IXYS UK WESTCODE

Date:- 27 Feb, 2015

Data Sheet Issue:- P1

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 = 125ºC.
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	-		µs
t_r(V)	Rise time	-	3.4	-	I_C =600A, V_{CE} =3600V, di/dt=1500A/µs	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	µs
t_f(I)	Fall time	-	2.1	-	(Note 3 & 4)	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_{To}	Threshold voltage	-	-	1.89	Current range 200A – 600A	V
r_T	Slope resistance	-	-	3.27		mΩ
I_{rm}	Peak reverse recovery current	-	700	-	V_r=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

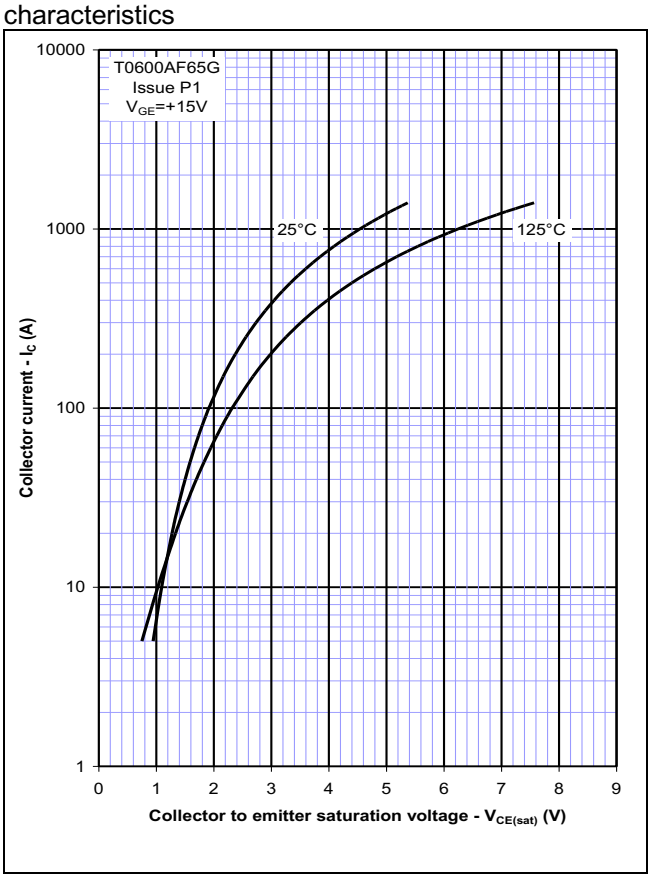


Figure 2 – Typical output characteristic

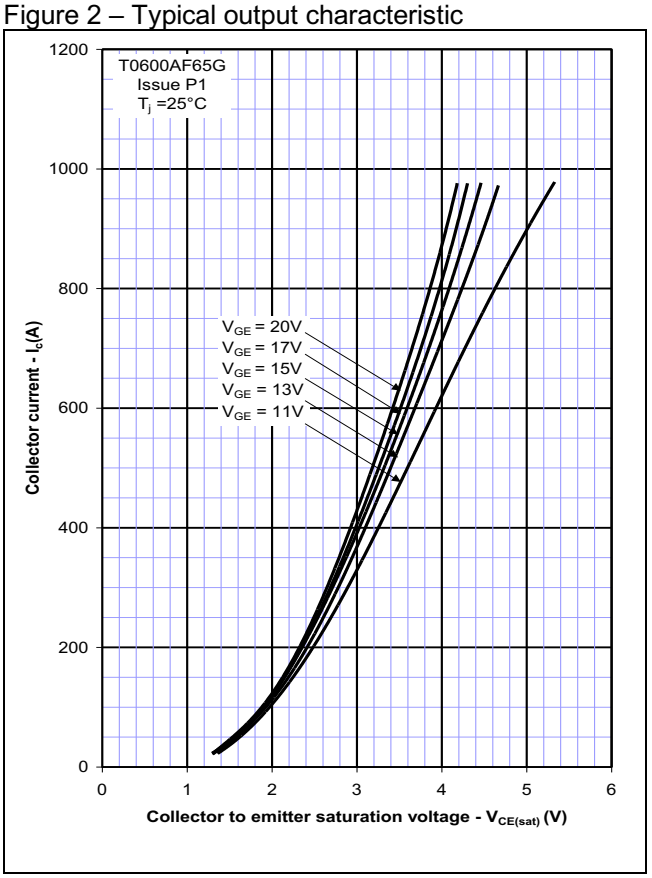


Figure 3 – Typical output characteristic

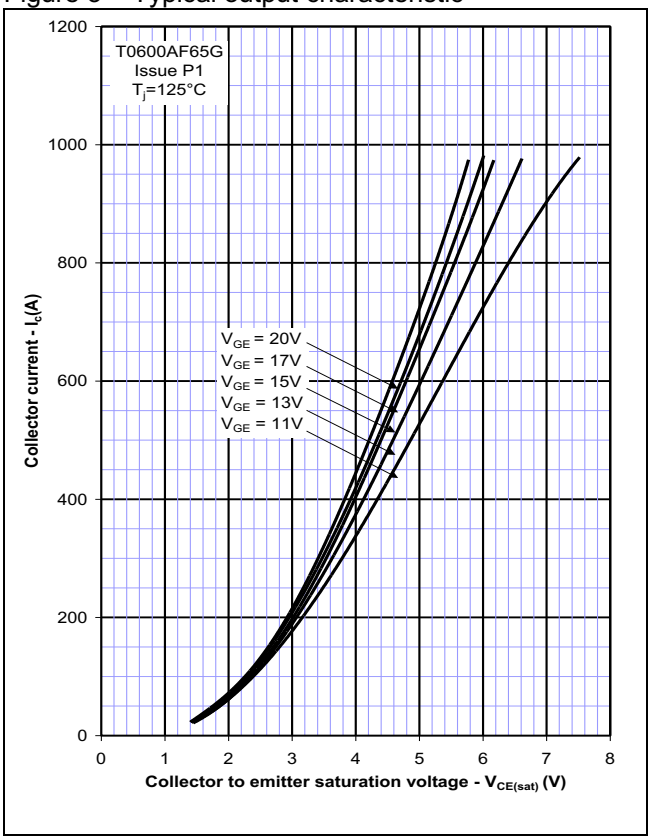


Figure 4 – Typical turn-on delay time vs gate resistance

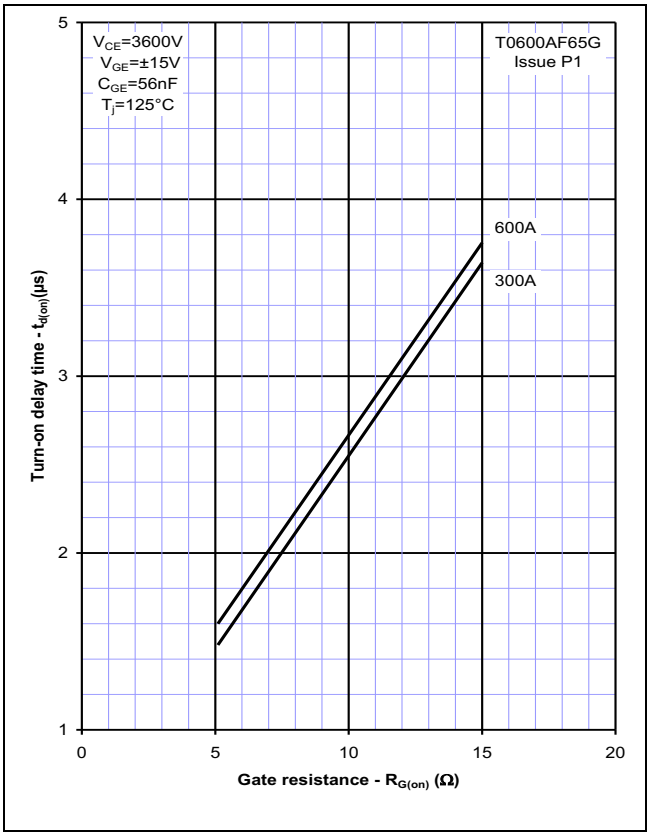


Figure 5 – Typical turn-off delay time vs. gate resistance

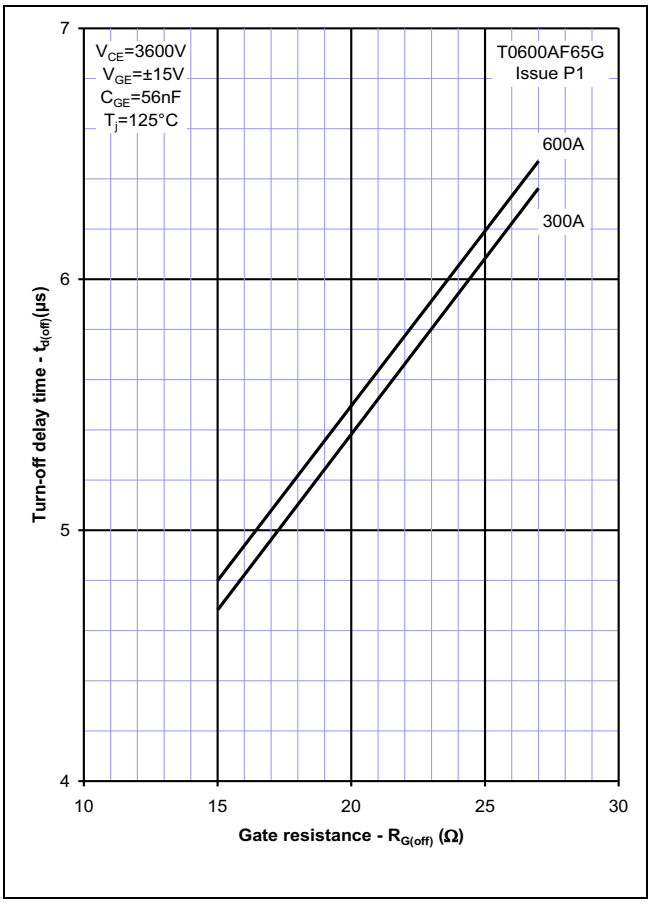


Figure 6 – Typical turn-on energy vs. collector current

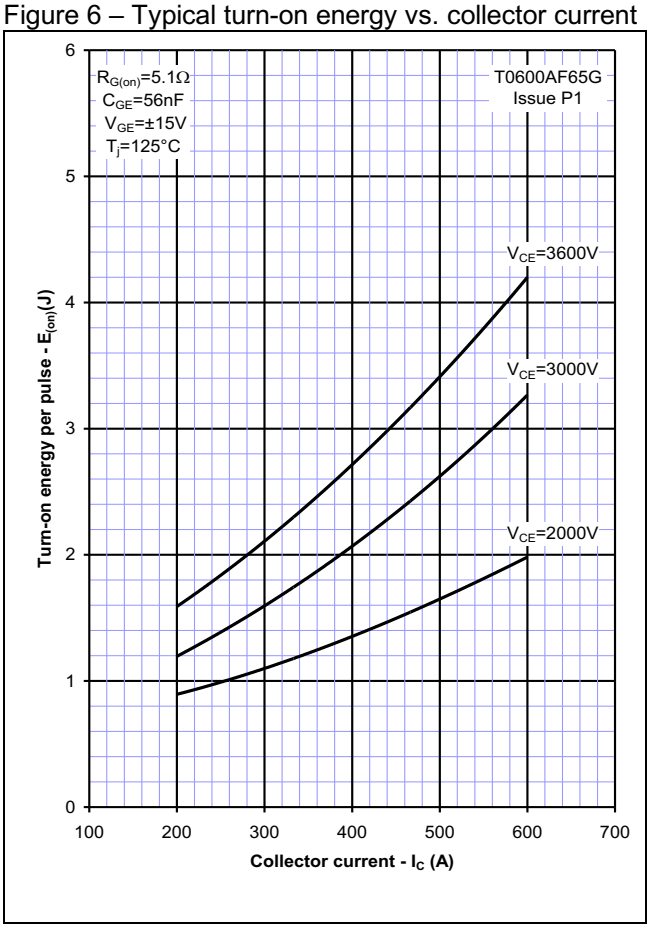


Figure 7 – Typical turn-on energy vs. di/dt

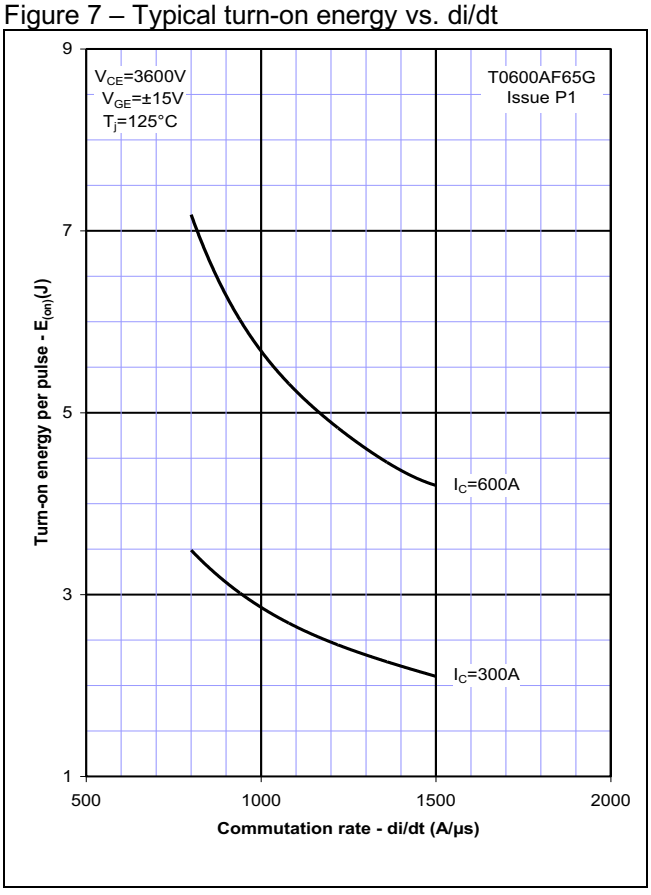


Figure 8 – Typical turn-off energy vs. collector current

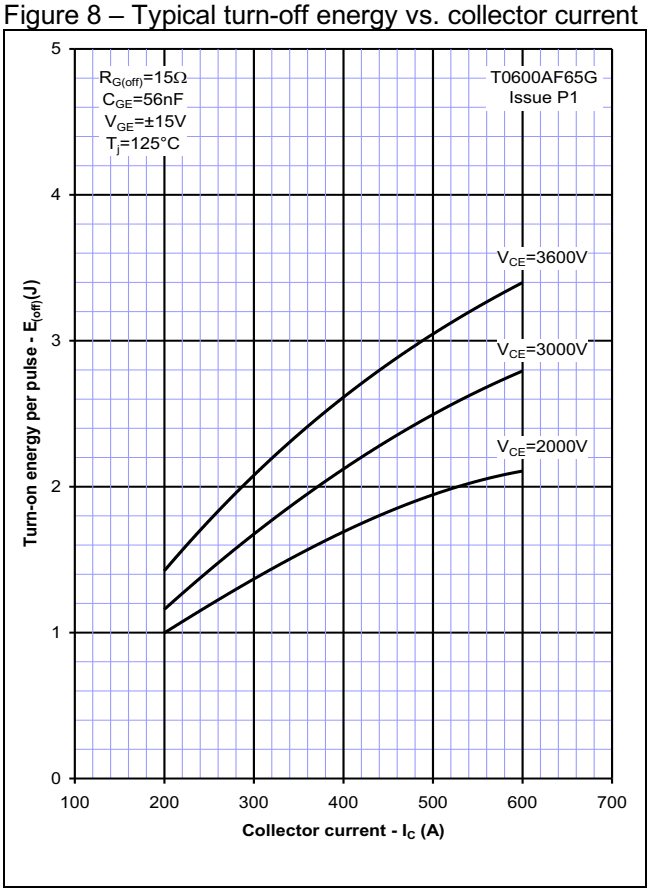


Figure 9 – Turn-off energy vs voltage

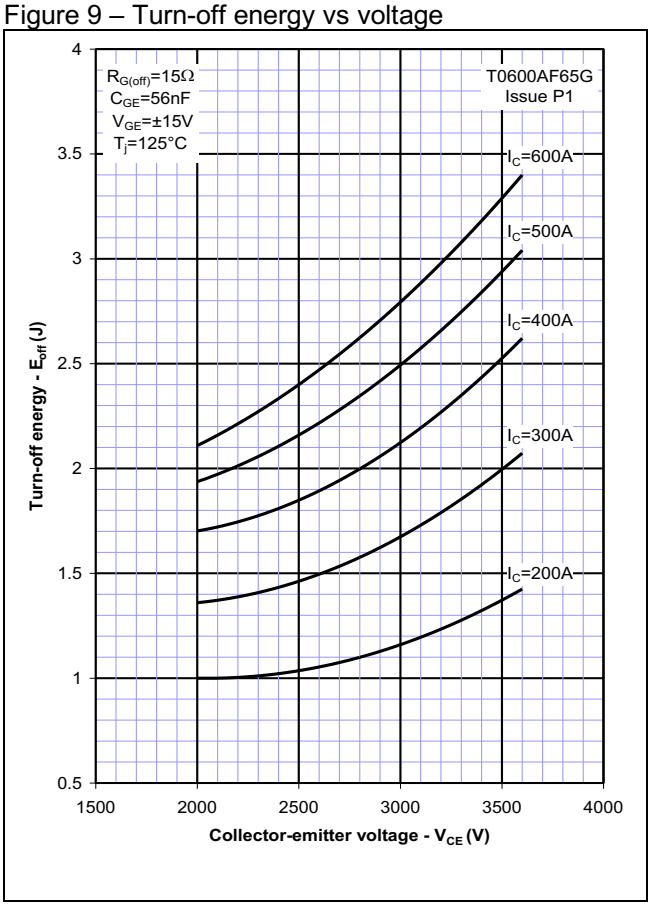


Figure 10 – Safe operating area (IGBT)

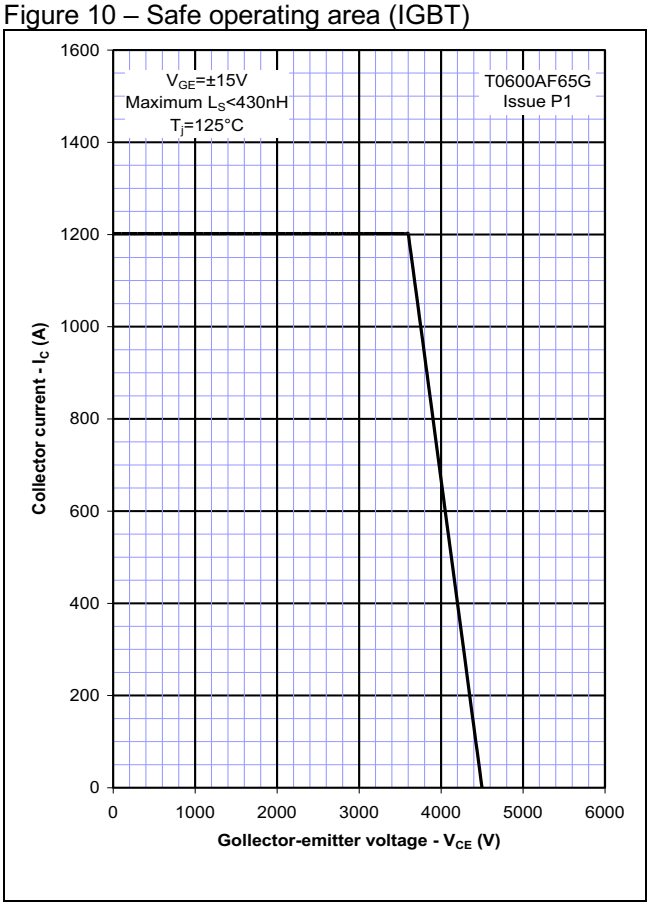


Figure 11 – Typical diode forward characteristics

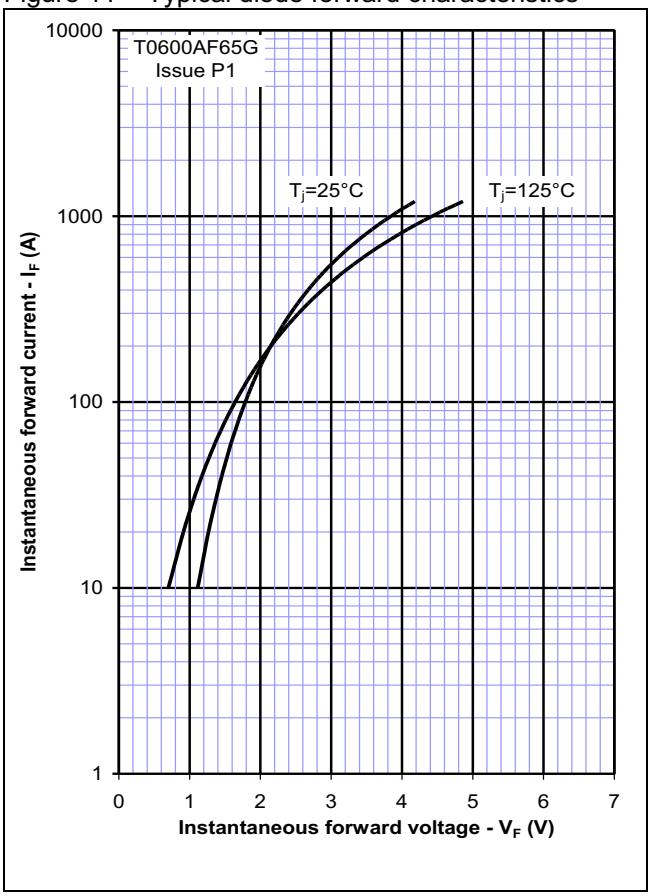


Figure 12 – Typical recovered charge

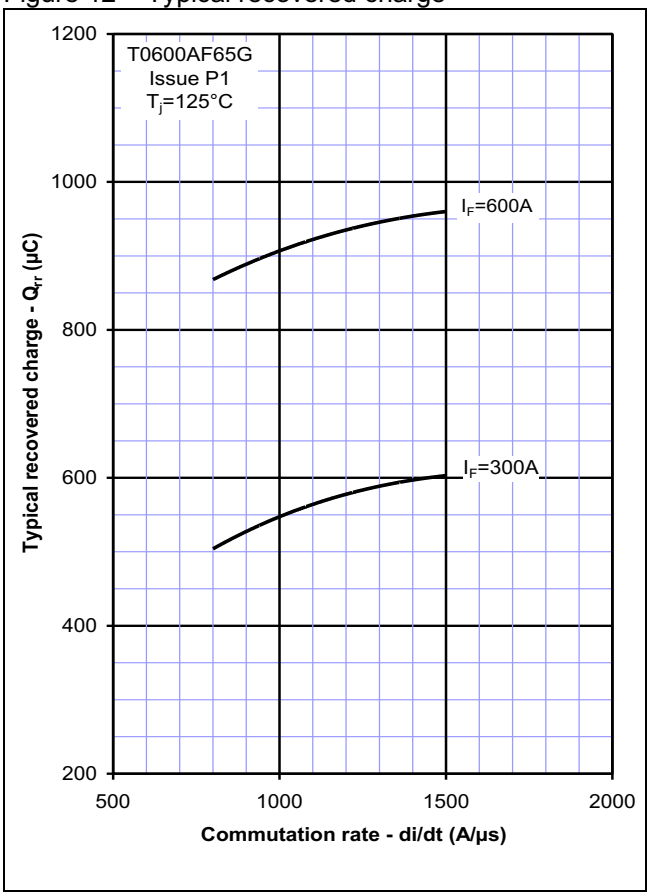


Figure 13 – Typical reverse recovery current

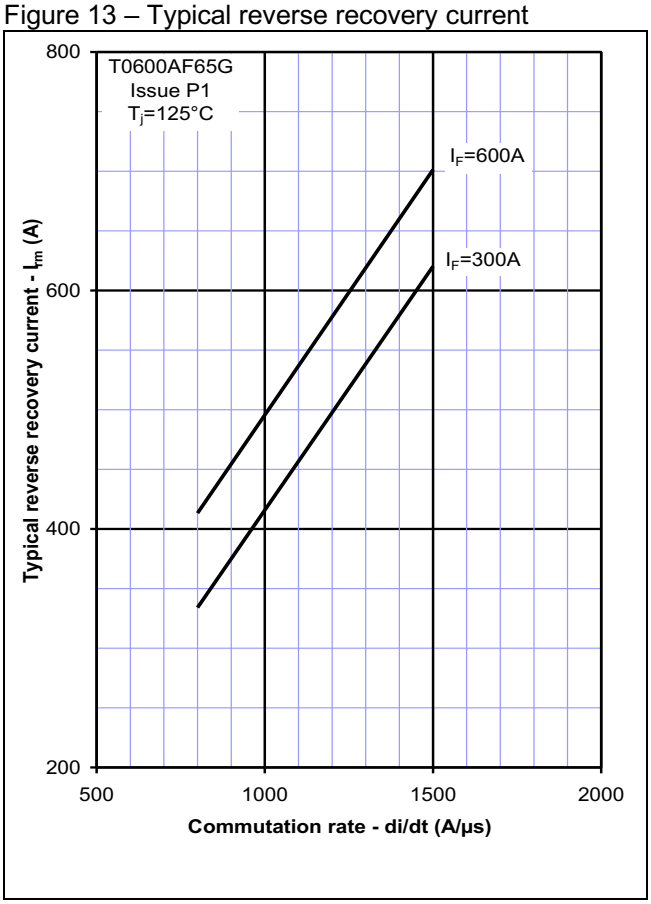


Figure 14 – Typical reverse recovery time

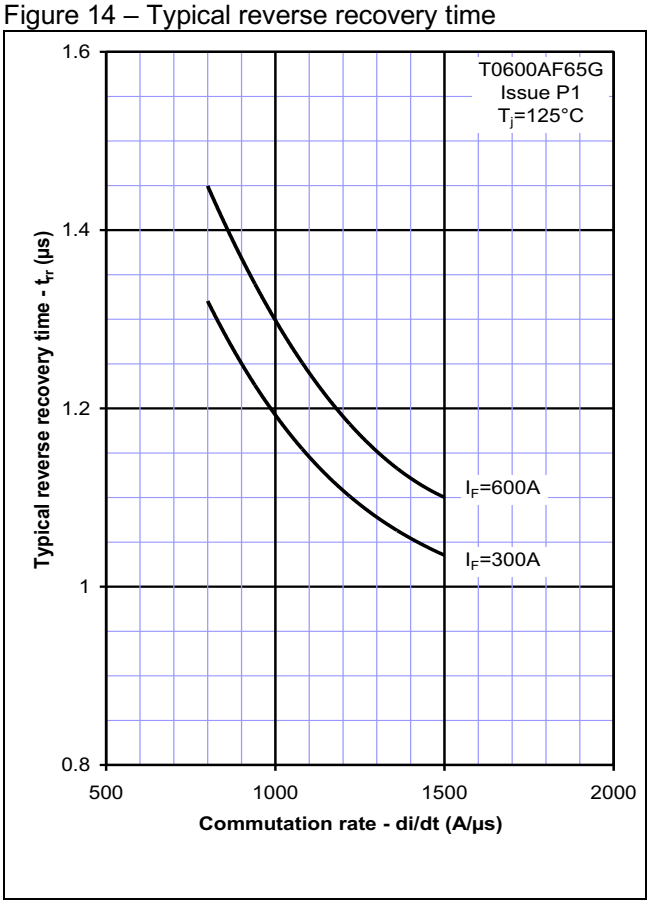


Figure 15 – Typical reverse recovery energy

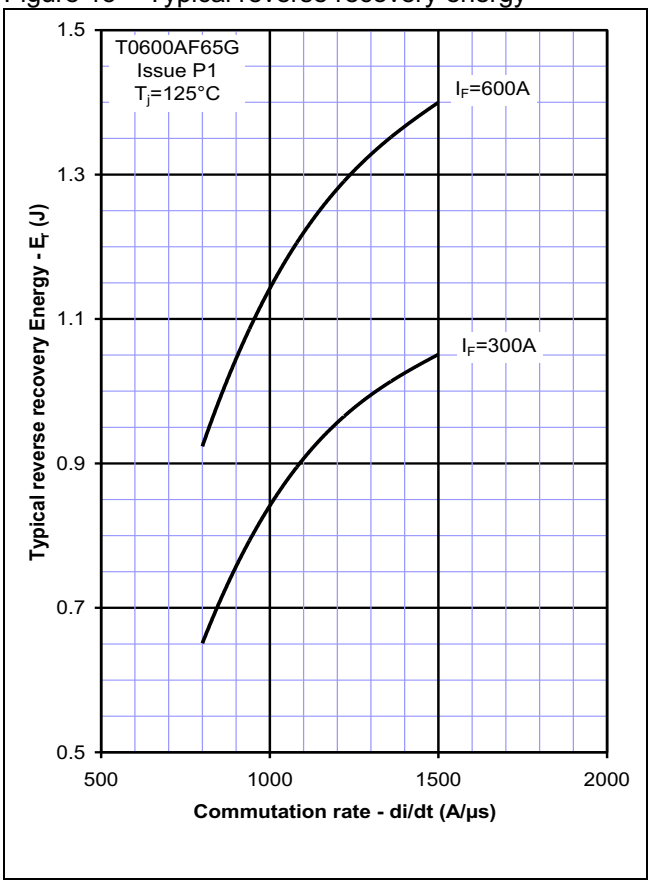


Figure 16 – Safe operating area (Diode)

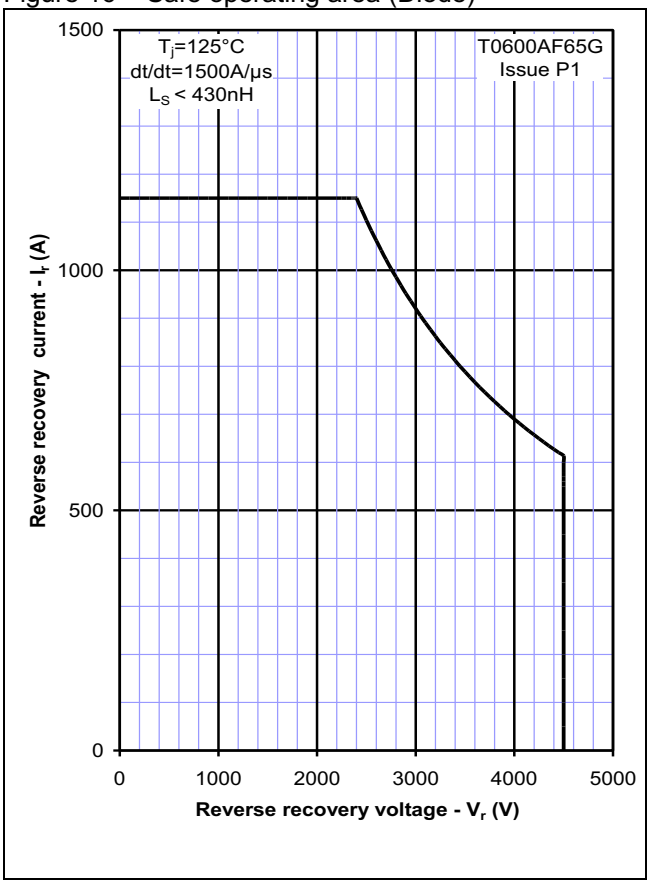


Figure 17 – Transient thermal impedance (IGBT)

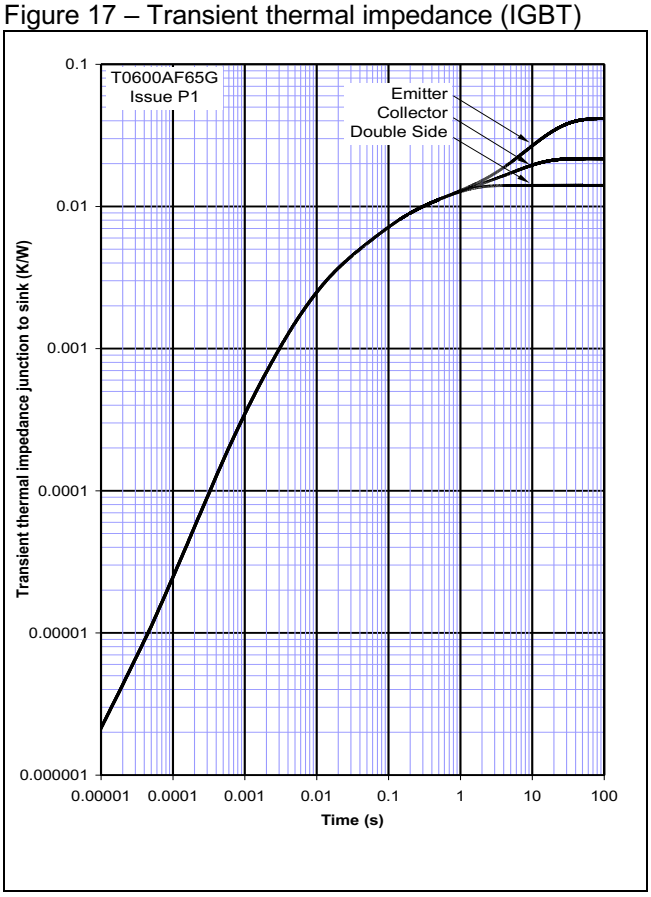
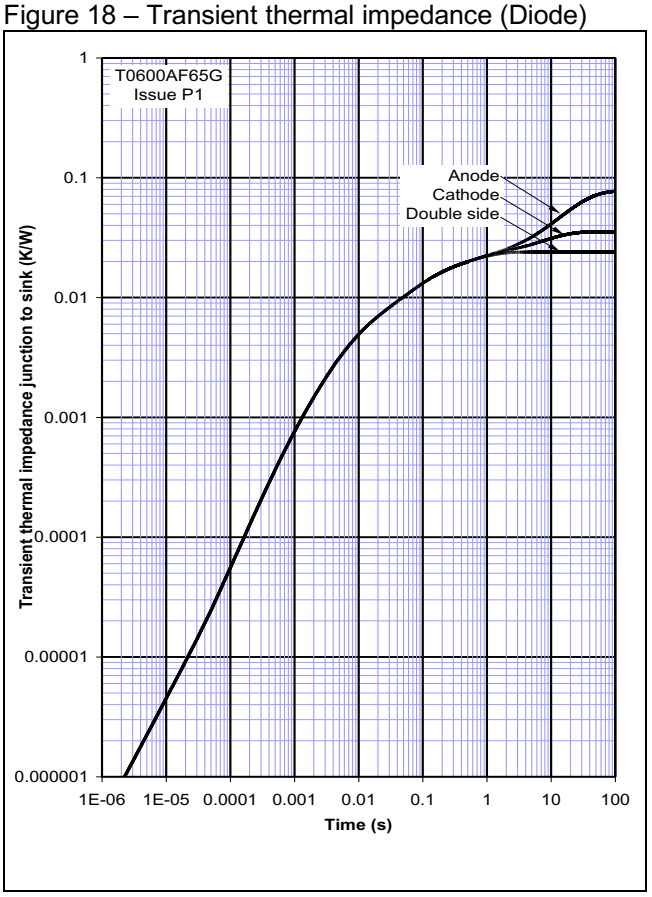
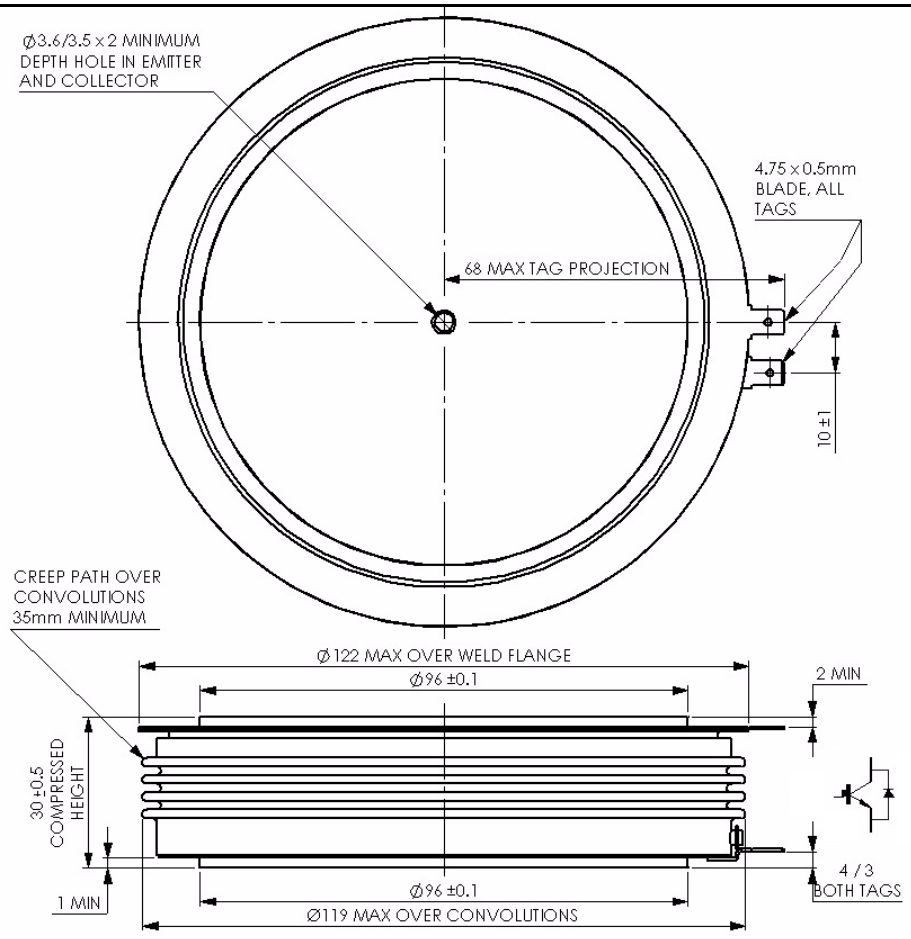


Figure 18 – Transient thermal impedance (Diode)



Outline Drawing & Ordering Information



101A413

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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