

Prospective Data
Insulated Gate Bi-Polar Transistor
Type T0600AF65G

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V _{CES}	Collector – emitter voltage	6500	V
V _{CES}	Collector – emitter voltage (T _j 25°C)	6500	V
V _{CES}	Collector – emitter voltage (T _j -40°C)	6000	V
V _{DC link}	Permanent DC voltage for 100 FIT failure rate.	3600	V
V _{GES}	Peak gate – emitter voltage	±20	V

	RATINGS	MAXIMUM LIMITS	UNITS
I _C	DC collector current, IGBT	600	A
I _{CRM}	Repetitive peak collector current, t _p =1ms, IGBT	1200	A
I _{F(DC)}	Continuous DC forward current, Diode	600	A
I _{FRM}	Repetitive peak forward current, t _p =1ms, Diode	1200	A
I _{FSM}	Peak non-repetitive surge t _p =10ms, V _{RM} =60%V _{RRM} , Diode (Note 4)	4910	A
I _{FSM2}	Peak non-repetitive surge t _p =10ms, V _{RM} ≤10V, Diode (Note 4)	5400	A
P _{MAX}	Maximum power dissipation, IGBT (Note 2)	7.1	KW
(di/dt) _{cr}	Critical diode di/dt (note 3)	2000	A/μs
T _j	Operating temperature range.	-40 to +125	°C
T _{stg}	Storage temperature range.	-40 to +125	°C

Notes: -

- 1) Unless otherwise indicated T_j = 125°C.
- 2) T_{sink} = 25°C, double side cooled.
- 3) Maximum commutation loop inductance 430nH.
- 4) Half-sinewave, 125°C T_j initial.

Characteristics

IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V _{CE(sat)}	Collector – emitter saturation voltage	-	3.6	-	I _C = 600A, V _{GE} = 15V, T _j = 25°C	V
		4.4	4.8	5.2	I _C = 600A, V _{GE} = 15V	V
V _{T0}	Threshold voltage	-		2.49	Current range: 200A – 600A	V
r _T	Slope resistance	-		4.52		mΩ
V _{GE(TH)}	Gate threshold voltage	-	5.2	-	V _{CE} = V _{GE} , I _C = 600mA	V
I _{CES}	Collector – emitter cut-off current	-	6	25	V _{CE} = V _{CES} , V _{GE} = 0V	mA
I _{GES}	Gate leakage current	-	-	30	V _{GE} = ±20V	μA
C _{ies}	Input capacitance	-	105	-	V _{CE} = 10V, V _{GE} = 0V, f = 100kHz, T _j =25°C	nF
t _{d(on)}	Turn-on delay time	-	1.6	-	I _C = 600A, V _{CE} = 3600V, di/dt = 1500A/μs	μs
t _{r(V)}	Rise time	-	3.4	-		μs
Q _{g(on)}	Turn-on gate charge	-	3.5	-	V _{GE} = ±15V, L _s = 430nH	μC
E _{on}	Turn-on energy	-	4.2	-	R _{g(ON)} = 5.1Ω, R _{g(OFF)} = 16Ω, C _{GE} = 56nF	J
t _{d(off)}	Turn-off delay time	-	4.8	-	Integral diode used as freewheel diode (Note 3 & 4)	μs
t _{f(l)}	Fall time	-	2.1	-		μs
Q _{g(off)}	Turn-off gate charge	-	5.8	-		μC
E _{off}	Turn-off energy	-	3.4	-		J
I _{SC}	Short circuit current	-	3250	-	V _{GE} = +15V, V _{CC} = 3600V, V _{CEmax} ≤ V _{CES} , t _p ≤ 10μs	A

Diode Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V _F	Forward voltage	-	3.1	-	I _F = 600A, T _j = 25°C	V
		-	3.45	3.85	I _F = 600A	V
V _{T0}	Threshold voltage	-	-	1.89	Current range 200A – 600A	V
r _T	Slope resistance	-	-	3.27		mΩ
I _{rm}	Peak reverse recovery current	-	700	-	V _i = 3600V, I _F = 600A, V _{GE} = -15V, di/dt = 1500A/μs	A
Q _{rr}	Recovered charge	-	960	-		μC
t _{rr}	Reverse recovery time, 50% chord	-	1.1	-		μs
E _r	Reverse recovery energy	-	1.4	-		J

Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R _{thJK}	Thermal resistance junction to sink, IGBT	-	-	14.1	Double side cooled	K/kW
		-	-	21.4	Collector side cooled	K/kW
		-	-	41.3	Emitter side cooled	K/kW
R _{thJK}	Thermal resistance junction to sink, Diode	-	-	24.3	Double side cooled	K/kW
		-	-	35.1	Cathode side cooled	K/kW
		-	-	78.4	Anode side cooled	K/kW
F	Mounting force	25	-	35	Note 2	kN
W _t	Weight	-	1.7	-		kg

Notes:-

- 1) Unless otherwise indicated T_j = 125°C.
- 2) Consult application note 2008AN01 for detailed mounting requirements
- 3) C_{GE} is additional gate – emitter capacitance added to output of gate drive
- 4) Figures 6 to 9 are obtained using integral diode as freewheeling diode

Curves

Figure 1 – Typical collector-emitter saturation voltage characteristics

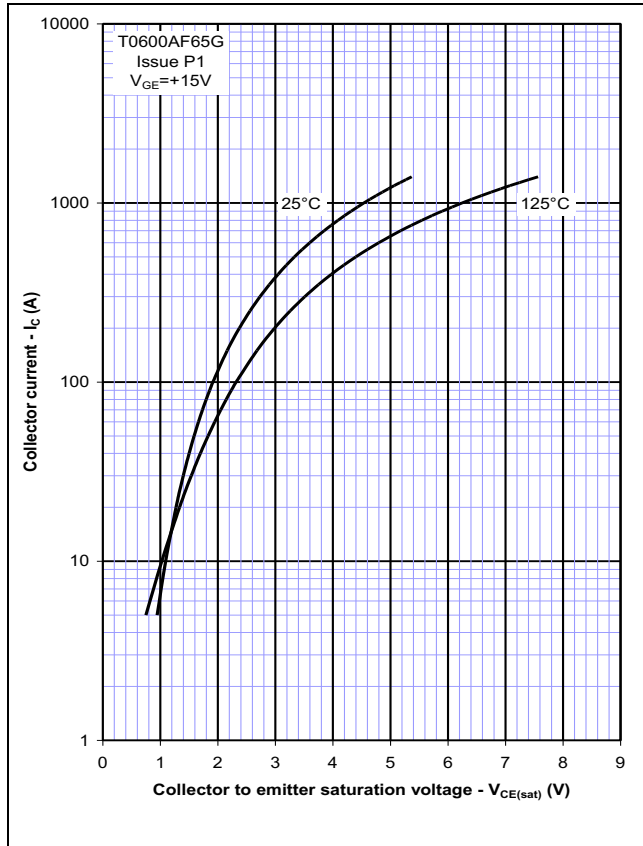


Figure 2 – Typical output characteristic

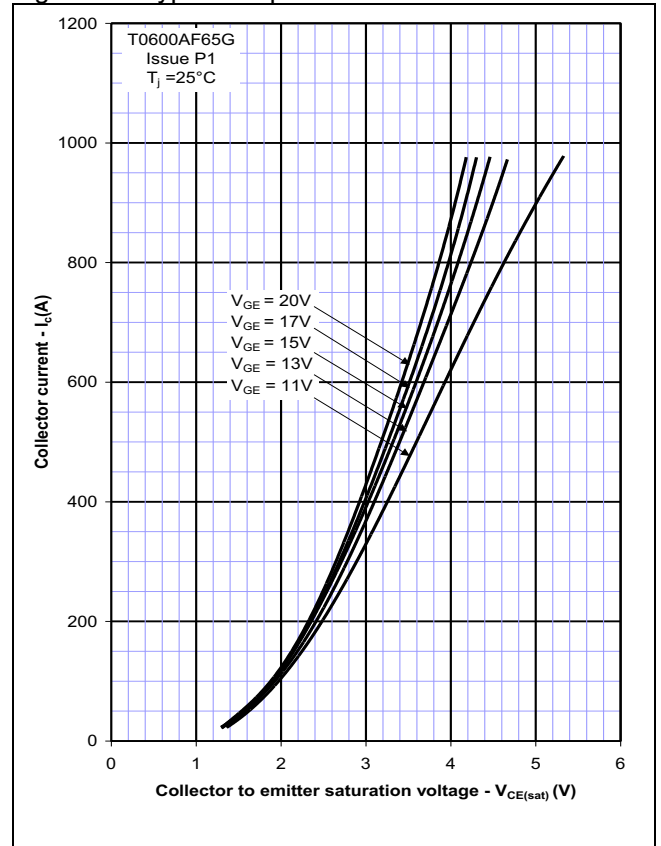


Figure 3 – Typical output characteristic

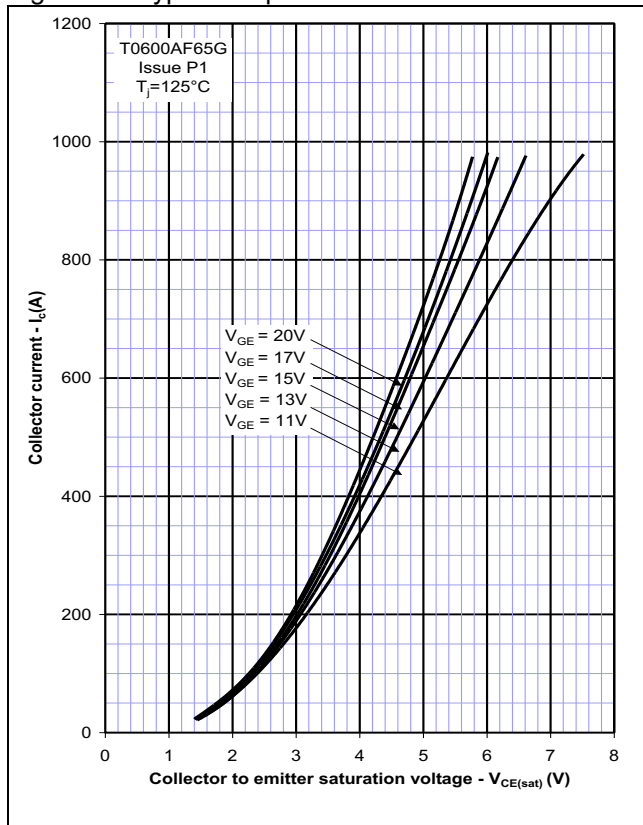


Figure 4 – Typical turn-on delay time vs gate resistance

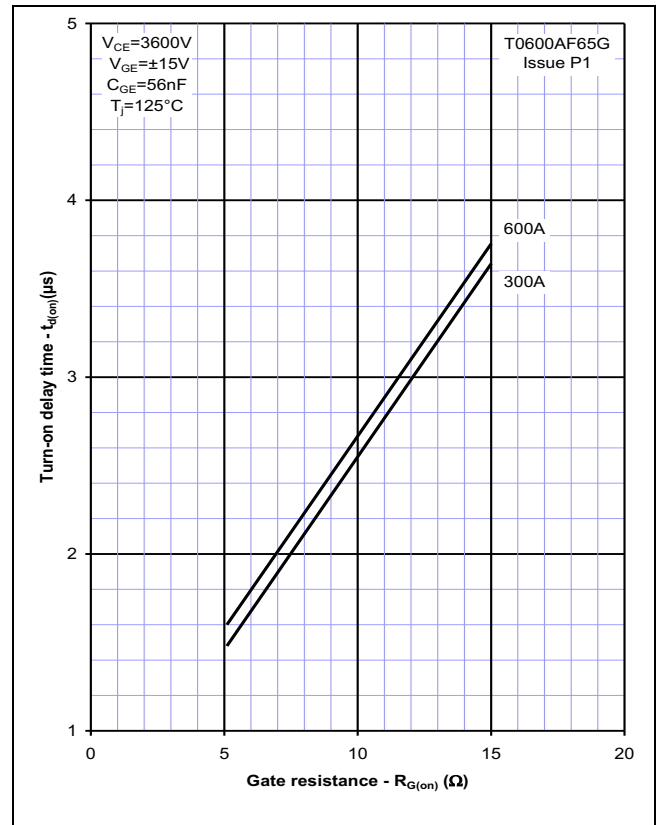


Figure 5 – Typical turn-off delay time vs. gate resistance

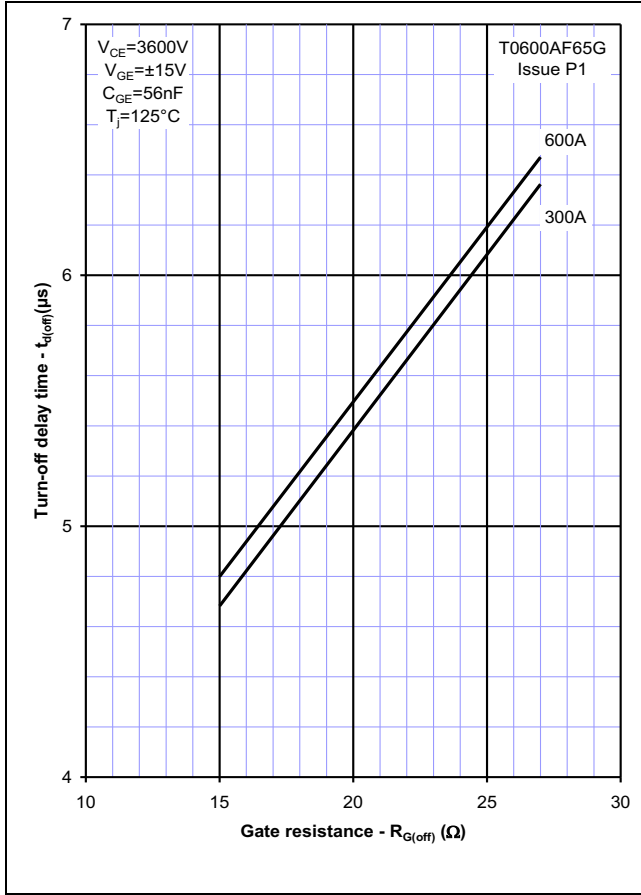


Figure 6 – Typical turn-on energy vs. collector current

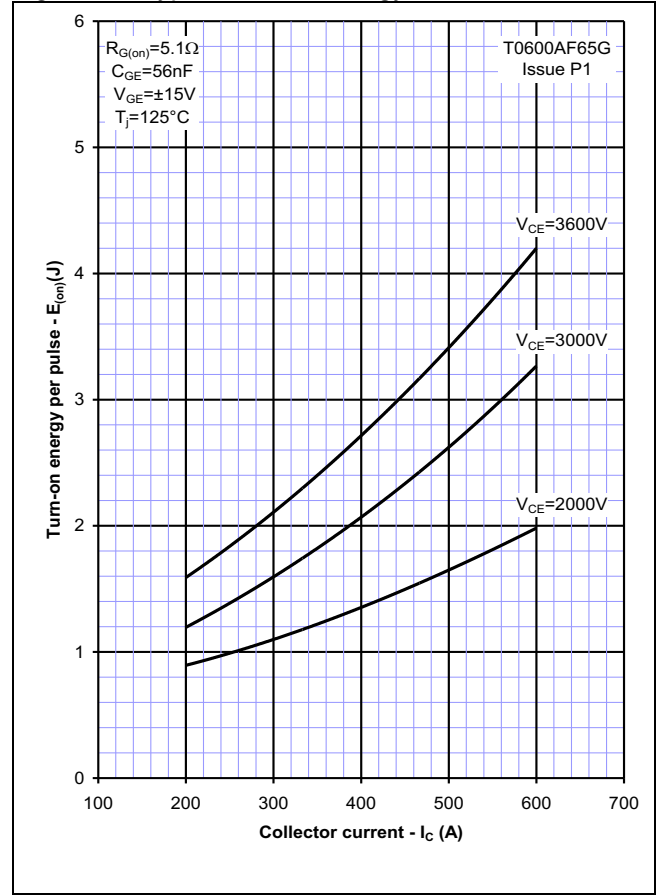


Figure 7 – Typical turn-on energy vs. di/dt

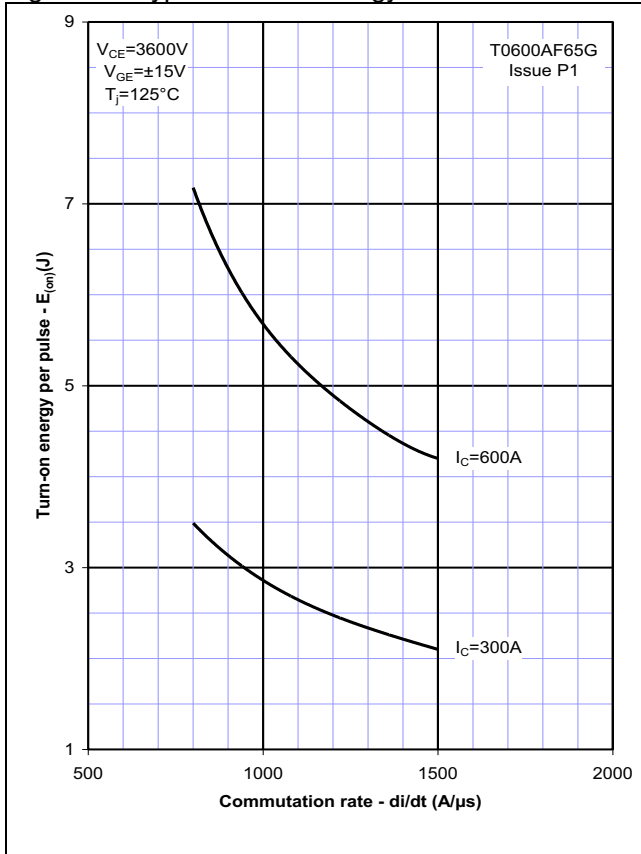


Figure 8 – Typical turn-off energy vs. collector current

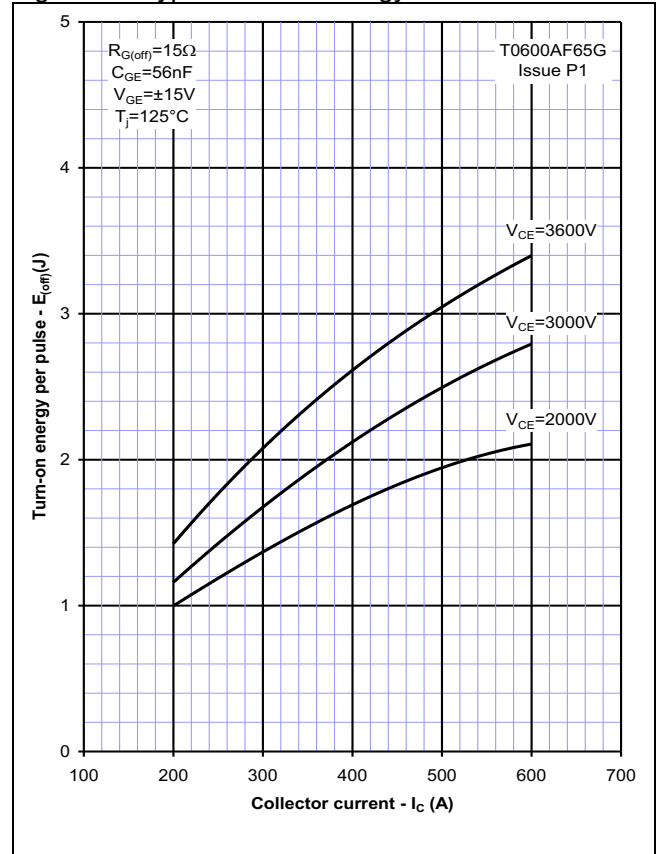


Figure 9 – Turn-off energy vs voltage

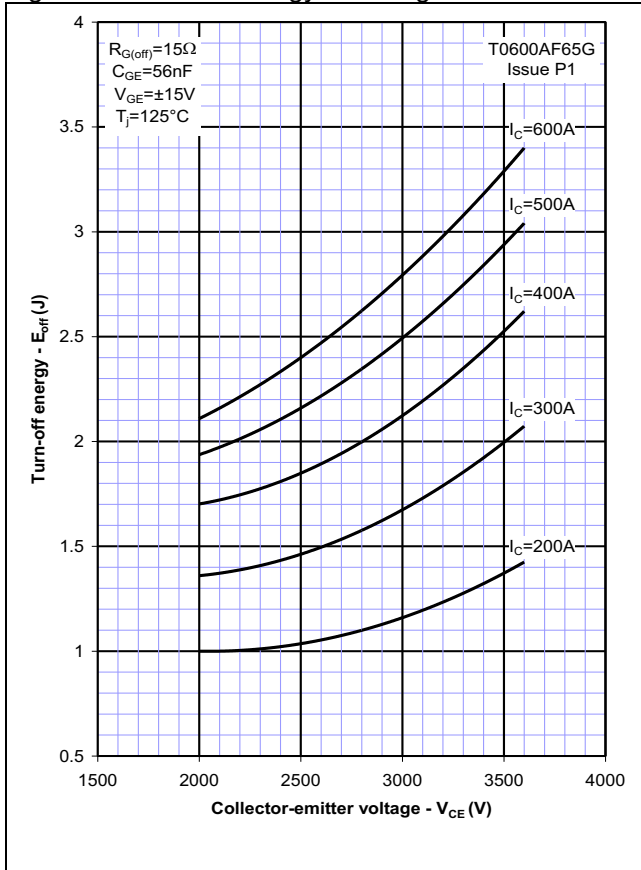


Figure 10 – Safe operating area (IGBT)

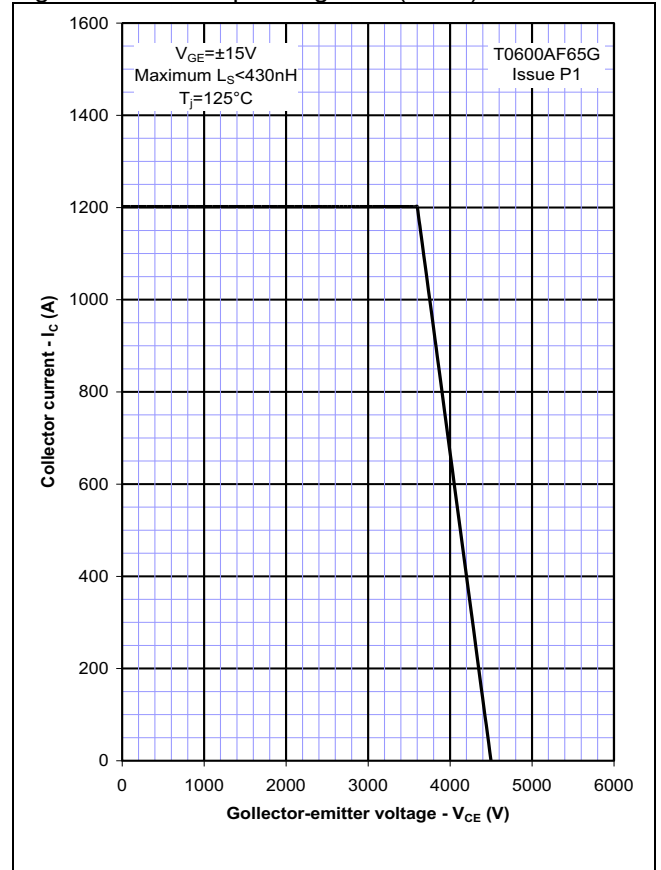


Figure 11 – Typical diode forward characteristics

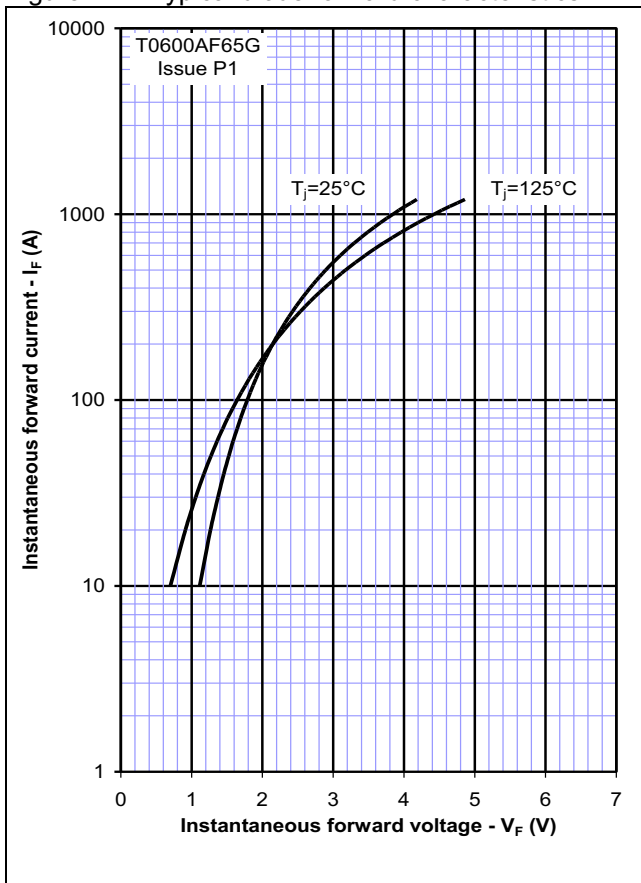


Figure 12 – Typical recovered charge

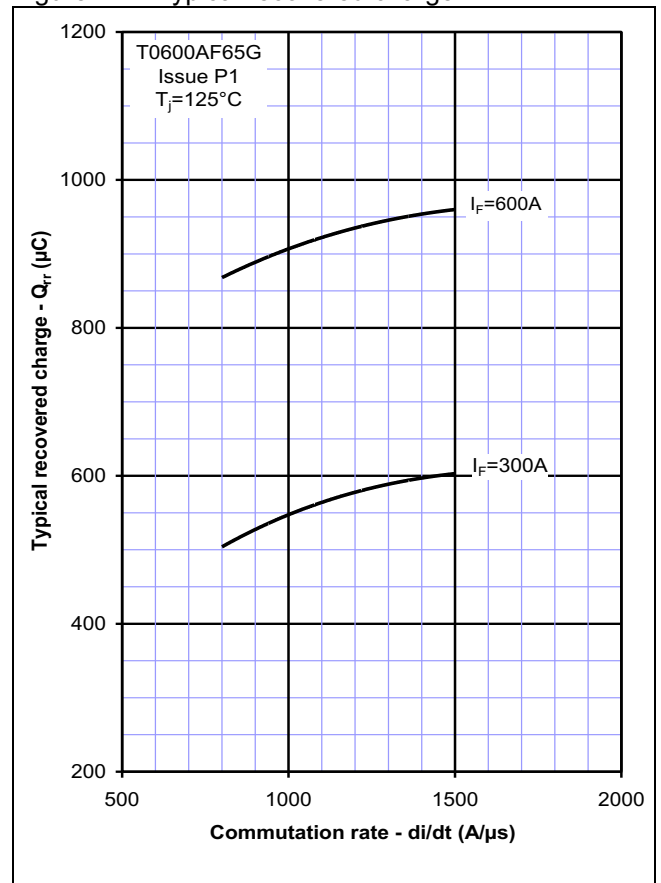


Figure 13 – Typical reverse recovery current

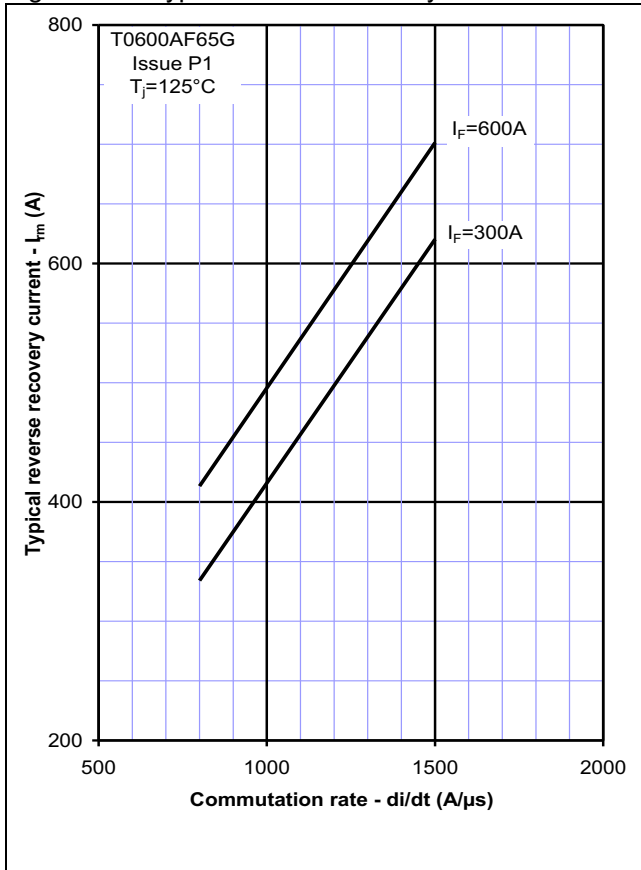


Figure 14 – Typical reverse recovery time

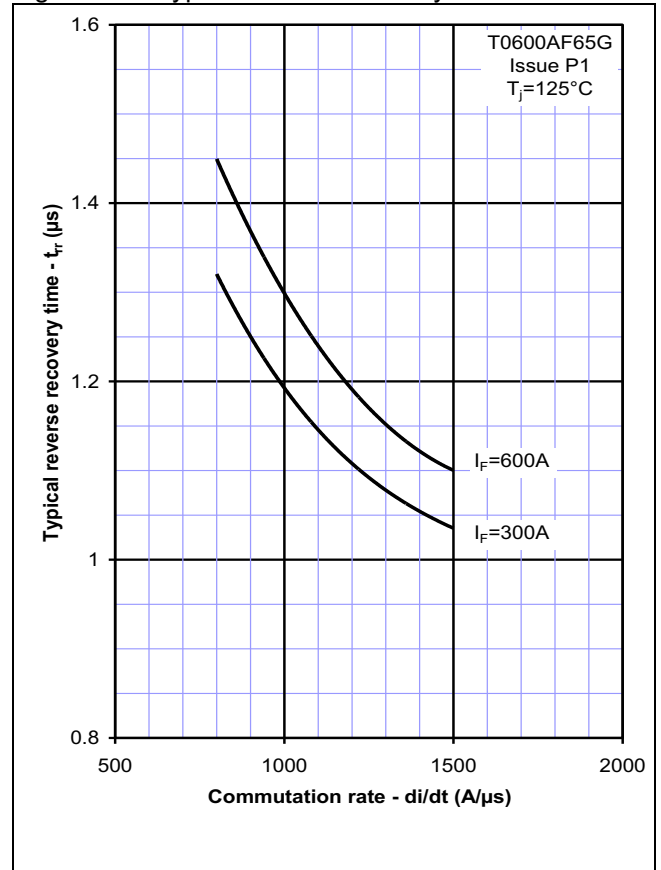


Figure 15 – Typical reverse recovery energy

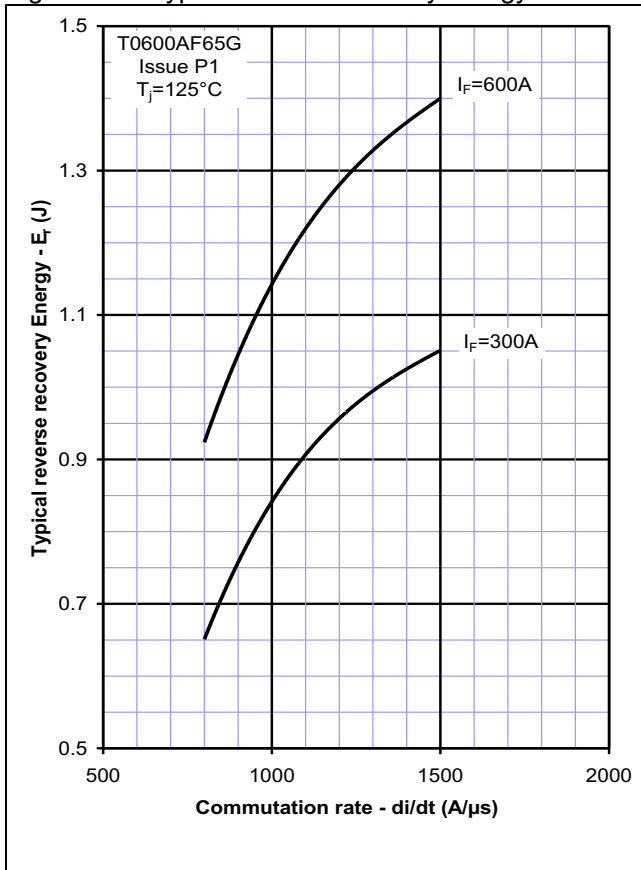


Figure 16 – Safe operating area (Diode)

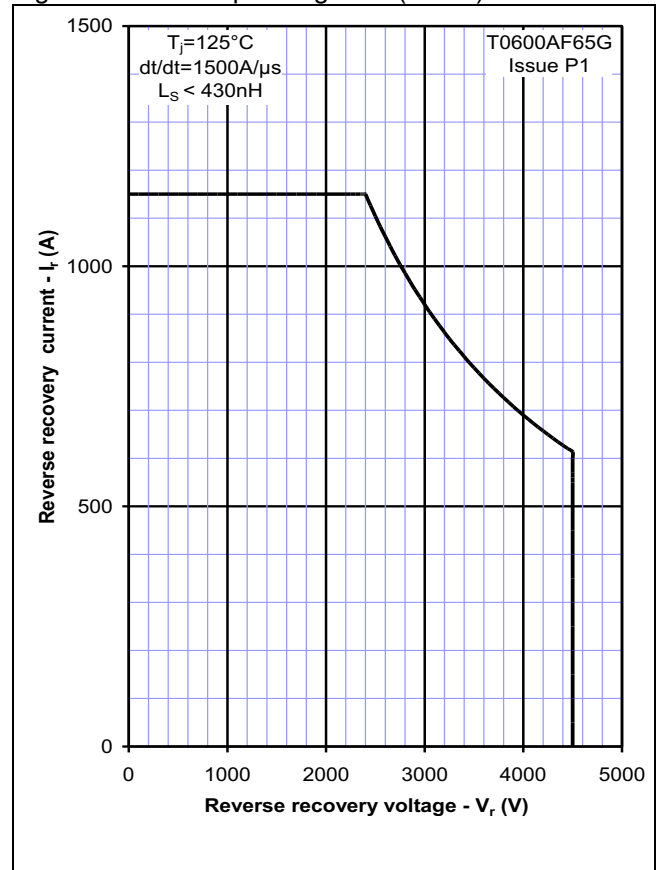


Figure 17 – Transient thermal impedance (IGBT)

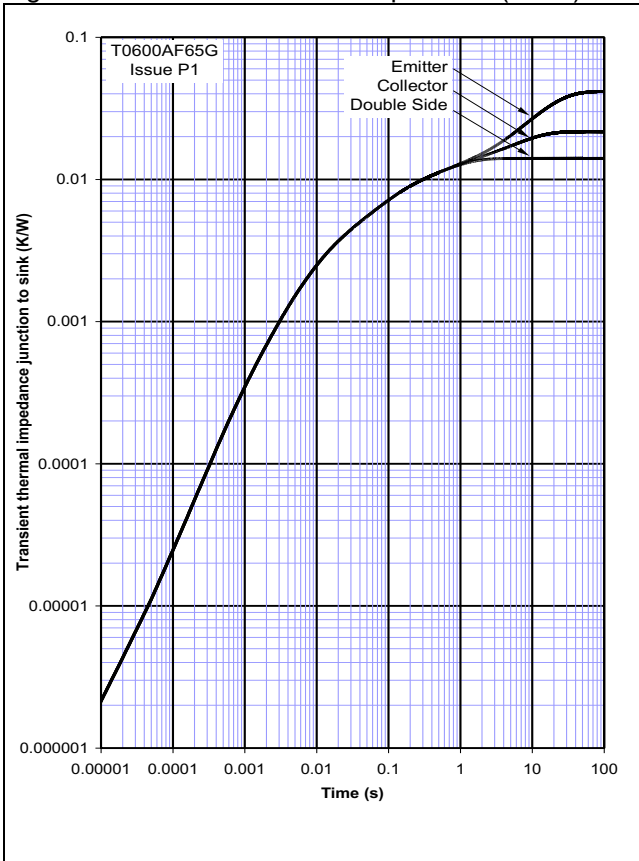
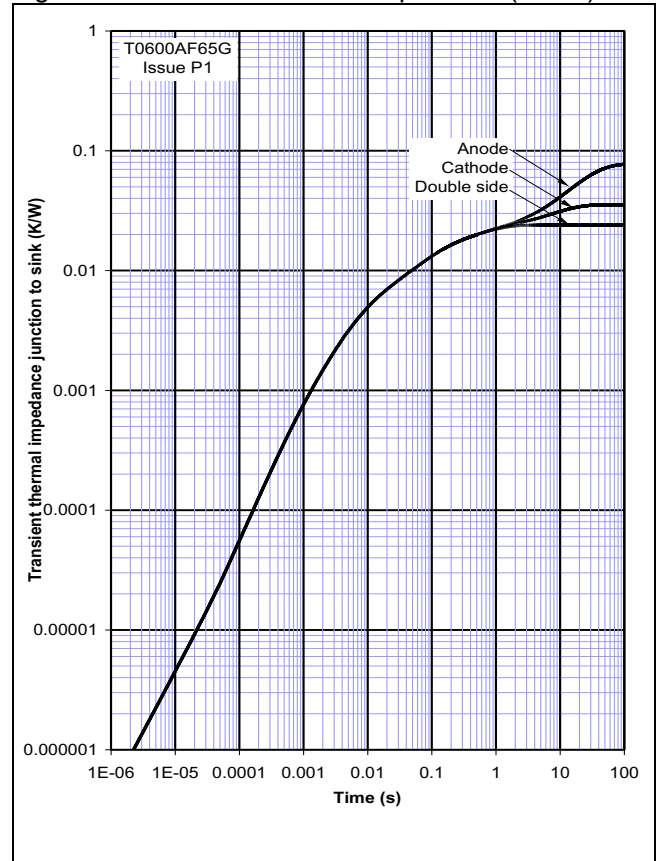
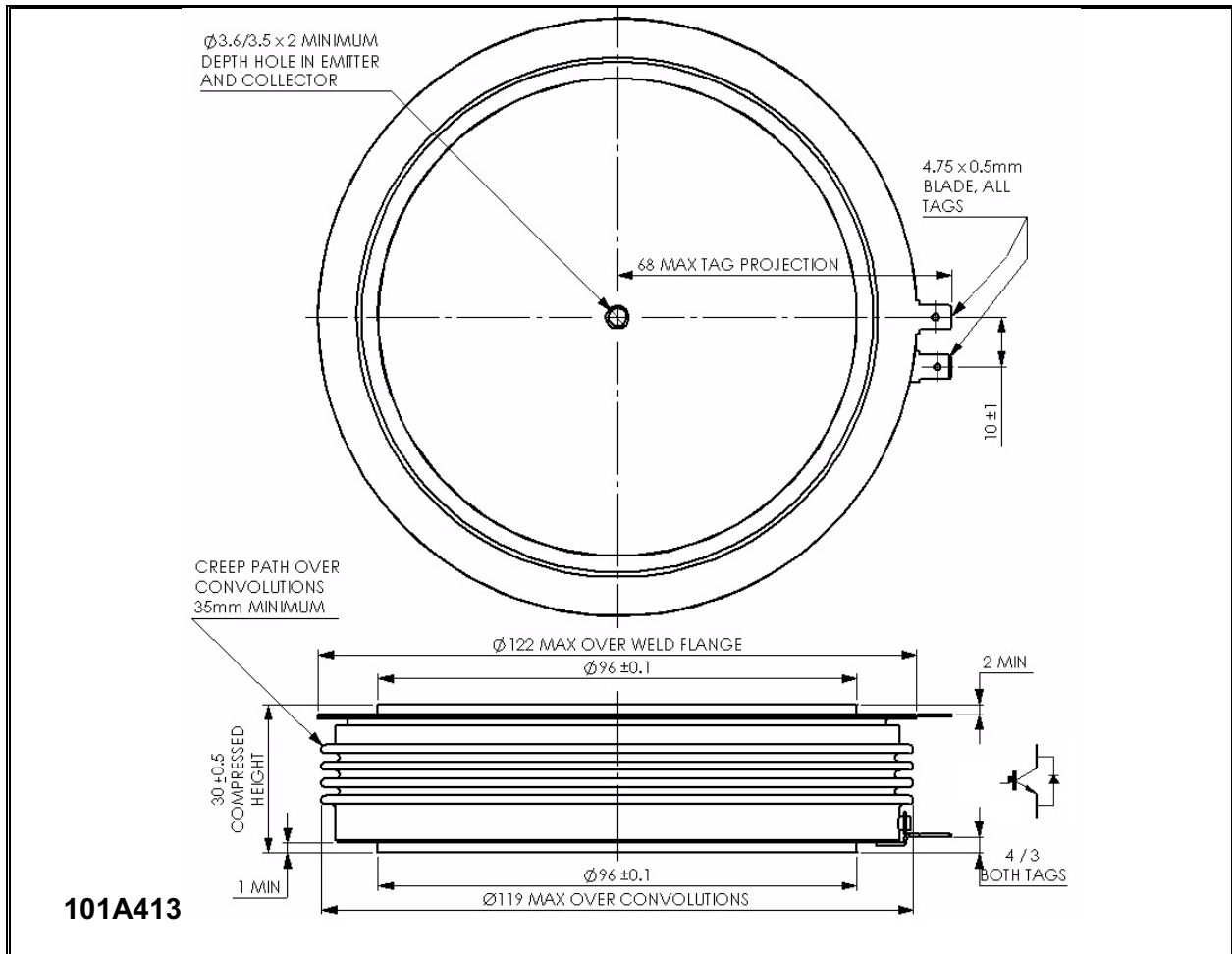


Figure 18 – Transient thermal impedance (Diode)



Outline Drawing & Ordering Information



ORDERING INFORMATION

(Please quote 10 digit code as below)

T0600	AF	65	G
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 65	Fixed format code

Typical order code: T0600AF65G ($V_{CES} = 6500V$)

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