QX300HB17C1 is 1700V/300A IGBT Power Module

General Description

KunSemi QX300HB17C1 300A, 1700V

IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as motor drive and solar energy.

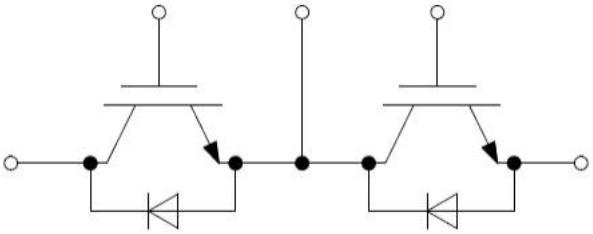
QX300HB17C1 Summary

Symbol	Value
V_{CES}	1700V
I_C@T_C = 100℃	300A

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Isolated copper baseplate using DBC technology

Equivalent Schematic



Applications

- Solar energy application
- Inverter for motor drive
- Uninterruptible power supply
- Hybrid and electric vehicle



Package Marking

Product#	Marking	Package
QX300HB17C1	QX300HB17C1	62MM

Maximum Ratings (T_C = 25℃ unless otherwise specified)

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件	MIN 最小值	MAX 最大值	UNIT 单位
Collector-emitter voltage 集电极-发射极电压	V_{CES}	V_{GE} = 0 V, T_{vj} = 25 °C		1700	V
DC collector current 集电极直流电流	I_C	T_C = 170 °C, T_{vj} = 175 °C		300	A
Peak collector current 集电极峰值电流	I_{CM}	t_p = 1 ms		600	A
Gate-emitter voltage 栅极-发射极驱动电压	V_{GES}		-20	20	V
Total power dissipation 最大功率损耗	P_{tot}	T_C = 25 °C, T_{vj} = 175 °C, per switch		1950	W
DC forward current 二极管直流正向电流	I_F			300	A
Peak forward current 二极管最大脉冲正向电流	I_{FRM}	t_p = 1 ms		600	A
Surge current 二极管最大浪涌电流	I_{FSM}	V_R = 0 V, T_{vj} = 150 °C, t_p = 10 ms, half-sinewave		1375 9450	A A^2s
Isolation voltage 绝缘电压	V_{isol}	1 min, f = 50 Hz		4000	V
Junction operating temperature 运行结温	$T_{vj(op)}$		-40	175[2]	°C
Case temperature 壳温	T_C		-40	150	°C
Storage temperature 存储温度	T_{stg}		-40	125	°C
Mounting torques 紧固力矩 [3]	M_S	Base-heatsink, M6 screws	3	6	Nm
	M_{t1}	Main terminals, M6 screws	2.5	5	Nm

Electrical Characteristics（TC = 25℃ unless otherwise specified）

1. IGBT

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Collector(-emitter) breakdown voltage 集电极-发射极击穿电压	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 10 mA, T_{vj} = 25°C		1700			V
Collector-emitter saturation voltage [5] 集电极-发射极饱和电压	$V_{CE\ sat}$	I_c = 300 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.65	2.0	V
			T_{vj} = 125 °C		1.85		V
			T_{vj} = 175 °C		2.05		V
Collector cut-off current 集电极截止电流	I_{CES}	V_{CE} = 1700 V, V_{GE} = 0 V	T_{vj} = 25 °C			1	mA
			T_{vj} = 125 °C		0.25		mA
			T_{vj} = 175 °C		4.5		mA
Gate leakage current 栅极漏电流	I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V		-0.5		0.5	µA
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	I_C = 10mA, V_{CE} = V_{GE}, T_{vj} = 25°C		5	6.15	7.5	V
Gate charge 栅极电荷	Q_G	I_C = 300 A, V_{CE} = 900 V, V_{GE} = -15 V .. 15 V			2.24		µC
Input capacitance 输入电容	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100kHz, T_{vj} = 25 °C			23		nF
Output capacitance 输出电容	C_{oes}				1.47		
Reverse tansfer capacitance 反向传输电容	C_{res}				0.7		
Internal gate resistor 栅极内阻	R_{Gint}	Per switch			2.8		Ω
Turn-on delay time 开通延迟	$t_{d(on)}$	V_{CC} = 900 V, I_C = 300 A, R_{Gon} = 3 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		116		ns
			T_{vj} = 125 °C		143		
			T_{vj} = 175 °C		168		
Rise time 上升时间	t_r		T_{vj} = 25 °C		35		
			T_{vj} = 125 °C		38		
			T_{vj} = 175 °C		39		

Turn-off delay time 关断延迟	$t_{d(off)}$	V_{CC} = 900 V, I_C = 300 A, R_G = 3 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		567		ns
			T_{vj} = 125 °C		658		
			T_{vj} = 175 °C		685		
Fall time 下降时间	t_f		T_{vj} = 25 °C		395		
			T_{vj} = 125 °C		600		
			T_{vj} = 175 °C		659		
Turn-on switching energy 开通损耗	E_{on}	V_{CC} = 900 V, I_C = 300 A, R_G = 3 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		63		mJ
			T_{vj} = 125 °C		88		
			T_{vj} = 175 °C		100		
Turn-off switching energy 关断损耗	E_{off}	V_{CC} = 900 V, I_C = 300 A, R_G = 3 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		63		
			T_{vj} = 125 °C		88		
			T_{vj} = 175 °C		95		
Short circuit current 短路电流	I_{SC}	$t_{pcs} \leq$ 10 µs, V_{GE} = 15 V, T_{vj} = 175 °C, V_{CC} = 1250 V, $V_{CEM\ Chip} \leq$ 1700 V			1368		A

2. Diode

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Forward voltage[7] 正向压降	V_F	I_F = 300 A	T_{vj} = 25 °C		1.7	2.1	V
			T_{vj} = 125 °C		1.85		V
			T_{vj} = 175 °C		1.95		V
Peak reverse recovery current 反向恢复电流峰值	I_{RM}	V_R = 900 V, I_F = 300 A, dI/dt = 9916 A/µs (175 °C), R_G = 3 Ω, V_{GE} = ± 15 V, L_s = 35 nH, inductive load	T_{vj} = 25 °C		502		A
			T_{vj} = 125 °C		560		A
			T_{vj} = 175 °C		558		A
Recovery charge 恢复电荷	Q_r		T_{vj} = 25 °C		82		µC
			T_{vj} = 125 °C		128		µC
			T_{vj} = 175 °C		146		µC
Reverse recovery time 反向恢复时间	t_{rr}		T_{vj} = 25 °C		682		ns
			T_{vj} = 125 °C		1104		ns
			T_{vj} = 175 °C		1305		ns
Reverse recovery energy 反向恢复能量	E_{rec}		T_{vj} = 25 °C		44		mJ
			T_{vj} = 125 °C		73		mJ
			T_{vj} = 175 °C		84		mJ

Package properties 封装特性

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
IGBT thermal resistance junction to case IGBT 结-壳热阻	$R_{th(j-c)IGBT}$	Per switch				0.079	K/W
Diode thermal resistance junction to case 二极管结-壳热阻	$R_{th(j-c)Diode}$					0.130	K/W
IGBT thermal resistance case to heatsink IGBT 壳到散热器热阻	$R_{th(c-s)IGBT}$	IGBT per switch, lambda grease = 1 W/m x K			0.035		K/W
Diode thermal resistance case to heatsink 二极管壳到散热器热阻	$R_{th(c-s)Diode}$	diode per switch, lambda grease = 1 W/m x K			0.042		K/W

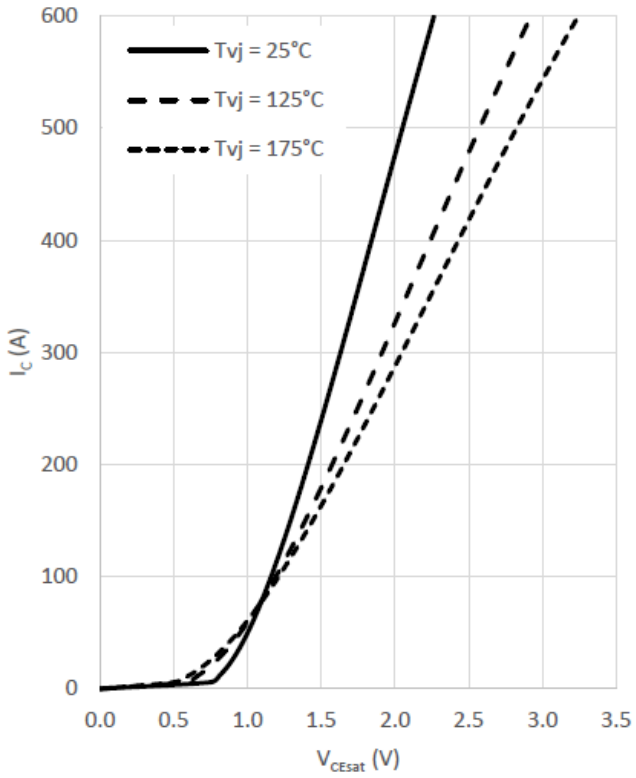
Comparative tracking index 相对漏电起痕指数	CTI			>400			
Module stray inductance 模块自身杂散电感	$L_{s\ CE}$	Per switch			20		nH
Resistance, terminal chip 端子到芯片之间的阻抗	$R_{CC'+EE'}$	Per switch	T_{vj} = 25 °C		0.7		mΩ
			T_{vj} = 125 °C				
			T_{vj} = 175 °C				

Mechanical properties 机械特性

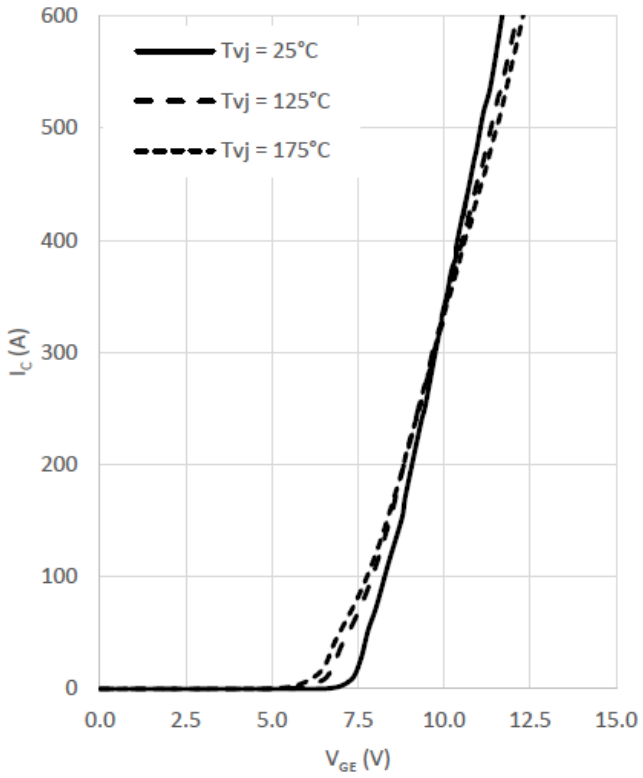
PARAMETER **参数**	**SYMBOL** **符号**	**CONDITIONS** **工作条件**		**MIN** **最小值**	**TYP** **典型**	**MAX** **最大值**	**UNIT** **单位**
Dimensions	L x W x H	Typical		106 x 62 x 30.9			mm^3
Clearance distance in air 电气间隙	da	According to IEC 60664-1 and EN 50124-1 参考标准 IEC 60664-1 和 EN 50124-1	Terminal to base: 端子到基板		23		mm
			Terminal to terminal: 端子到端子		11		
Surface creepage distance 爬电距离	ds		Terminal to base: 端子到基板		29		mm
			Terminal to terminal: 端子到端子		23		
Mass 重量	m				310		g

Typical Performance

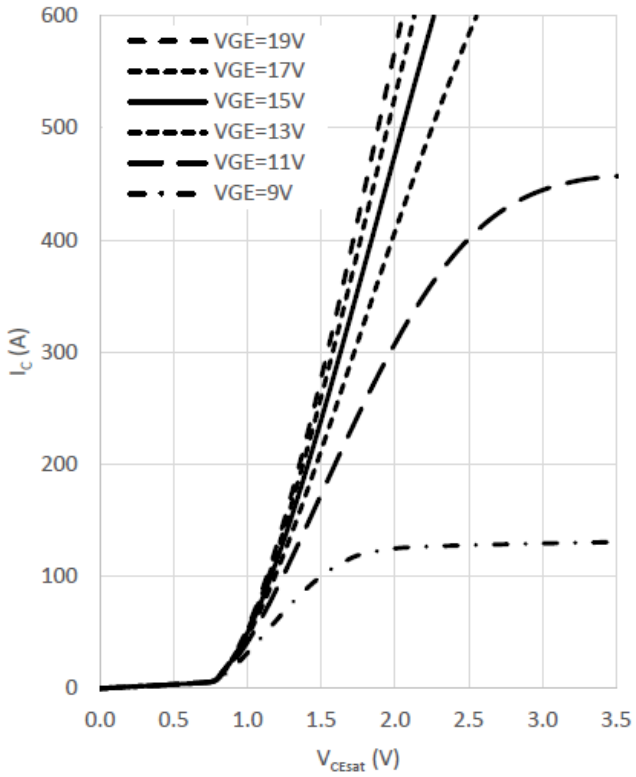
IGBT on-state characteristics (typical)
IGBT 通态特性曲线（典型）
$I_C = f(V_{CE})$
V_{GE} = 15 V



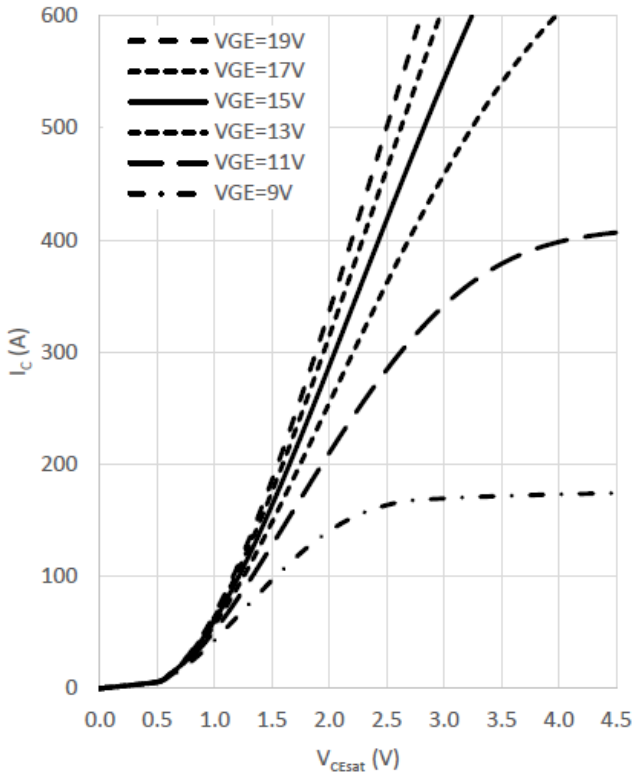
IGBT transfer characteristics (typical)
IGBT 转移特性曲线（典型）
$I_C = f(V_{GE})$
V_{CE} = 20V



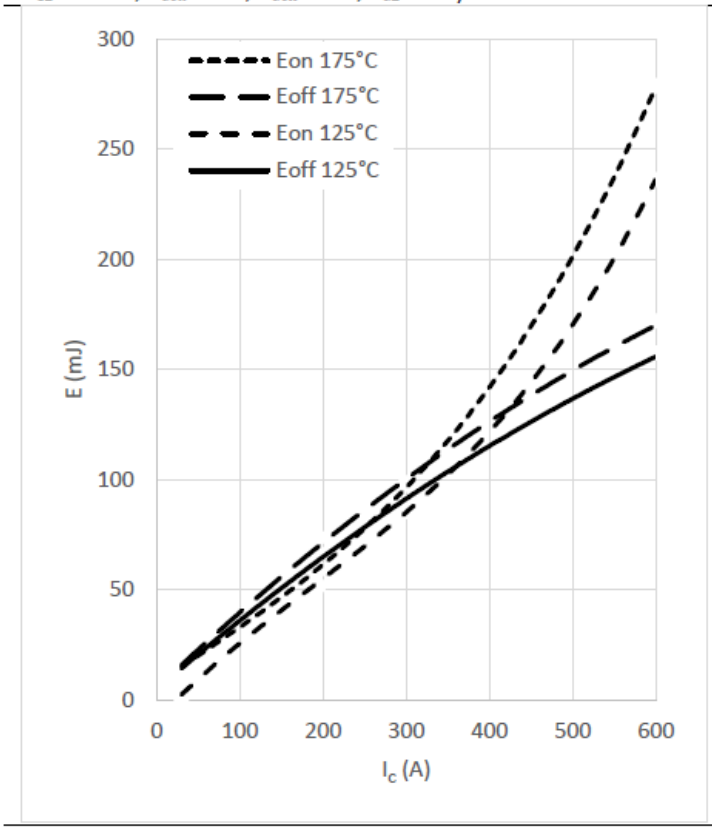
IGBT output characteristics (typical)
IGBT 输出特性曲线（典型）
$I_C = f(V_{CE})$
T_{vj} = 25 °C



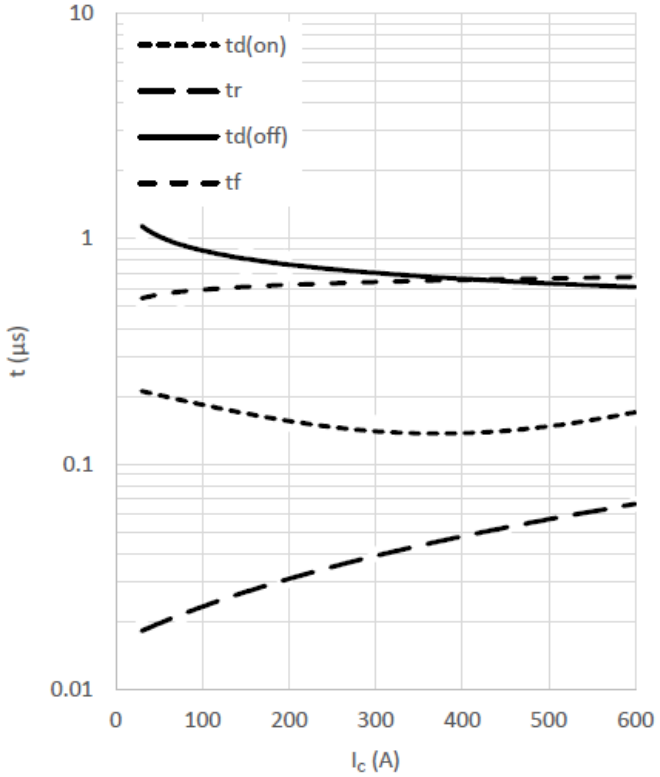
IGBT output characteristics (typical)
IGBT 输出特性曲线（典型）
$I_C = f(V_{CE})$
T_{vj} = 175 °C



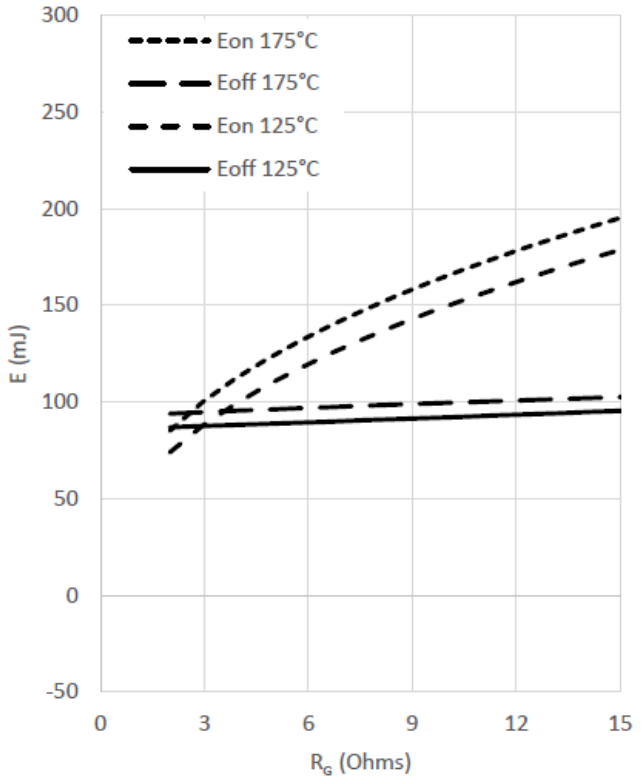
IGBT switching losses (typical)
IGBT 开关损耗曲线（典型）
E = f(I_{CE})
V_{CE} = 900 V, R_{Gon} = 3 Ω, R_{Goff} = 3 Ω, V_{GE} = -15/+15 V



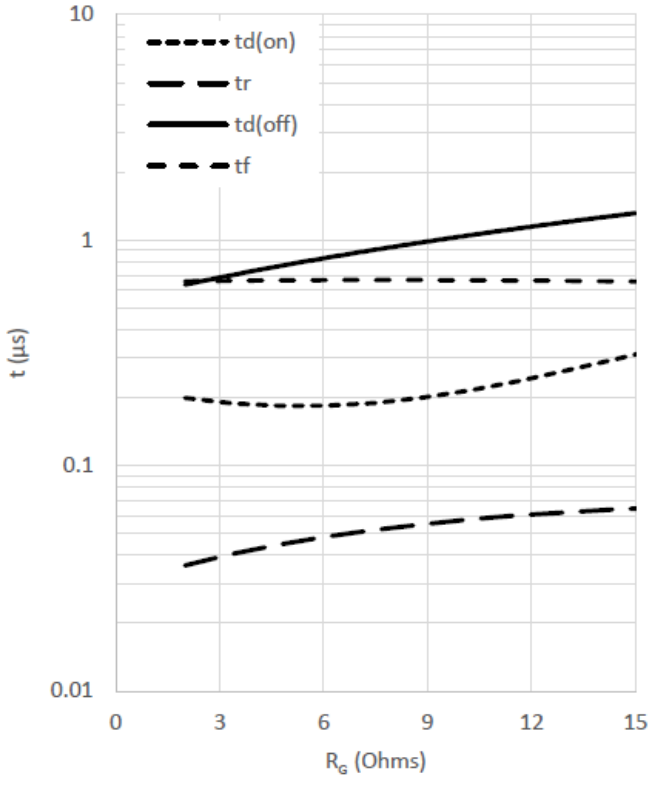
IGBT switching times (typical)
IGBT 开关时间曲线（典型）
t = f(I_{CE}), T_{vj} = 175 °C
V_{CE} = 900 V, R_{Gon} = 3 Ω, R_{Goff} = 3 Ω, V_{GE} =-15/+15 V



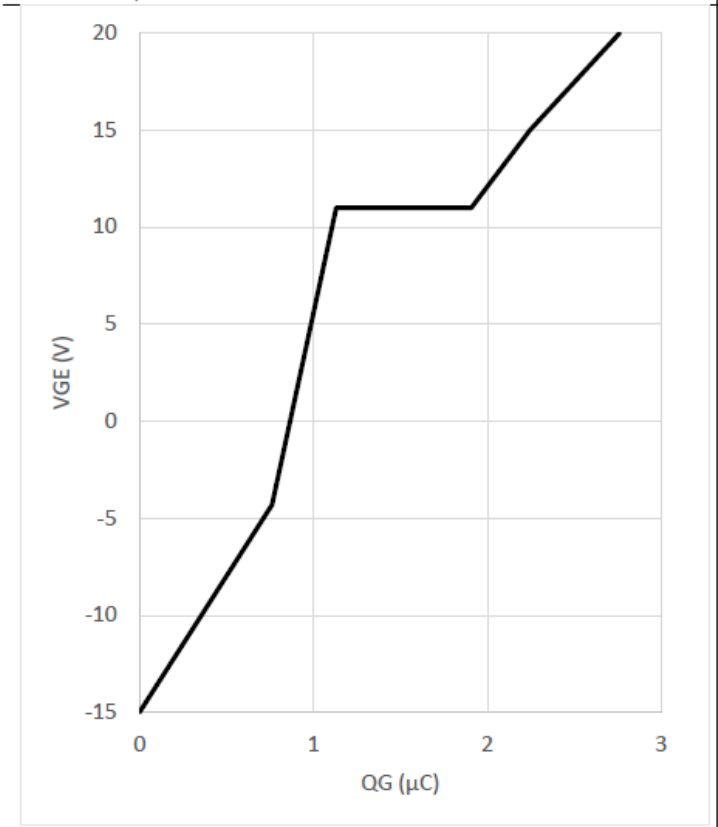
IGBT switching losses (typical)
IGBT 开关损耗曲线（典型）
E = f(R_G)
V_{CE} = 900 V, I_C = 300 A, V_{GE} = -15/+15 V



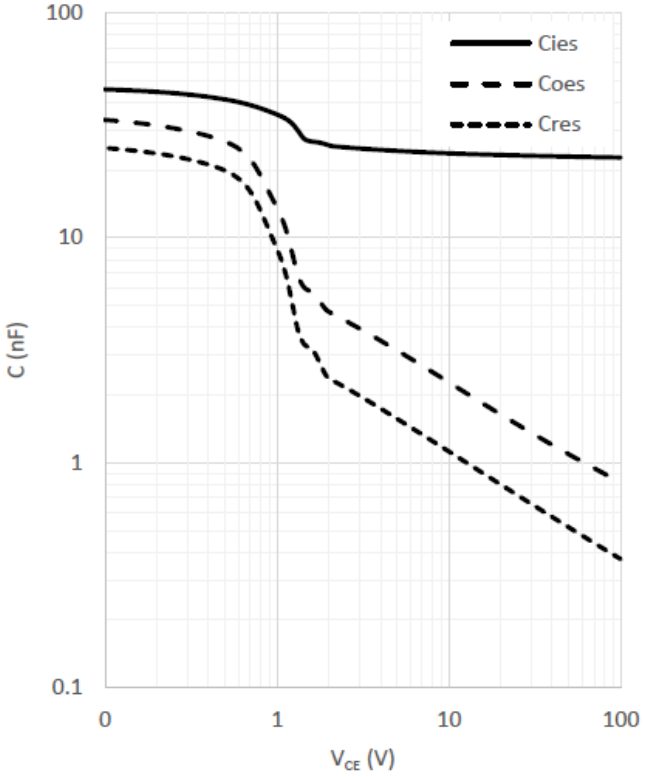
IGBT switching times (typical)
IGBT 开关时间曲线（典型）
t = f(R_G), T_{vj} = 175 °C
V_{CE} = 900 V, I_C = 300 A, V_{GE} = -15/+15 V



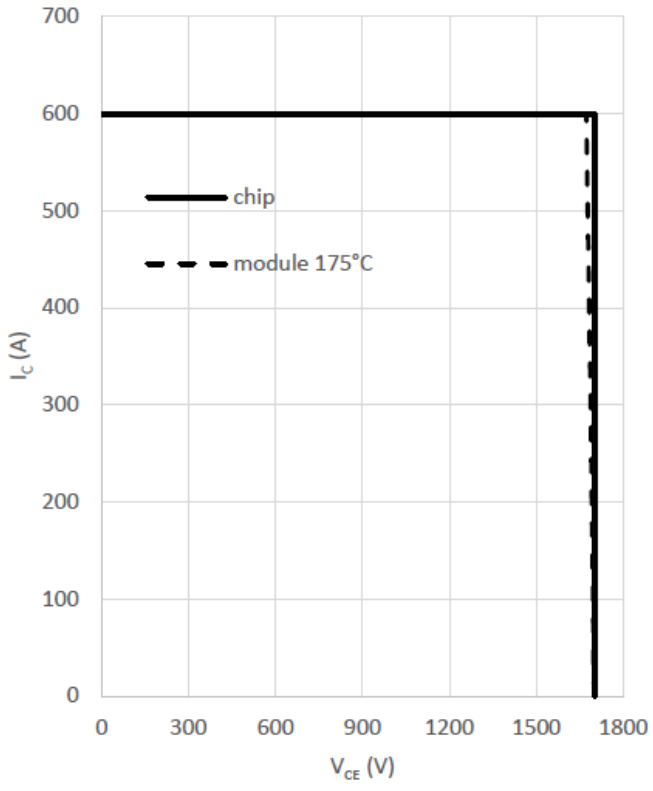
IGBT gate charge (typical)
IGBT 门极电荷（典型）
$V_{GE} = f(Q_G)$, $T_{vj} = 25$ °C
$V_{CE} = 900$ V, $I_C = 300$ A



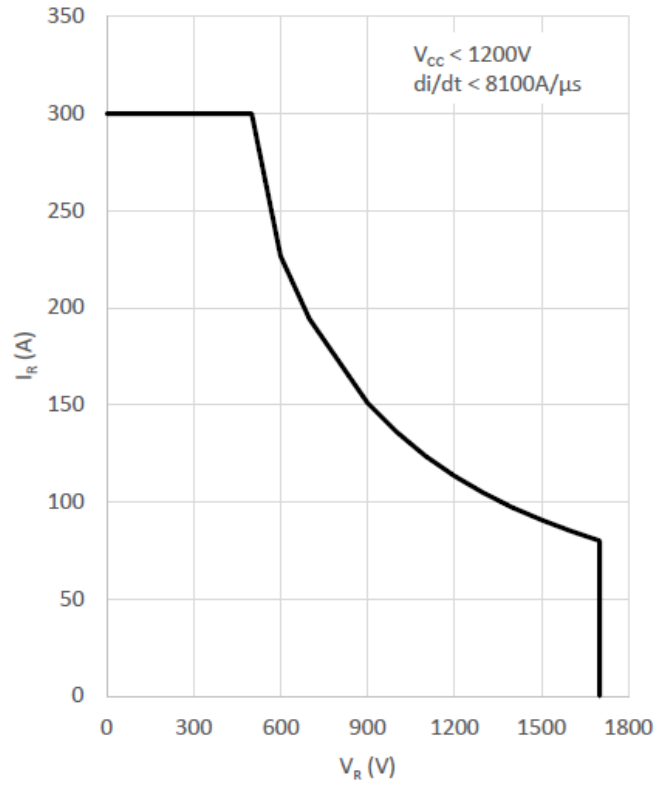
Capacitance characteristics (typical)
电容特性曲线（典型）
$C = f(V_{CE})$, $T_{vj} = 25$ °C
$f = 100$ kHz, $V_{GE} = 0$ V



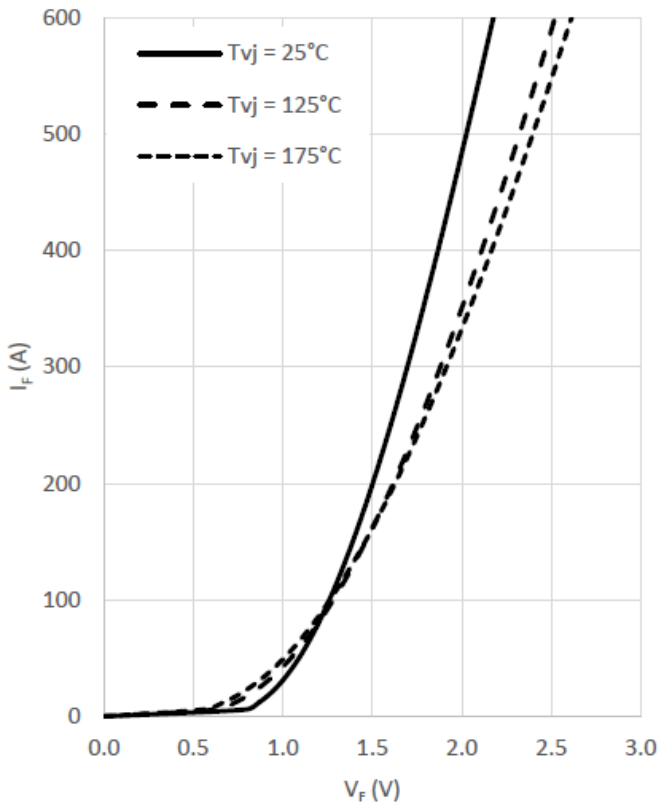
IGBT RBSOA
IGBT 反偏安全工作区域
$I_C = f(V_{CEm})$
$R_{Goff} = 3\ \Omega$, $V_{GE} = \pm 15$ V



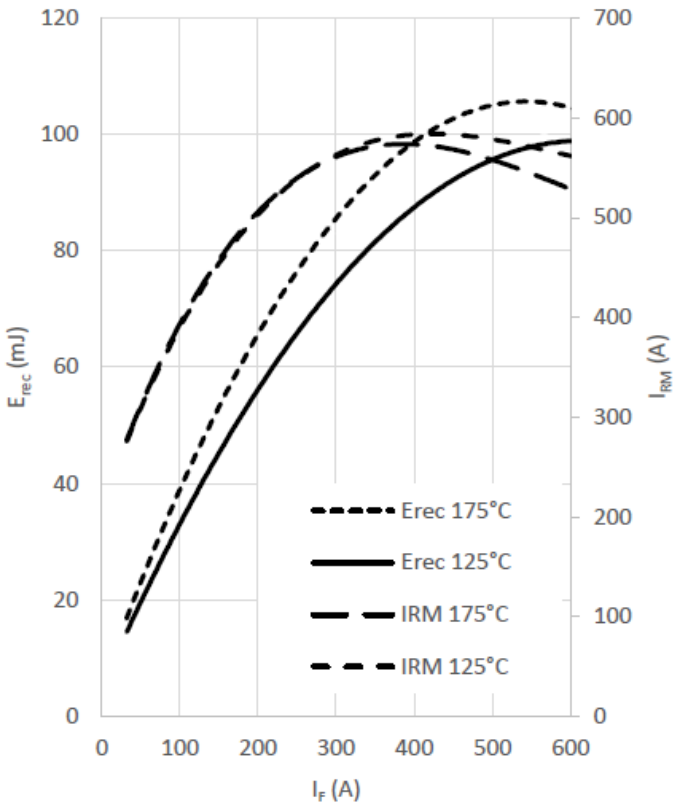
Diode SOA
Diode 反偏安全工作区域
$T_{vj} \leq 175$ °C



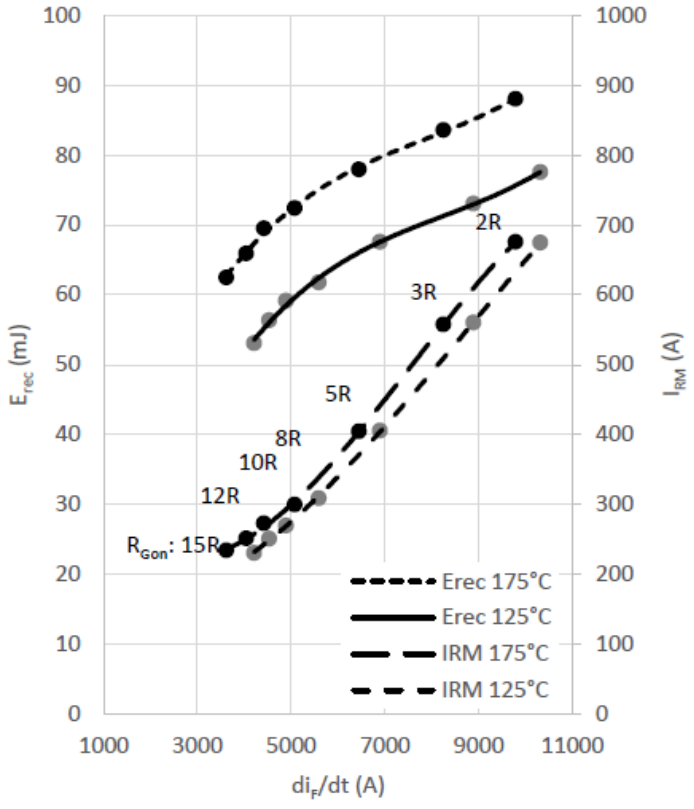
Diode forward characteristic (typical)
二极管正向特性（典型）
$I_F = f(V_F)$



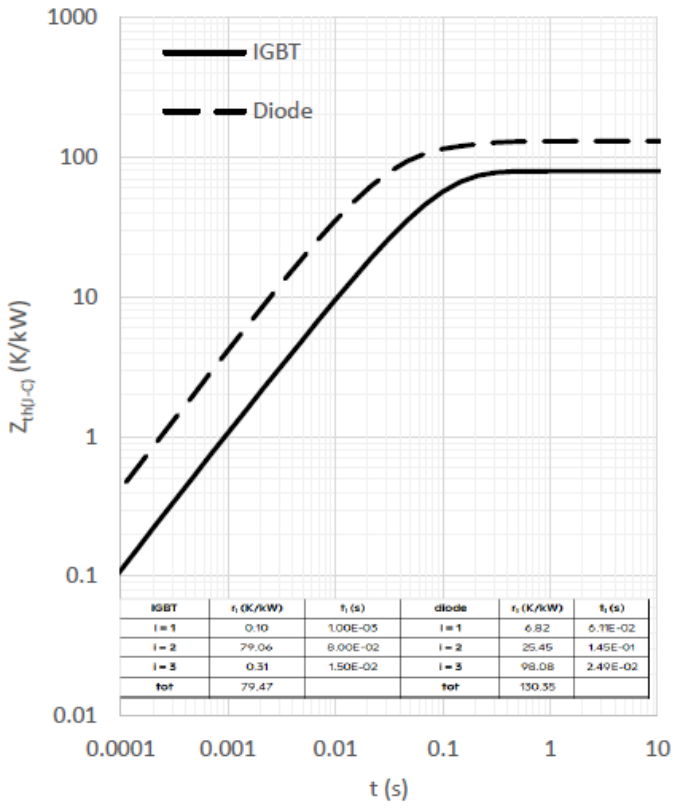
Diode switching characteristics (typical)
二极管开关特性（典型）
$E_{rec} = f(I_F)$, $I_{RM} = f(I_F)$
V_{DC} = 900 V, R_{Gon} = 4 Ω (IGBT), V_{GE} =-15/+15 V (IGBT)



Diode switching characteristics (typical)
二极管开关特性（典型）
$E_{rec} = f(di/dt)$, $I_{RM} = f(di/dt)$
V_{DC} = 900 V, I_F = 300 A, V_{GE} =-15/+15 V (IGBT)

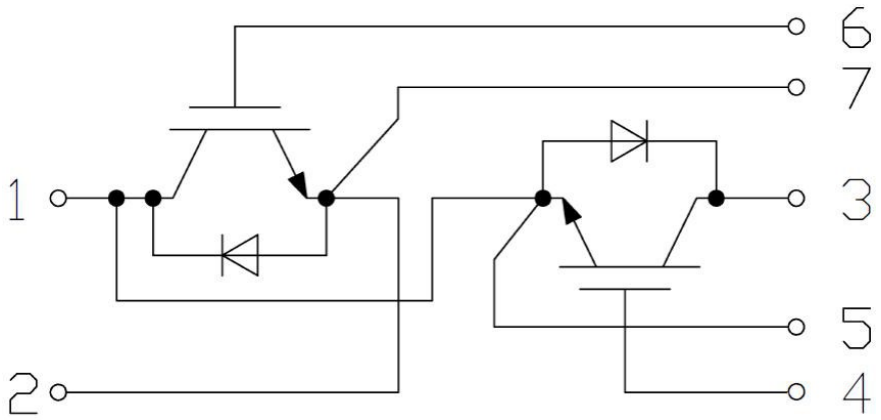


Thermal impedance (typical)
热阻抗（典型）
$Z_{th(j-c)} = f(t)$

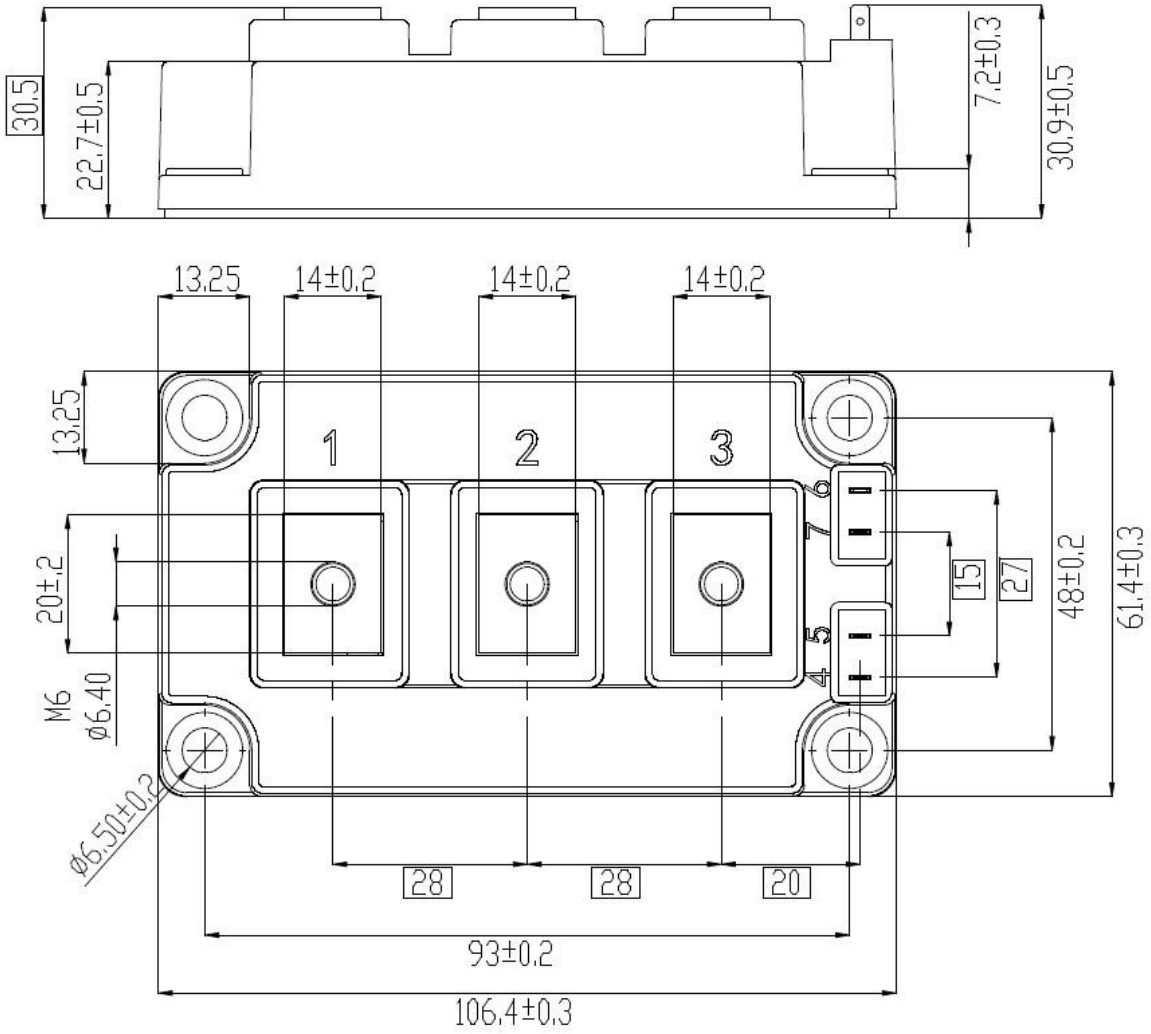


IGBT	r_i (K/kW)	τ_i (s)	diode	r_i (K/kW)	τ_i (s)
i = 1	0.10	1.00E-05	i = 1	6.82	6.11E-02
i = 2	79.06	8.00E-02	i = 2	25.45	1.45E-01
i = 3	0.31	1.50E-02	i = 3	98.08	2.49E-02
tot	79.47		tot	130.35	

Circuit Schematic



Package Dimensions



UNIT:mm