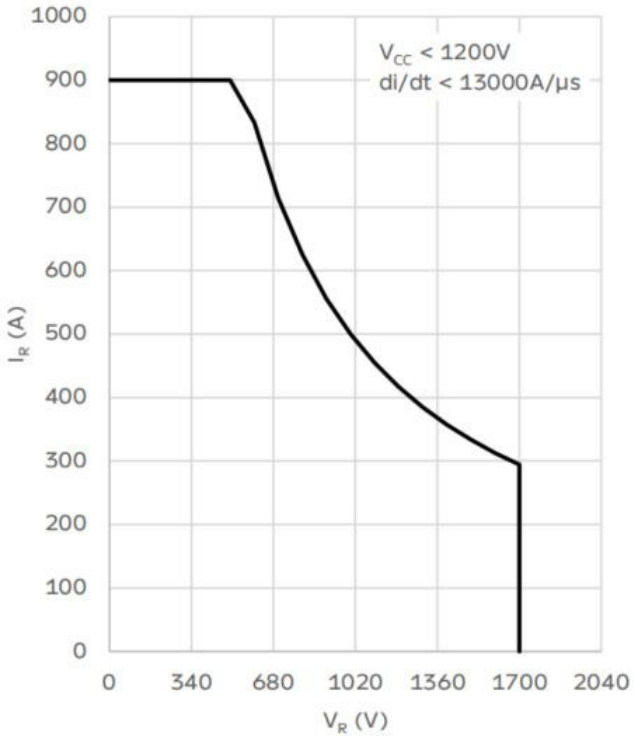


Figure 13. Diode SOA
T_{vj}≤175℃

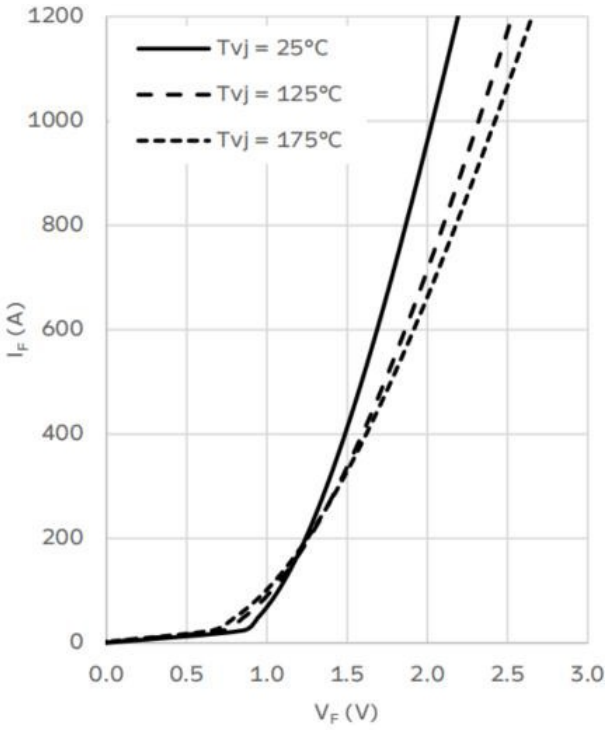


Figure 14. Diode forward characteristic (typical)

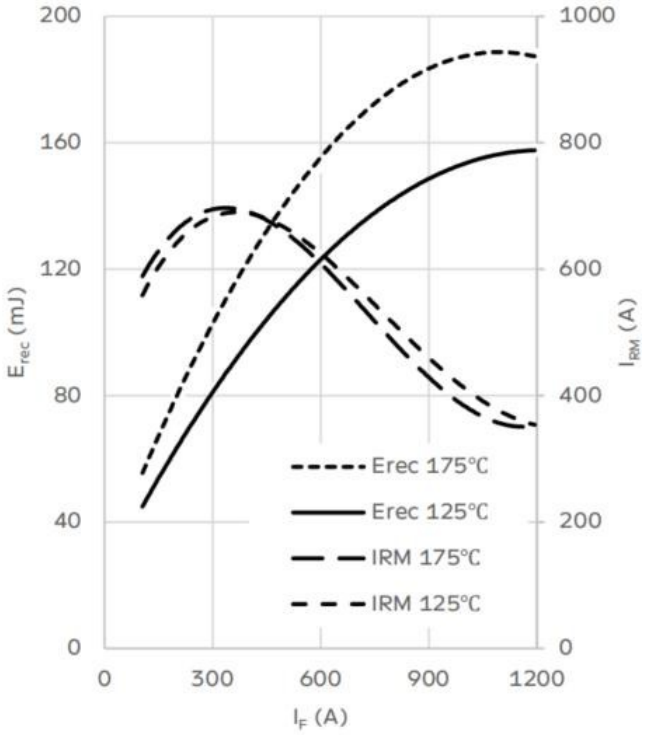


Figure 15. Diode switching characteristics (typical)

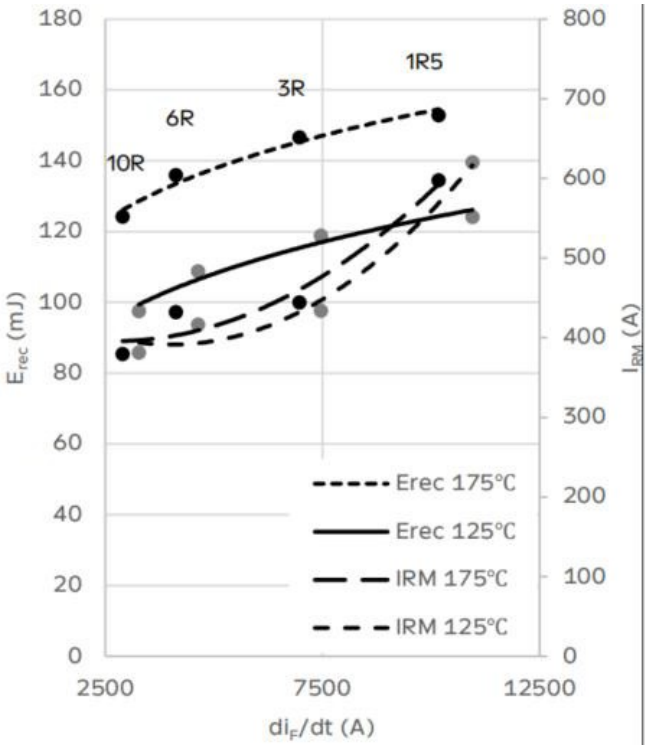
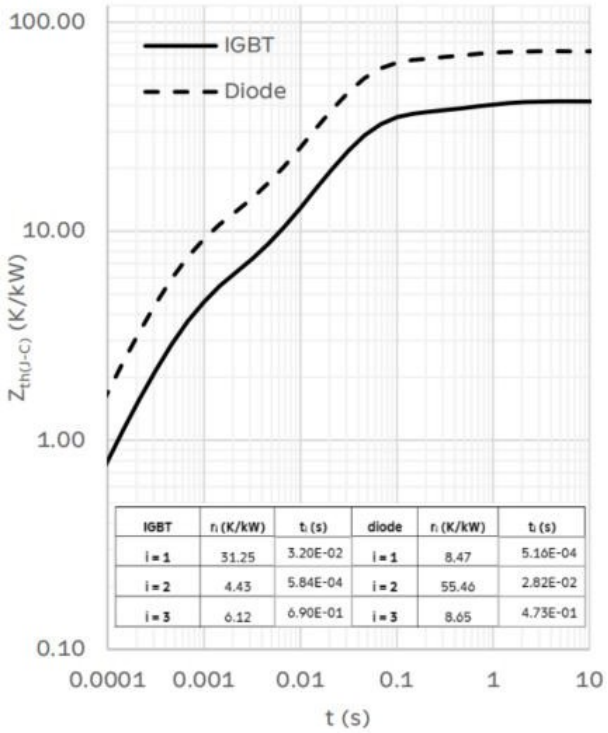


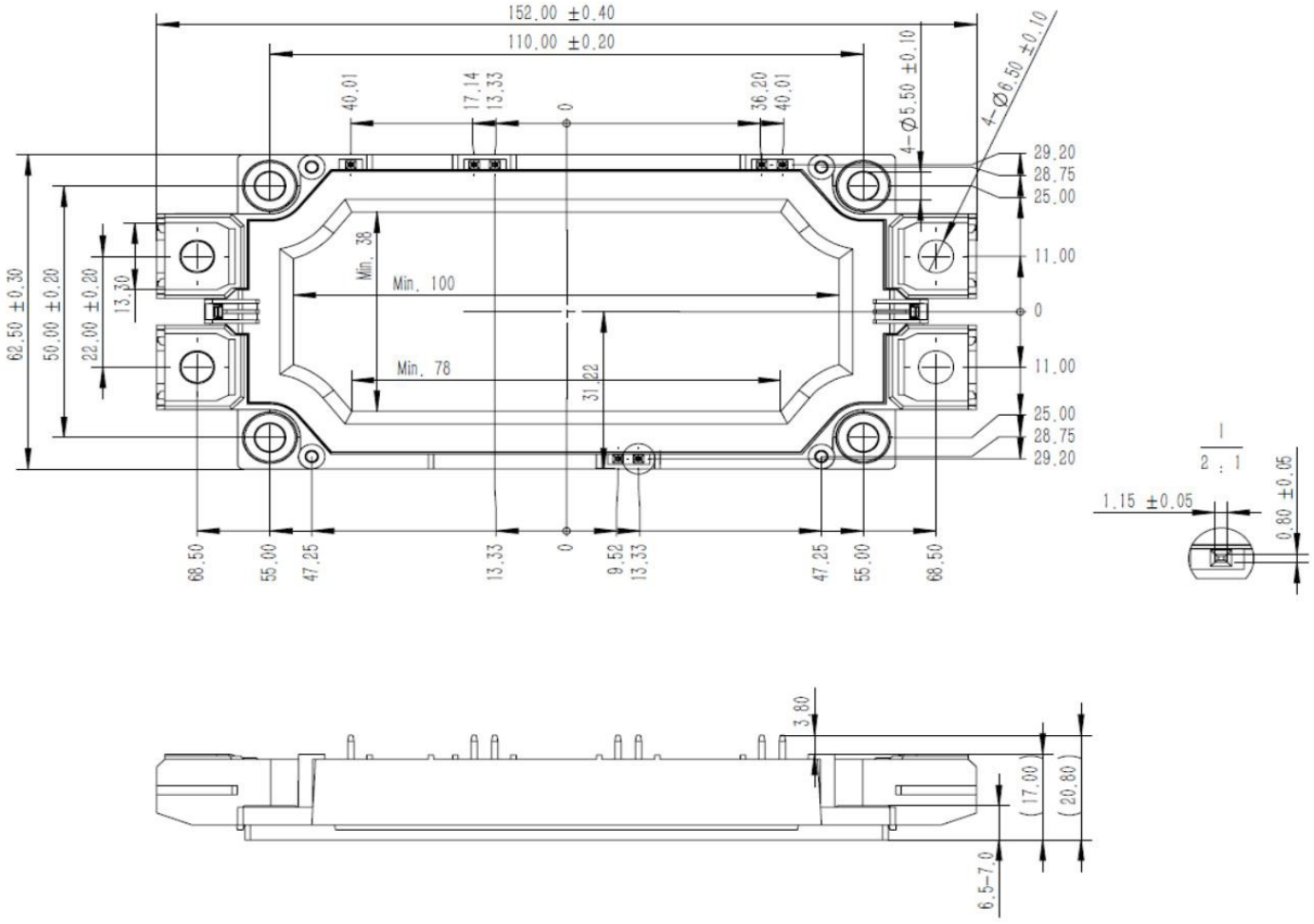
Figure 16. Diode switching characteristics (typical)



IGBT	r_i (K/kW)	τ_i (s)	diode	r_i (K/kW)	τ_i (s)
i = 1	31.25	3.20E-02	i = 1	8.47	5.16E-04
i = 2	4.43	5.84E-04	i = 2	55.46	2.82E-02
i = 3	6.12	6.90E-01	i = 3	8.65	4.73E-01

Figure 17. Thermal impedance (typical)

Package Drawing



UNIT:mm