DATASHEET

SISD0600ED170i20_A01

ED-Type phase leg IGBT module

V_{CE} = 1700 V
I_C = 2 x 600 A

- *i20* ultra-low loss fine pattern Trench IGBT chipset
- Baseplate isolation with reinforced Al_2O_3 ceramic
- Cu baseplate for low thermal resistance
- Improved Package with reduced internal impedance and terminal heating

Maximum ratings[1]

PARAMETER	SYMBOL	CONDITIONS	MIN	MAX	UNIT
Collector-emitter voltage	V_{CES}	V_{GE} = 0 V, T_{vj} = 25 °C		1700	V
DC collector current	I_C	T_C = 115 °C, T_{vj} = 175 °C		600	A
Peak collector current	I_{CM}	t_p = 1 ms		1200	A
Gate-emitter voltage	V_{GES}		-20	20	V
Total power dissipation	P_{tot}	T_C = 25 °C, T_{vj} = 175 °C, per switch		3570	W
DC forward current	I_F			600	A
Peak forward current	I_{FRM}	t_p = 1 ms		1200	A
Surge current	I_{FSM} I^2t	V_R = 0 V, T_{vj} = 150 °C, t_p = 10 ms, half-sinewave		2750 37500	A A^2s
Isolation voltage	V_{isol}	1 min, f = 50 Hz		3400	V
Junction operating temperature	$T_{vj(op)}$		-40	175[2]	°C
Case temperature	T_C		-40	125[3]	°C
Storage temperature	T_{stg}		-40	125	°C
Mounting torques [4]	M_S	Base-heatsink, M5 screws	3	6	Nm
	M_{t1}	Main terminals, M6 screws	3	6	Nm

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[1] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747;
[2] $T_{vj(op)}$ > 150°C allowed for overload conditions, in maximum for 60s and less than 20% of operation time
[3] For UL1557 compliance T_{Cmax} must be limited to 125°C
[4] For details, please refer to the mounting instructions.

IGBT[5]

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Collector(-emitter) breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 1 mA, T_{vj} = 25°C		1700			V
Collector-emitter saturation voltage [6]	V_{CEsat}	I_c = 600 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.65	2.0	V_{CEsat}
			T_{vj} = 125 °C		1.85		V
			T_{vj} = 175 °C		2.05		V
Collector cut-off current	I_{CES}	V_{CE} = 1700 V, V_{GE} = 0 V	T_{vj} = 25 °C			1	I_{CES}
			T_{vj} = 125 °C		0.8		mA
			T_{vj} = 175 °C		13		mA
Gate leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V		-0.5		0.5	µA
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 30 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		5	6.15	7.5	V
Gate charge	Q_G	I_C = 600 A, V_{CE} = 900 V, V_{GE} = -15 V .. 15 V			4.5		µC
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz, T_{vj} = 25 °C			45.9		nF
Output capacitance	C_{oes}				2.66		nF
Reverse tansfer capacitance	C_{res}				1.40		nF
Internal gate resistor	R_{Gint}	Per switch, f = 1 MHz, V_{GE} = 0V, CE short			1.4		Ω
Turn-on delay time	$t_{d(on)}$	V_{CC} = 900 V, I_C = 600 A, R_G = 1.5 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		105		$t_{d(on)}$
			T_{vj} = 125 °C		130		ns
			T_{vj} = 175 °C		150		ns
Rise time	t_r		T_{vj} = 25 °C		52		t_r
			T_{vj} = 125 °C		58		ns
			T_{vj} = 175 °C		62		ns
Turn-off delay time	$t_{d(off)}$	V_{CC} = 900 V, I_C = 600 A, R_G = 1.5 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		590		$t_{d(off)}$
			T_{vj} = 125 °C		720		ns
			T_{vj} = 175 °C		775		ns
Fall time	t_f		T_{vj} = 25 °C		360		t_f
			T_{vj} = 125 °C		570		ns
			T_{vj} = 175 °C		660		ns
Turn-on switching energy	E_{on}	V_{CC} = 900 V, I_C = 600 A, R_G = 1.5 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		164		E_{on}
			T_{vj} = 125 °C		223		mJ
			T_{vj} = 175 °C		261		mJ
Turn-off switching energy	E_{off}	V_{CC} = 900 V, I_C = 600 A, R_G = 1.5 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		133		E_{off}
			T_{vj} = 125 °C		192		mJ
			T_{vj} = 175 °C		216		mJ
Short circuit current	I_{SC}	t_{pcs} ≤ 10 µs, V_{GE} = 15 V, T_{vj} = 175 °C, V_{CC} = 1200V, $V_{CEM\ Chip}$ ≤ 1700 V			2300		A

[5] Characteristic values according to IEC 60747-9
[6] Collector-emitter saturation voltage is given at chip-level

Diode[7]

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Forward voltage[8]	V_F	I_F = 600 A	T_{vj} = 25 °C		1.7	2.15	V
			T_{vj} = 125 °C		1.85		V
			T_{vj} = 175 °C		1.95		V
Peak reverse recovery current	I_{RM}	V_R = 900 V, I_F = 600 A, dI_F/dt = 10200 A/µs (175 °C), R_G =1.5 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		635		A
			T_{vj} = 125 °C		627		A
			T_{vj} = 175 °C		612		A
Recovery charge	Q_{rr}		T_{vj} = 25 °C		149		µC
			T_{vj} = 125 °C		224		µC
			T_{vj} = 175 °C		272		µC
Reverse recovery time	t_{rr}		T_{vj} = 25 °C		774		ns
			T_{vj} = 125 °C		1160		ns
			T_{vj} = 175 °C		1420		ns
Reverse recovery energy	E_{rec}		T_{vj} = 25 °C		75		mJ
			T_{vj} = 125 °C		124		mJ
			T_{vj} = 175 °C		153		mJ

NTC Thermistor

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Rated resistance	R_{25}	T_C = 25 °C		5		kΩ
R100	R_{100}	T_C = 100 °C	468		518	Ω
B-value B	$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T2 - 1/(298.15K))]$		3375		K
B-value B	$B_{25/100}$	$R_2 = R_{25} \exp [B_{25/100}(1/T2 - 1/(298.15K))]$		3433		K

[7] Characteristic values according to IEC 60747-2
[8] Forward voltage is given at chip-level

Package properties[9]

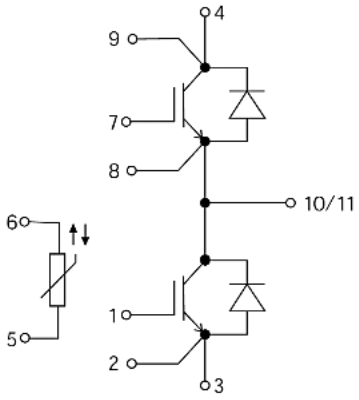
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
IGBT thermal resistance junction to case IGBT	$R_{th(j-c)IGBT}$	Per switch				0.042	K/W
Diode thermal resistance junction to case	$R_{th(j-c)Diode}$					0.073	K/W
IGBT thermal resistance case to heatsink IGBT	$R_{th(c-s)IGBT}$	IGBT per switch IGBT			0.030		K/W
Diode thermal resistance case to heatsink	$R_{th(c-s)Diode}$	diode per switch			0.036		K/W
Comparative tracking index	CTI			200			
Module stray inductance	$L_{s\,CE}$	Per switch			16		nH
Resistance, terminal chip	$R_{CC'+EE'}$	Per switch	T_{vj} = 25 °C		0.7		mΩ
			T_{vj} = 125 °C		1		mΩ
			T_{vj} = 175 °C		1.1		mΩ
Maximum RMS DC-Terminal current	$I_{Term\,RMS}$		$T_{Terminal}$ = 90°C		580		A
			$T_{Terminal}$ = 105°C		565		A

Mechanical properties

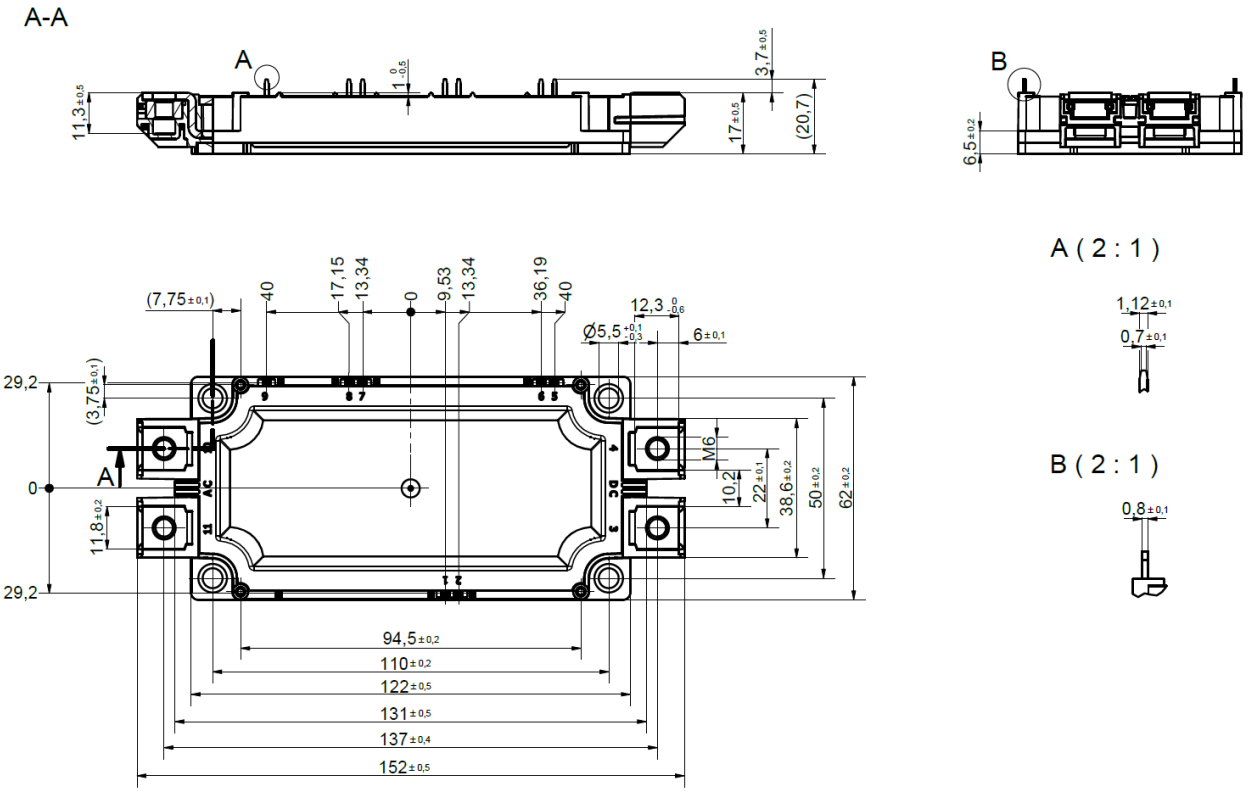
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Dimensions	L x W x H	Typical			152 x 62 x 17		mm^3
Clearance distance in air	d_a	According to IEC 60664-1 and EN 50124-1 标准 IEC 60664-1EN 50124-1	Terminal to base:	12.5			mm
			Terminal to terminal:	10			mm
Surface creepage distance	d_s	According to IEC 60664-1 and EN 50124-1 IEC 60664-1EN 50124-1	Terminal to base:	15			mm
			Terminal to terminal:	13			mm
Mass	m				350		g

[9] Package and mechanical properties according to IEC 60747-15

Electrical configuration



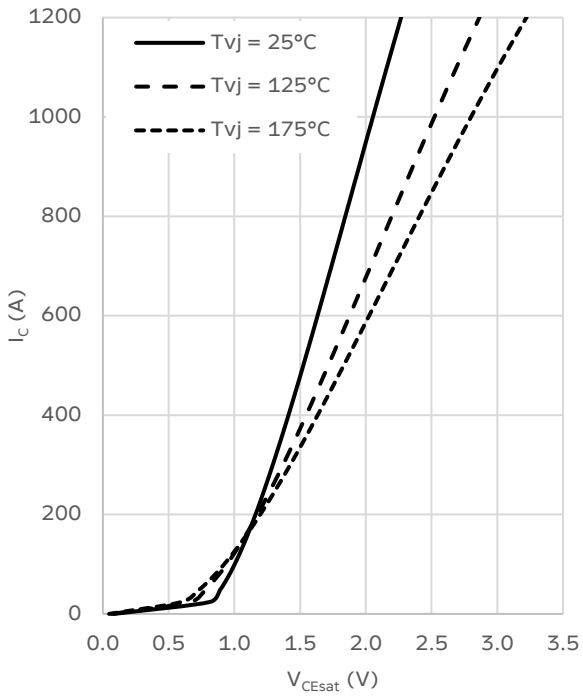
Outline drawing



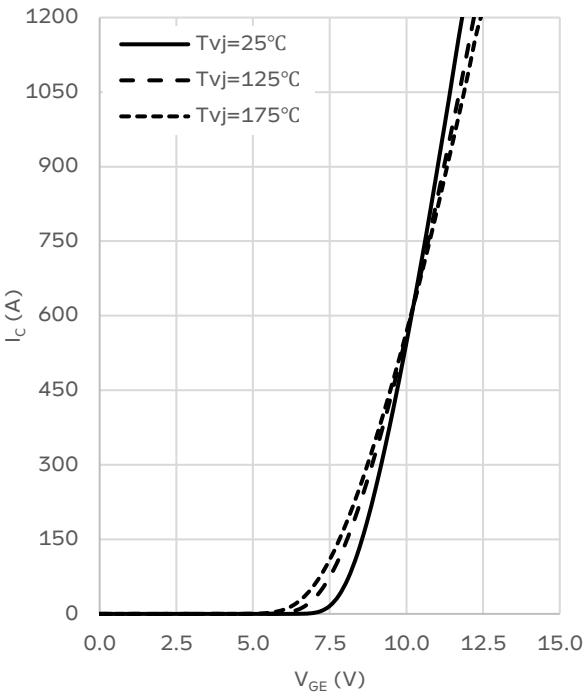
This is an electrocstatic sensitive device.
This product has been designed and qualified for Industrial Level.

Characteristics

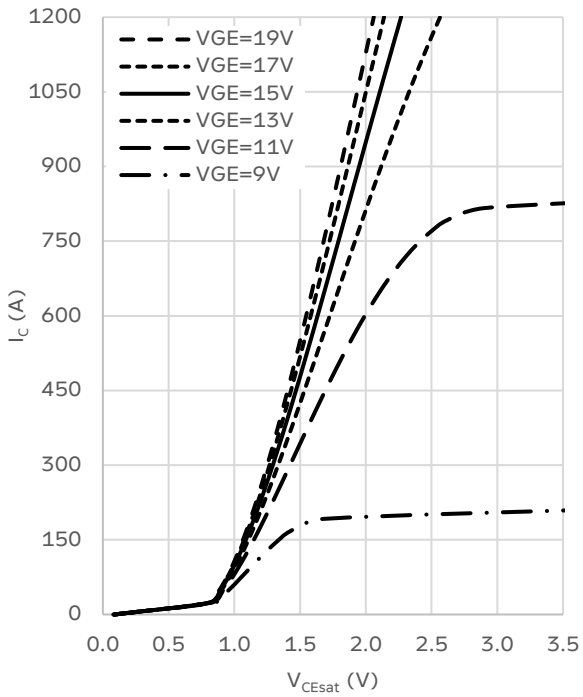
IGBT on-state characteristics (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



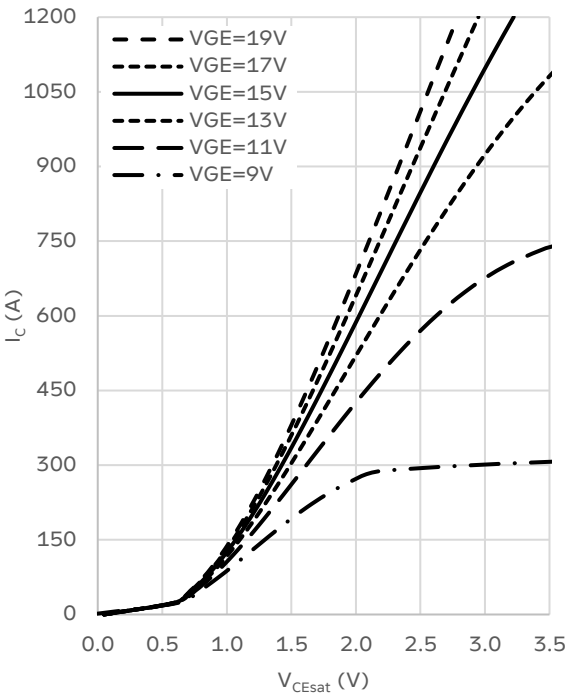
IGBT transfer characteristics (typical)
$I_C = f(V_{GE})$
V_{CE} = 20V



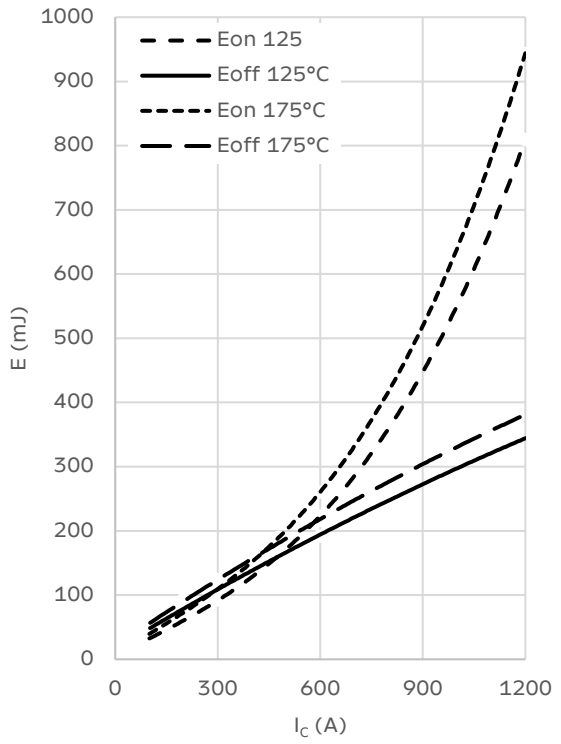
IGBT output characteristics (typical)
$I_C = f(V_{CE})$
T_{vj} = 25 °C



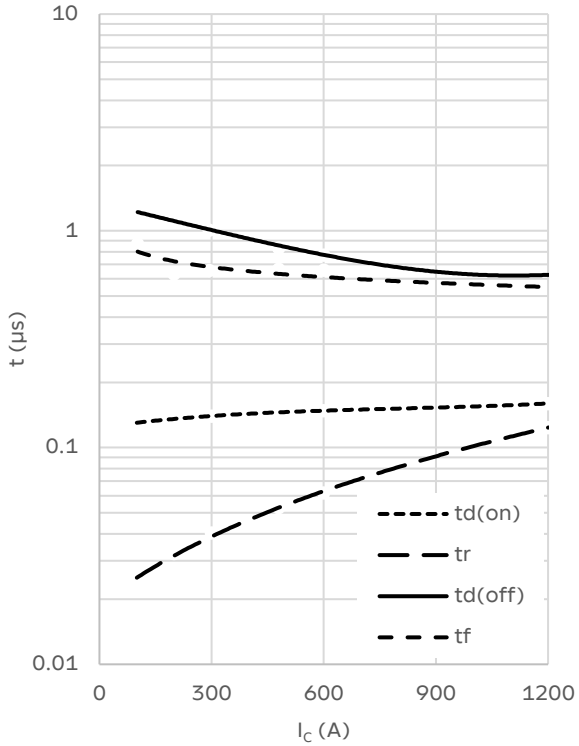
IGBT output characteristics (typical)
$I_C = f(V_{CE})$
T_{vj} = 175 °C



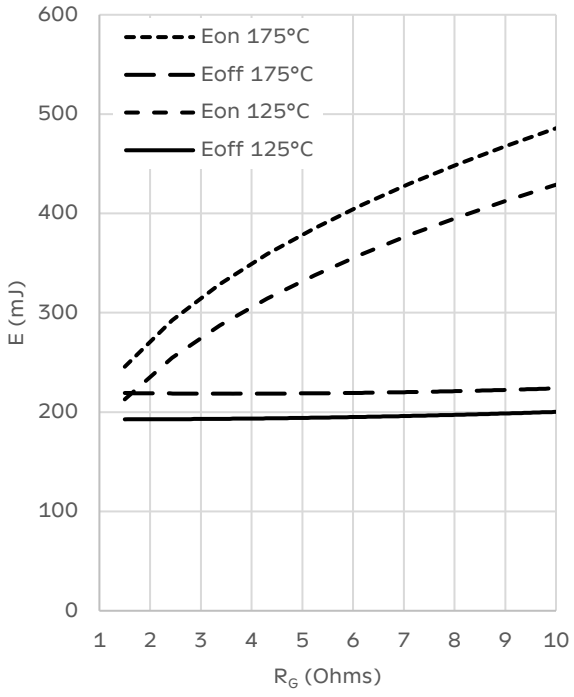
IGBT switching losses (typical)
E = f(I_{CE})
V_{CE} = 900 V, R_{Gon} = 1.5 Ω, R_{Goff} = 1.5 Ω, V_{GE} = -15/+15 V



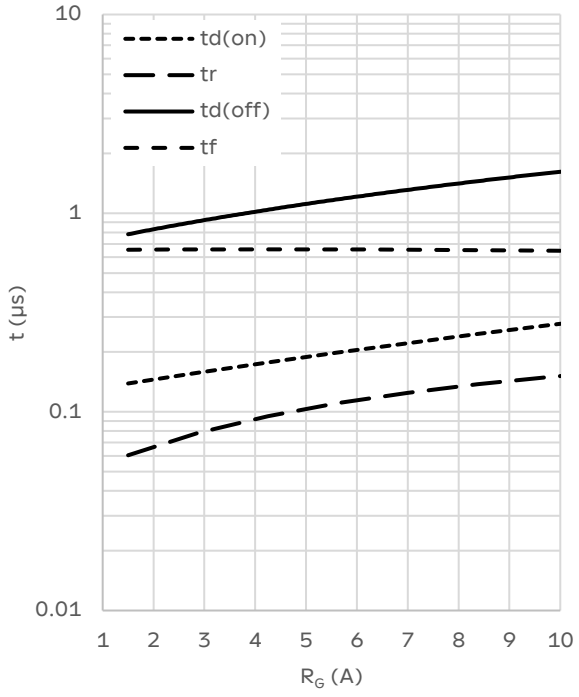
IGBT switching times (typical)
t = f(I_{CE}), T_{vj} = 175 °C
V_{CE} = 900 V, R_{Gon} = 1.5 Ω, R_{Goff} = 1.5 Ω, V_{GE} =-15/+15 V



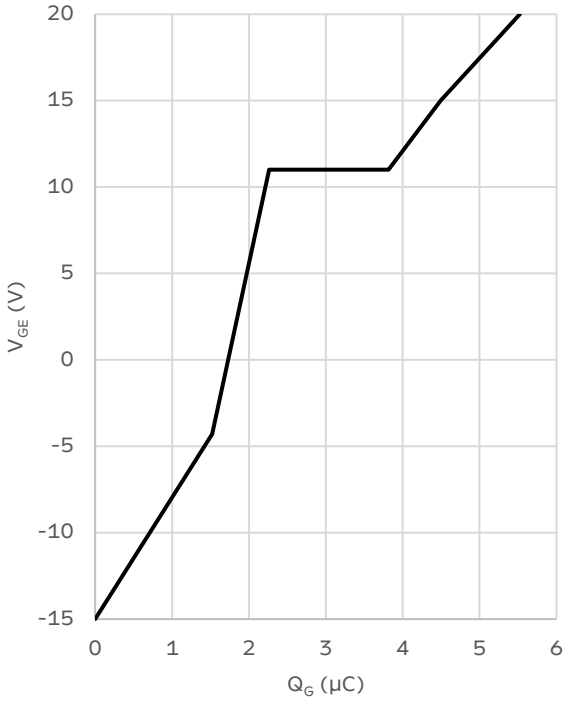
IGBT switching losses (typical)
E = f(R_G)
V_{CE} = 900 V, I_C = 600 A, V_{GE} = -15/+15 V



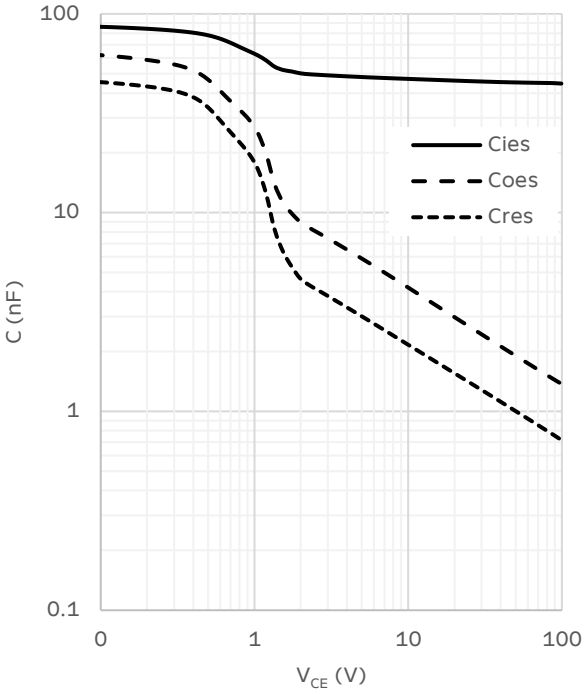
IGBT switching times (typical)
t = f(R_G), T_{vj} = 175 °C
V_{CE} = 900 V, I_C = 600 A, V_{GE} = -15/+15 V V



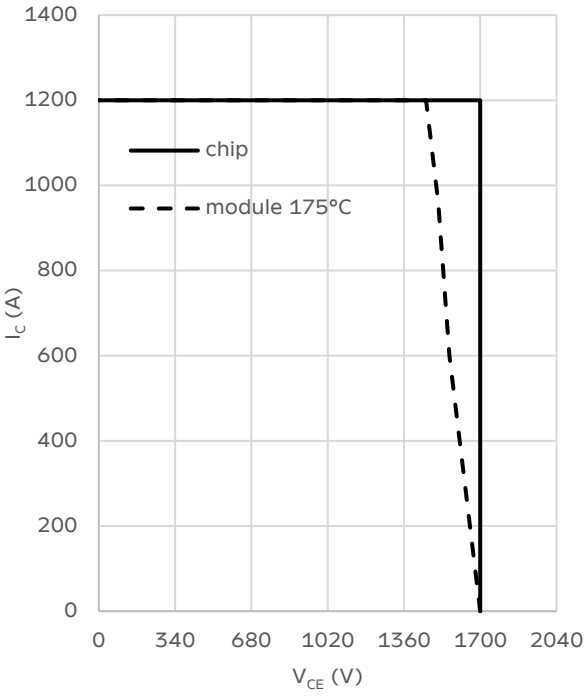
IGBT gate charge (typical)
$V_{GE} = f(Q_G)$, $T_{vj} = 25$ °C
$V_{CE} = 900$ V, $I_C = 600$ A



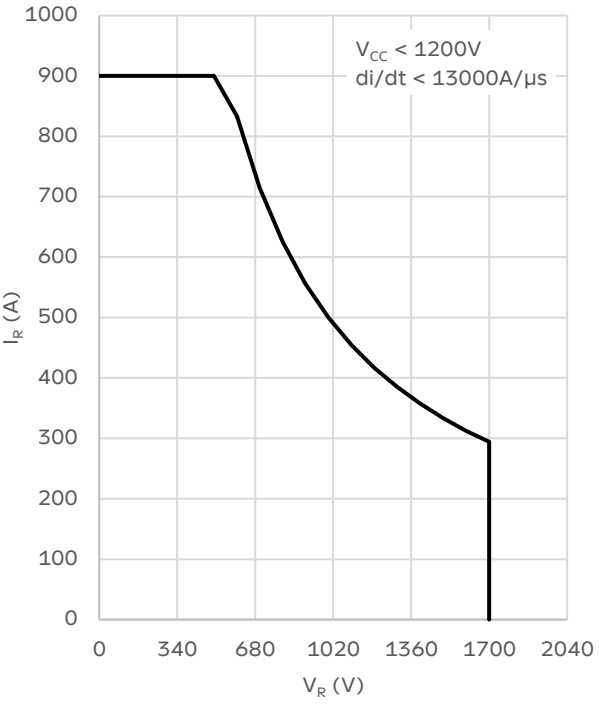
Capacitance characteristics (typical)
$C = f(V_{CE})$, $T_{vj} = 25$ °C
$f = 100$ kHz, $V_{GE} = 0$ V



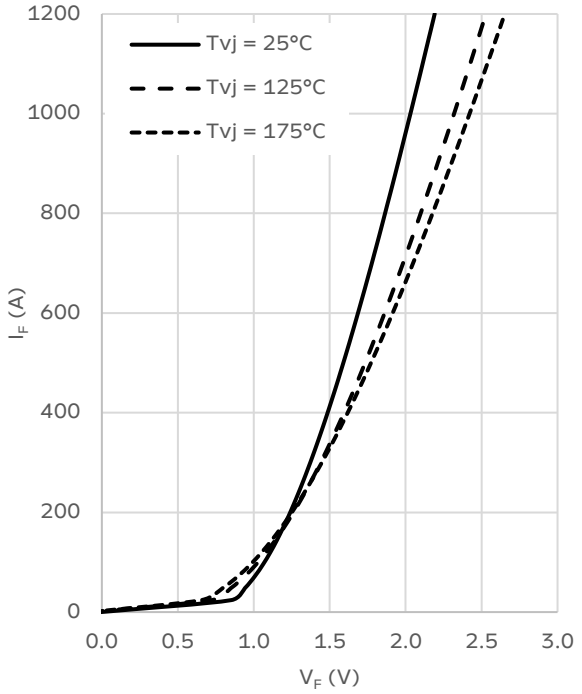
IGBT RBSOA
$I_C = f(V_{CEm})$
$R_{Goff} = 1.5\ \Omega$, $V_{GE} = \pm 15$ V



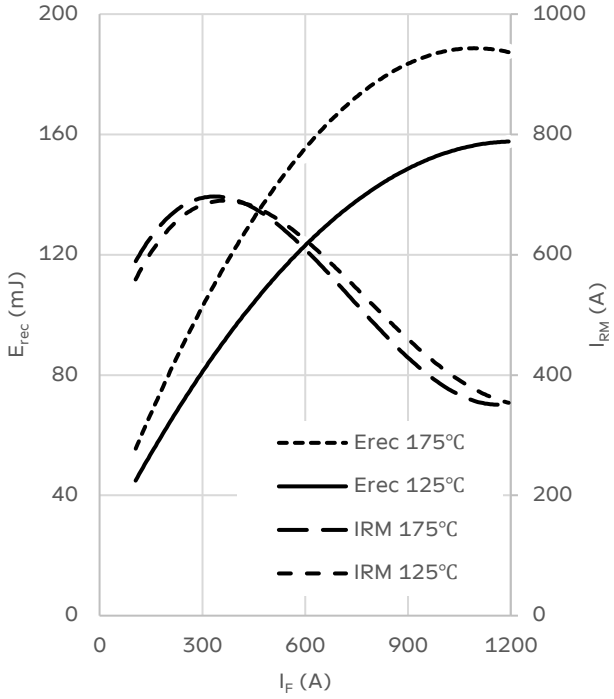
Diode SOA
$T_{vj} \leq 175$ °C



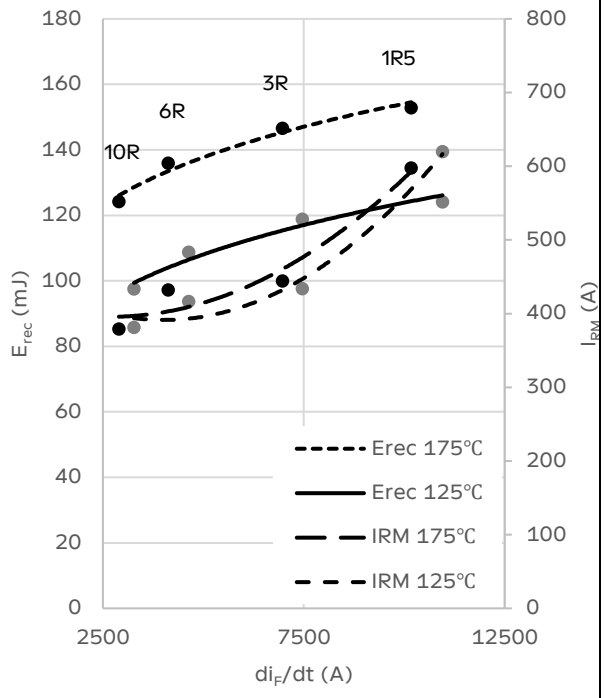
Diode forward characteristic (typical)
$I_F = f(V_F)$



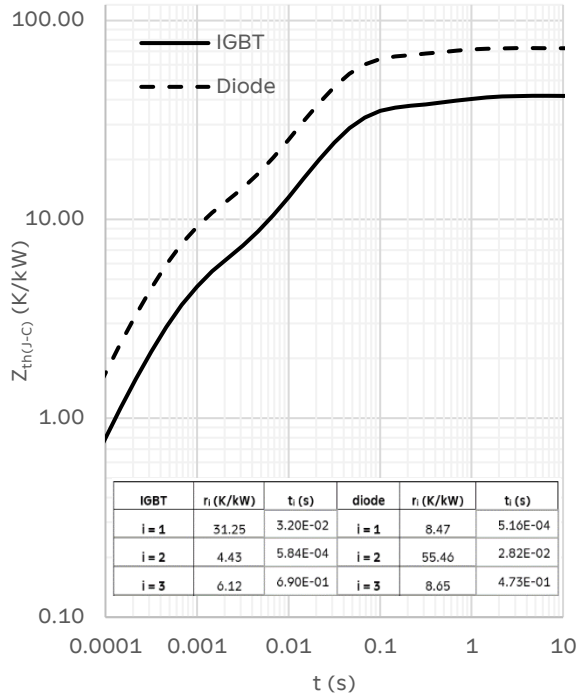
Diode switching characteristics (typical)
$E_{rec} = f(I_F)$, $I_{RM} = f(I_F)$
V_{DC} = 900 V, R_{Gon} = 1.5 Ω (IGBT), V_{GE} =-15/+15 V (IGBT)



Diode switching characteristics (typical)
$E_{rec} = f(di/dt)$, $I_{RM} = f(di/dt)$
V_{DC} = 900 V, I_F = 600 A, V_{GE} =-15/+15 V (IGBT)



Thermal impedance (typical)
$Z_{th(j-c)} = f(t)$



IGBT	r_i (K/kW)	t_i (s)	diode	r_i (K/kW)	t_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