

Provisional data

## Insulated Bi-Polar Gate Transistor

### Type T0360NA25A

(Development Type Number: TX031NA25A)

#### Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V <sub>CES</sub>	Collector – emitter voltage	2500	V
V <sub>DC link</sub>	Permanent DC voltage for 100 FIT failure rate.	1250	V
V <sub>GES</sub>	Peak gate – emitter voltage	±20	V

	RATINGS	MAXIMUM LIMITS	UNITS
I <sub>C(DC)</sub>	Continuous DC collector current, IGBT (Note 2).	360	A
I <sub>CRM</sub>	Repetitive peak collector current, t <sub>p</sub> =1ms, IGBT.	720	A
I <sub>F(DC)</sub>	Continuous DC forward current, Diode (note 2).	376	A
I <sub>FRM</sub>	Repetitive peak forward current, t <sub>p</sub> =1ms, Diode.	720	A
P <sub>MAX</sub>	Maximum power dissipation, IGBT (note 3).	1.85	kW
(di/dt) <sub>cr</sub>	Critical diode di/dt (note 4)	650	A/μs
T <sub>j</sub>	Operating temperature range.	-40 to +125	°C
T <sub>stg</sub>	Storage temperature range.	-40 to +125	°C

Notes: -

- 1) Unless otherwise indicated T<sub>j</sub> = 125°C.
- 2) T<sub>sink</sub> = 55°C, double side cooled.
- 3) T<sub>sink</sub> = 25°C, double side cooled.
- 4) Maximum commutation loop inductance 1μH.

## Characteristics

### IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V <sub>CE(sat)</sub>	Collector – emitter saturation voltage	-	2.4	2.8	I <sub>C</sub> = 360A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C	V
		-	3.3	3.6	I <sub>C</sub> = 360A, V <sub>GE</sub> = 15V	V
V <sub>To</sub>	Threshold voltage	-	-	1.25	Current range: 100 – 500A	V
r <sub>T</sub>	Slope resistance	-	-	6.53		mΩ
V <sub>GE(TH)</sub>	Gate threshold voltage	6	6.6	9	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 200mA	V
I <sub>CES</sub>	Collector – emitter cut-off current	-	2	12	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	mA
I <sub>GES</sub>	Gate leakage current	-	-	±2.5	V <sub>GE</sub> = ±20V	μA
C <sub>ies</sub>	Input capacitance	-	68	-	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz	nF
t <sub>d(on)</sub>	Turn-on delay time	-	2.8	-	I <sub>C</sub> = 360A, V <sub>CE</sub> = 0.5V <sub>CES</sub> , V <sub>GE</sub> = ±20V, R <sub>g(ON)</sub> = 33Ω, R <sub>g(OFF)</sub> = 18Ω, Snubber : 10Ω and 0.22μF in series	μs
t <sub>r(l)</sub>	Rise time	-	2.0	-		μs
Q <sub>g(on)</sub>	Turn-on gate charge	-	-	10		μC
E <sub>on</sub>	Turn-on energy	-	0.75	-		J
t <sub>d(off)</sub>	Turn-off delay time	-	1.5	-		μs
t <sub>f</sub>	Fall time	-	2.8	-		μs
Q <sub>g(off)</sub>	Turn-off gate charge	-	-	17		μC
E <sub>off</sub>	Turn-off energy	-	0.34	-		J

### Diode Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V <sub>F</sub>	Forward voltage	-	2.1	-	I <sub>F</sub> = 360A, T <sub>j</sub> = 25°C	V
		-	2.1	2.5	I <sub>F</sub> = 360A	V
V <sub>To</sub>	Threshold voltage	-	-	1.5	Current range 100-500A	V
r <sub>T</sub>	Slope resistance	-	-	2.78		mΩ
I <sub>rm</sub>	Peak reverse recovery current	-	250	-	I <sub>F</sub> = 360A, V <sub>GE</sub> = ±20V, di/dt=600A/μs Snubber : 10Ω and 0.22μF in series	A
Q <sub>rr</sub>	Recovered charge, 50% chord	-	285	-		μC
t <sub>rr</sub>	Reverse recovery time, 50% chord	-	0.93	-		μs
E <sub>r</sub>	Reverse recovery energy	-	0.2	-		J

### Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R <sub>thJK</sub>	Thermal resistance junction to sink, IGBT	-	-	54	Double side cooled	K/kW
		-	-	82	Collector side cooled	K/kW
		-	-	157	Emitter side cooled	K/kW
R <sub>thJK</sub>	Thermal resistance junction to sink, Diode	-	-	73	Double side cooled	K/kW
		-	-	113	Cathode side cooled	K/kW
		-	-	210	Anode side cooled	K/kW
F	Mounting force	8	-	12		kN
W <sub>t</sub>	Weight	-	0.5	-		kg

Notes:-

- 1) Unless otherwise indicated T<sub>j</sub>=125°C.

**Curves**

Figure 1 – Typical collector-emitter saturation voltage characteristics

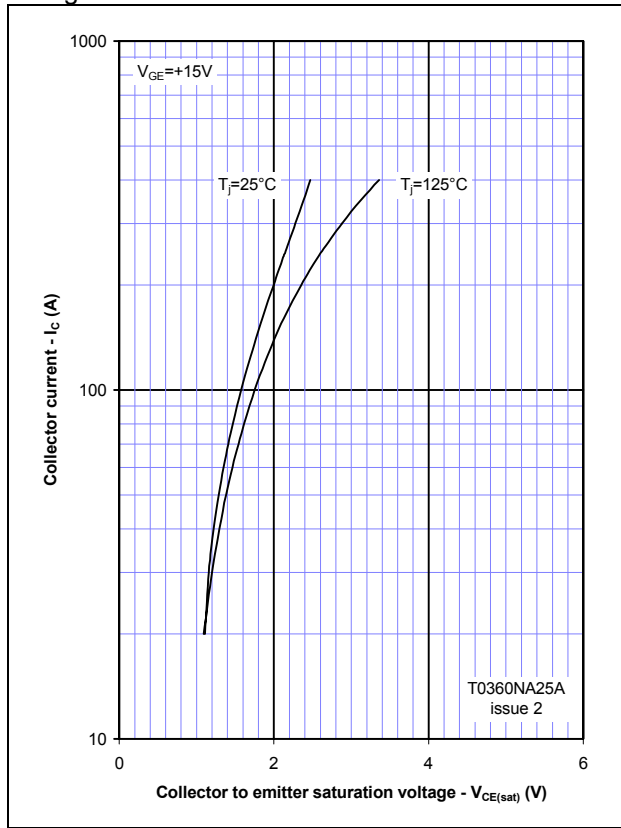


Figure 2 – Typical output characteristic at 25°C

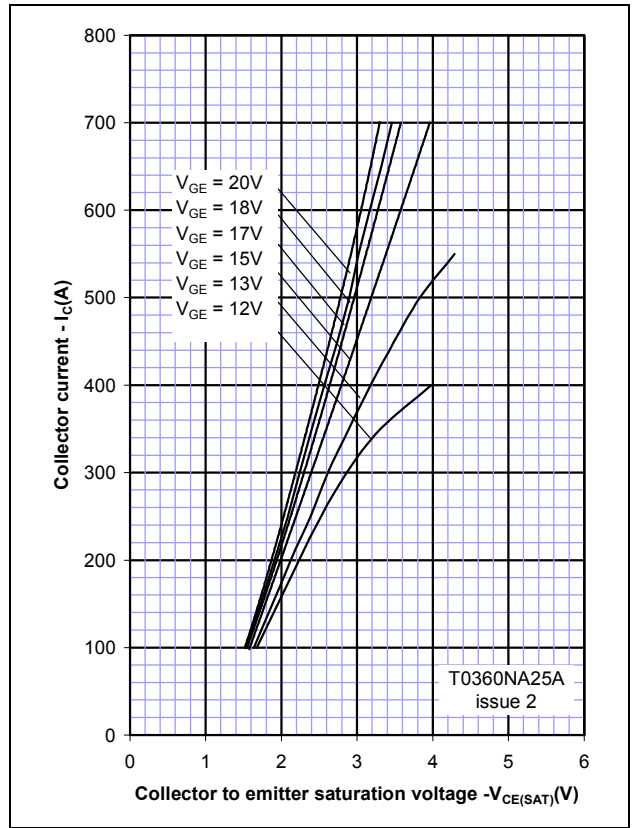


Figure 3 – Typical output characteristic at 125°C

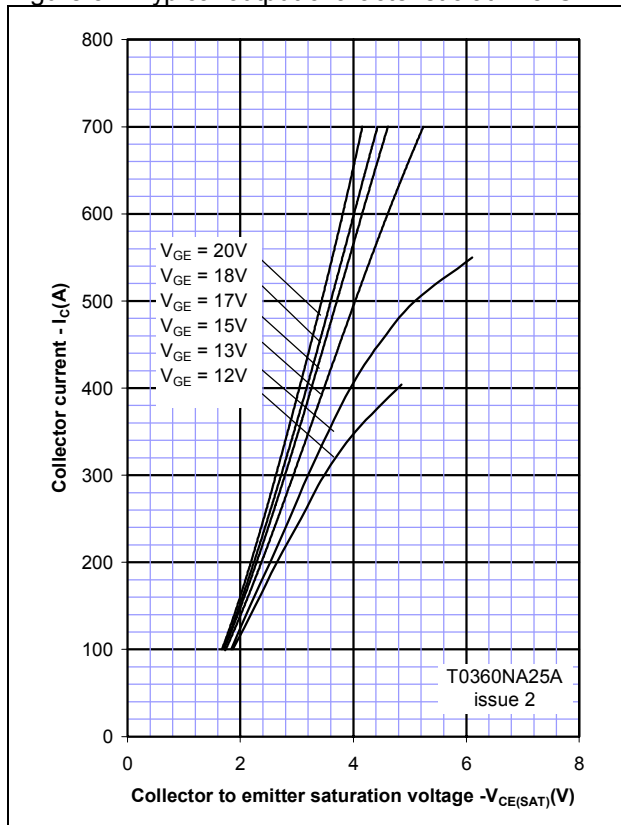


Figure 4 – Typical turn-on gate charge

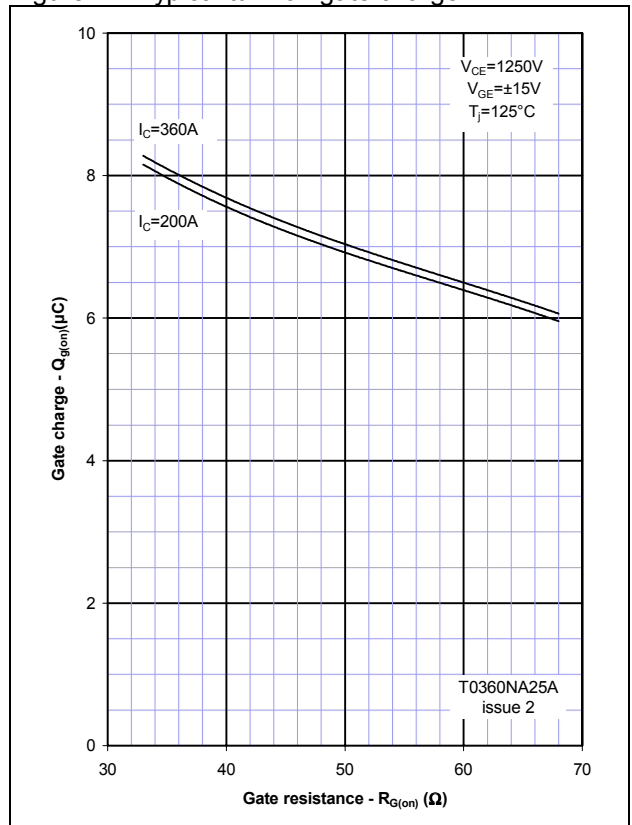


Figure 5 – Typical turn-off gate charge

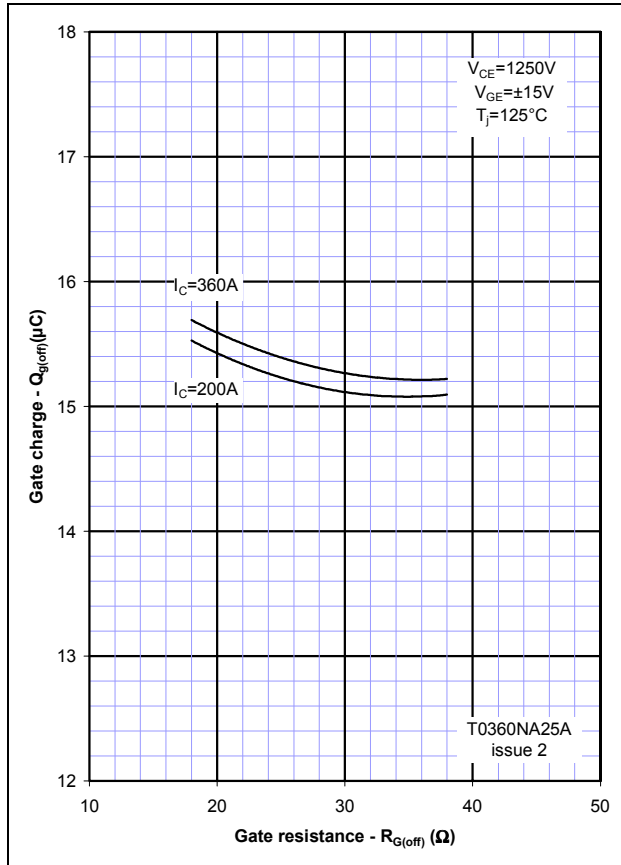


Figure 6 – Typical turn-on delay time vs gate resistance

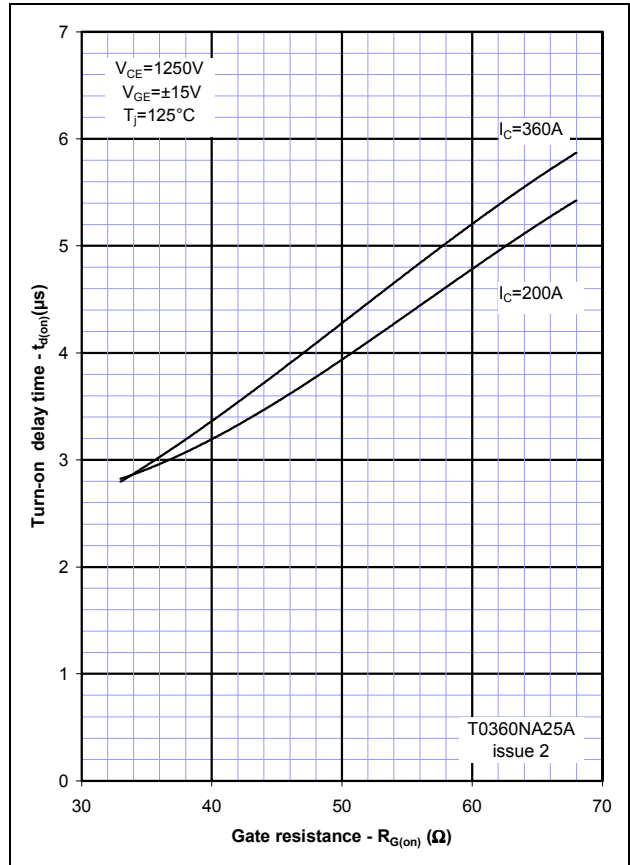


Figure 7 – Typical turn-off delay time vs. gate resistance

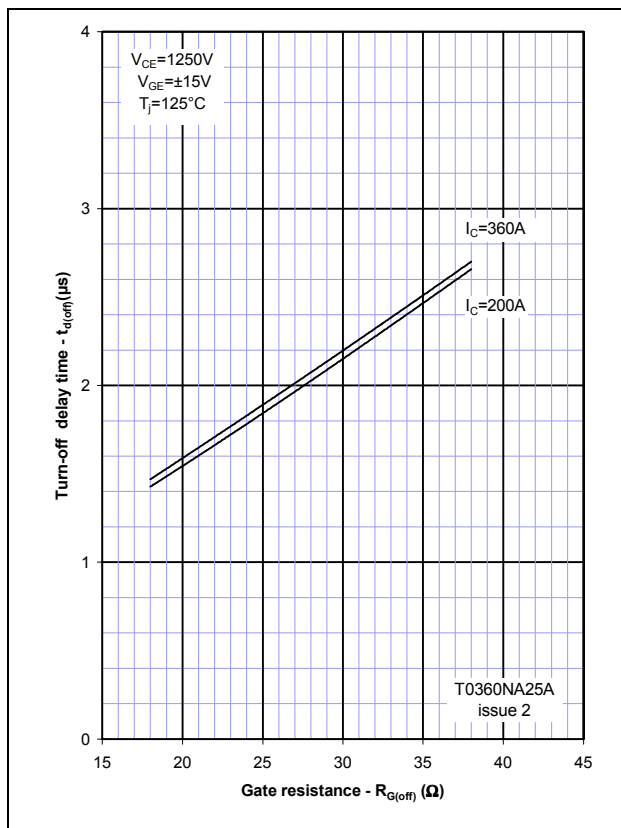


Figure 8 – Typical turn-on energy vs. collector current

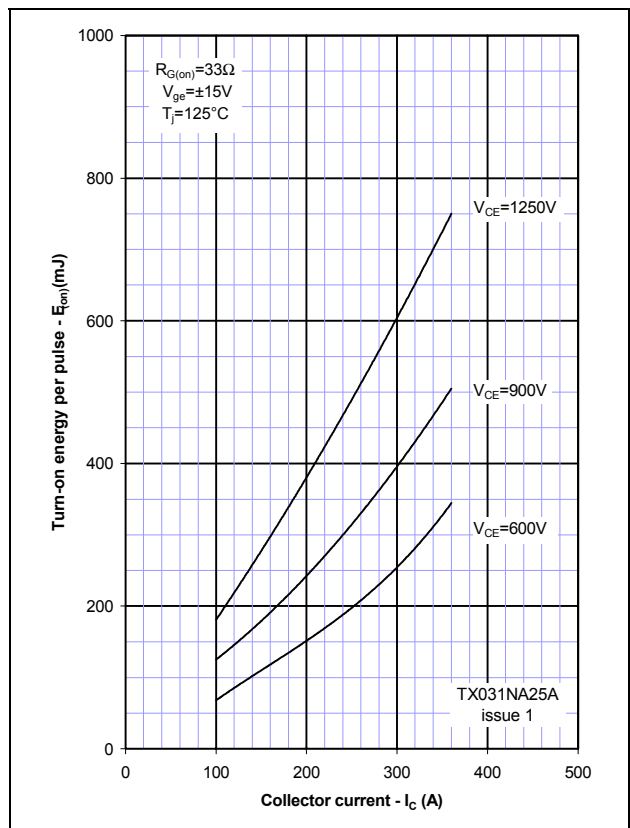


Figure 9 – Typical turn-on energy vs. di/dt

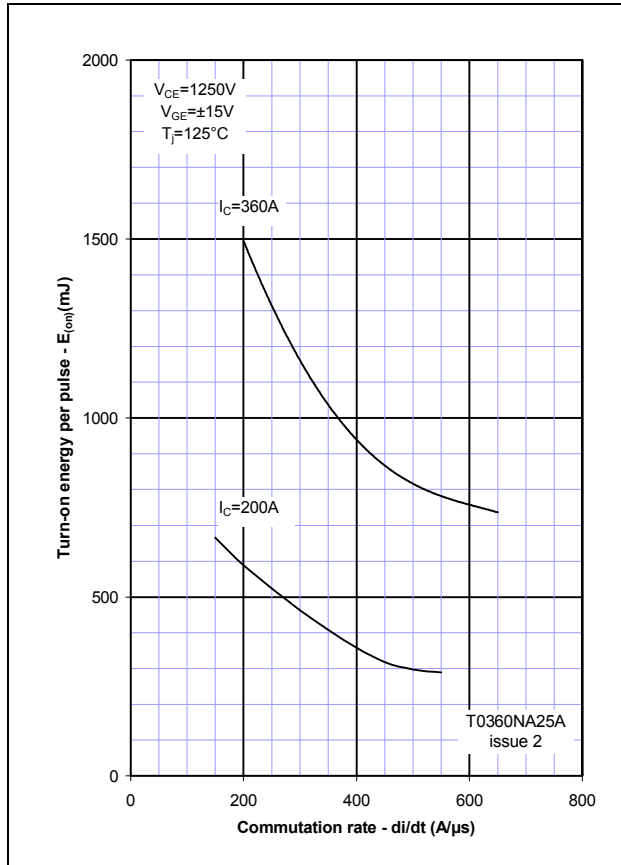


Figure 10 – Typical turn-off energy vs. collector current

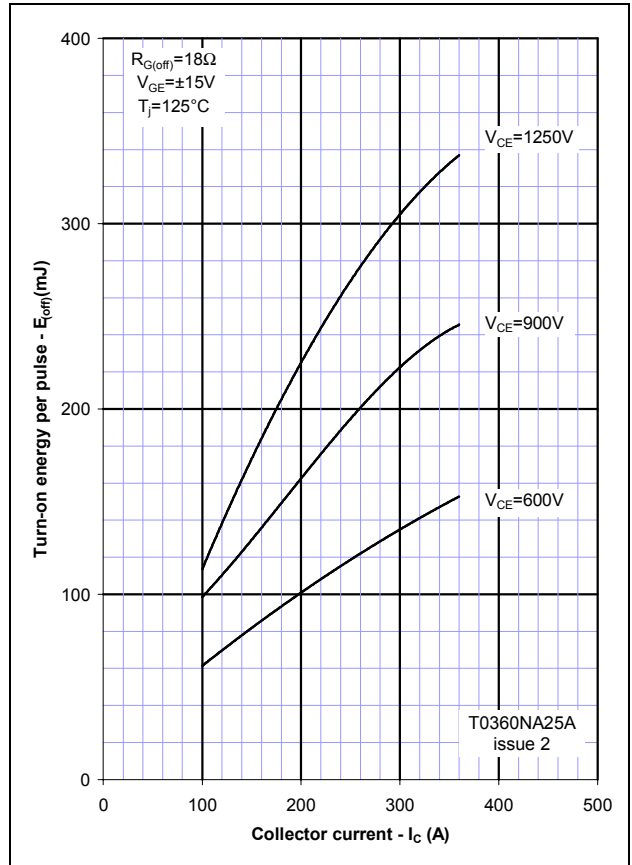


Figure 11 – Turn-off energy vs voltage

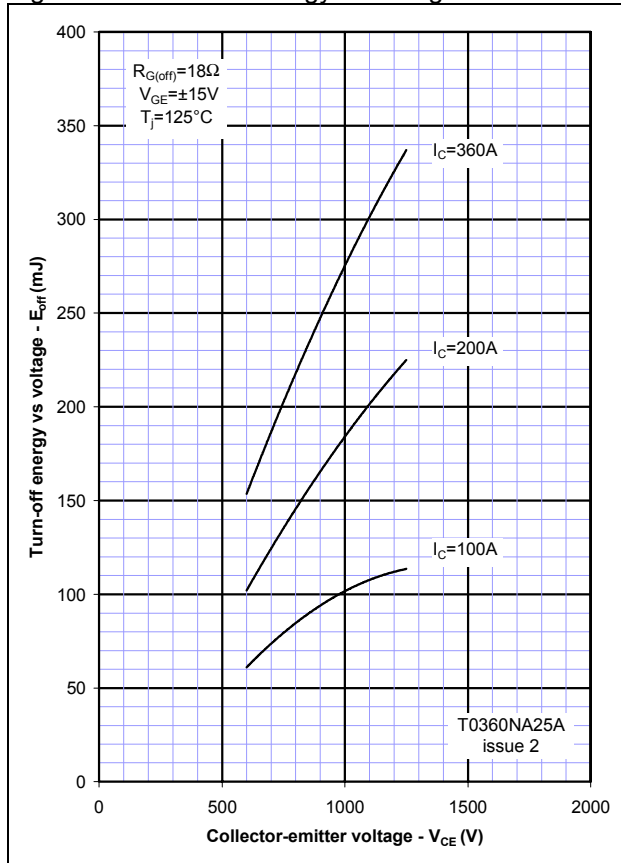


Figure 12 – Safe operating area

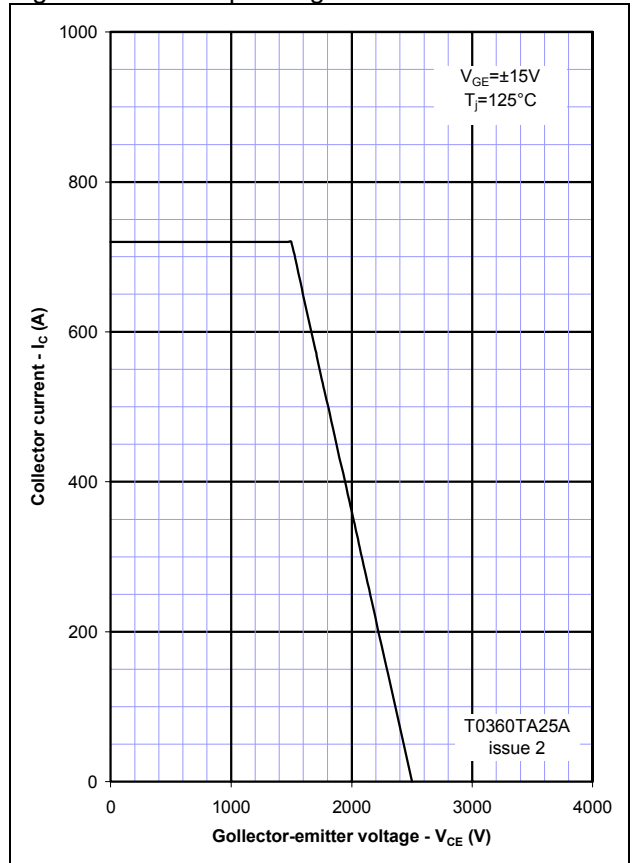


Figure 13 – Typical diode forward characteristic

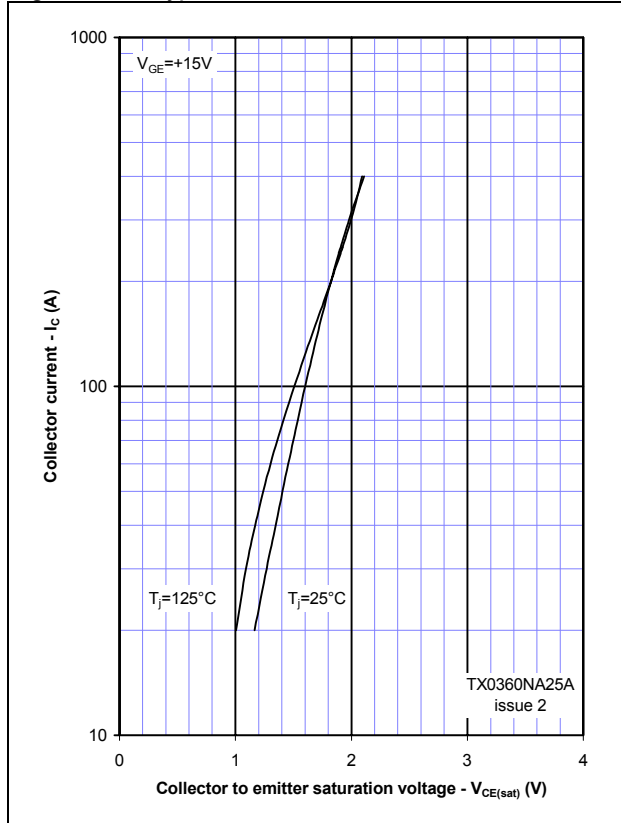


Figure 14 – Typical recovered charge

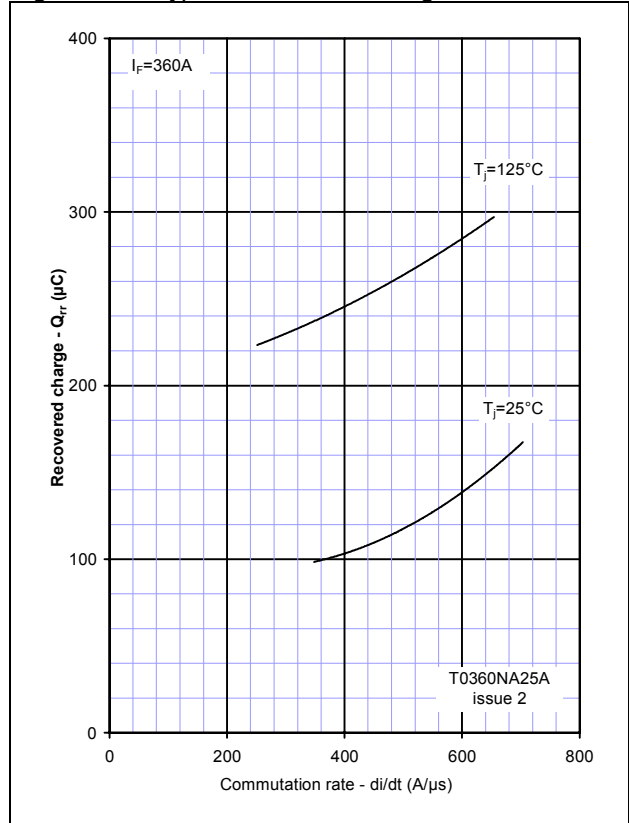


Figure 15 – Typical reverse recovery current

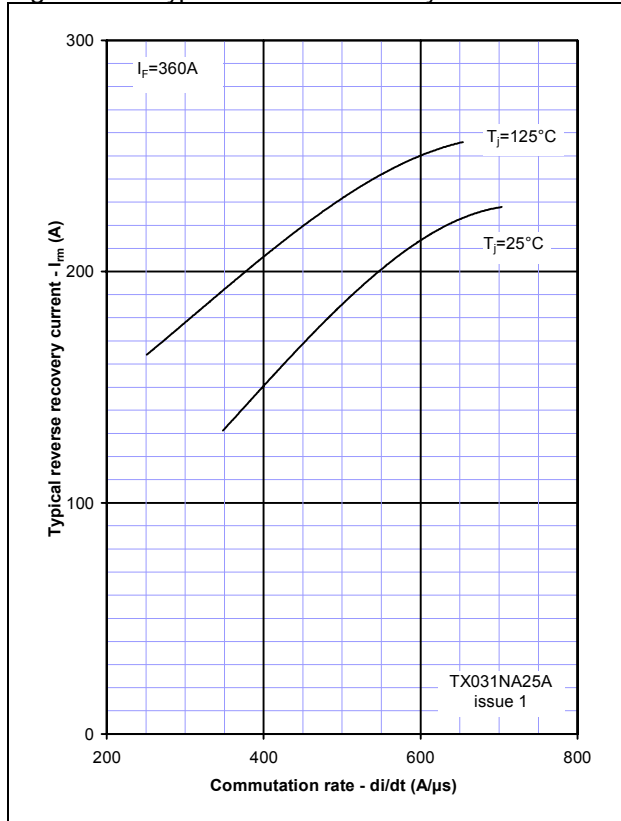


Figure 16 – Typical reverse recovery time

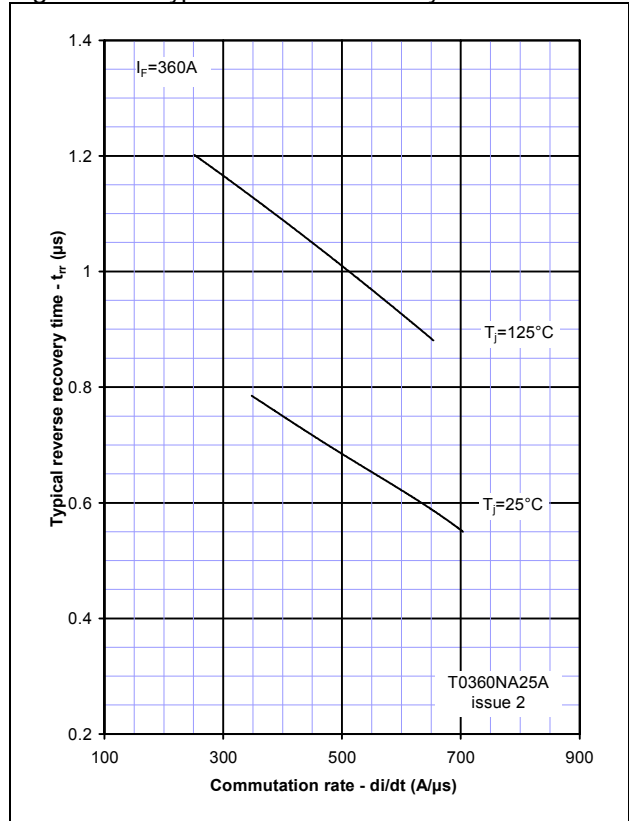


Figure 17 – Transient thermal impedance (IGBT)

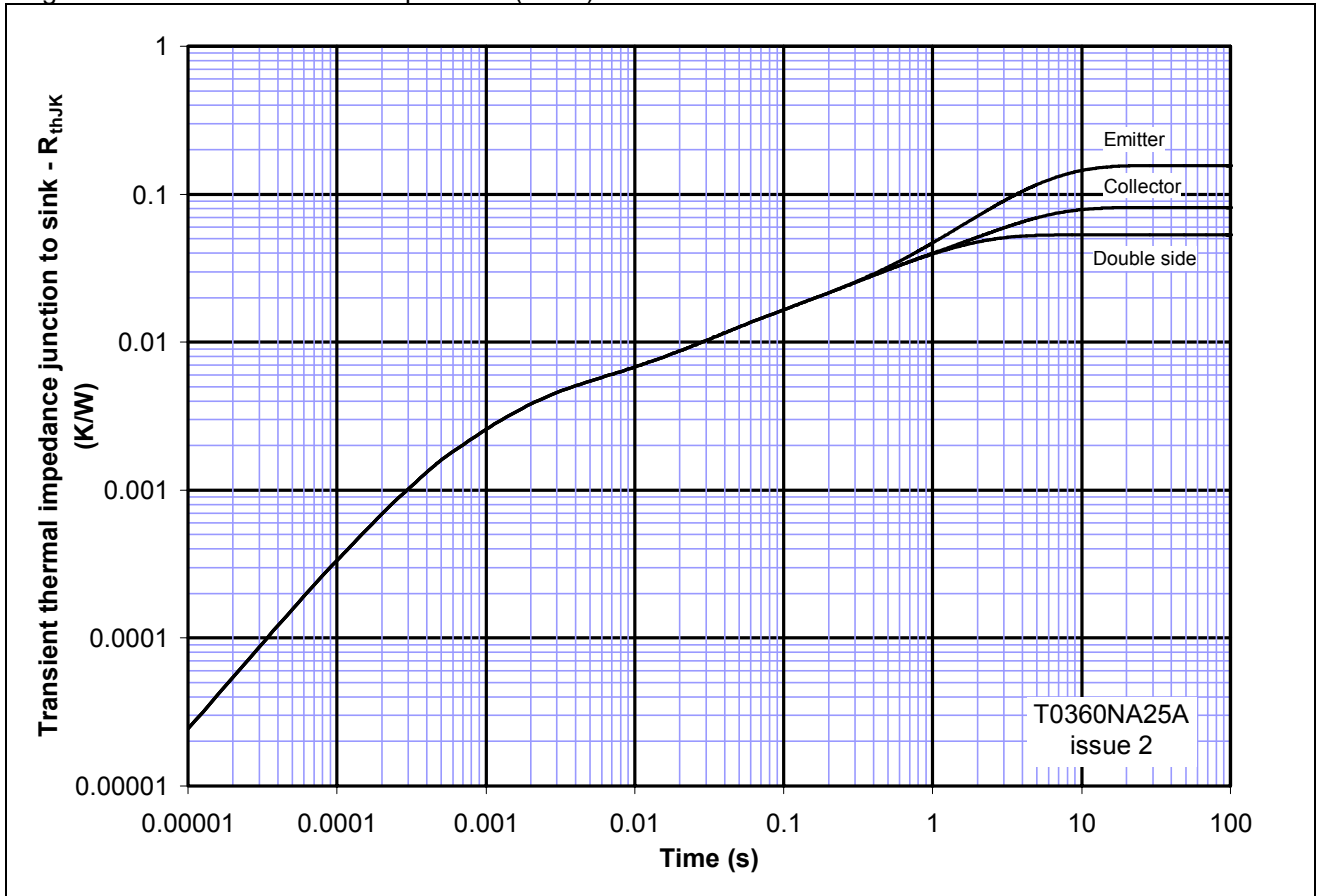
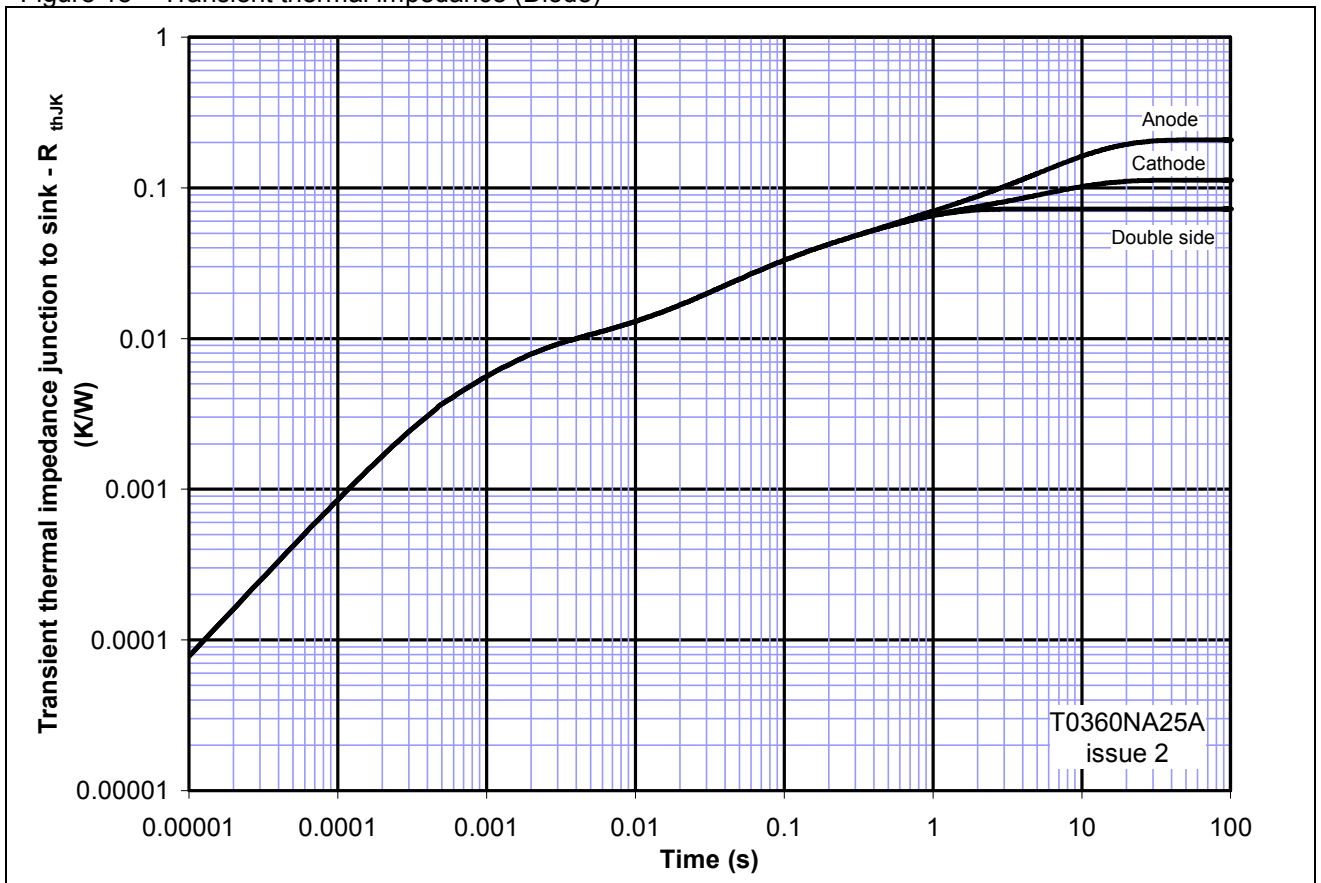
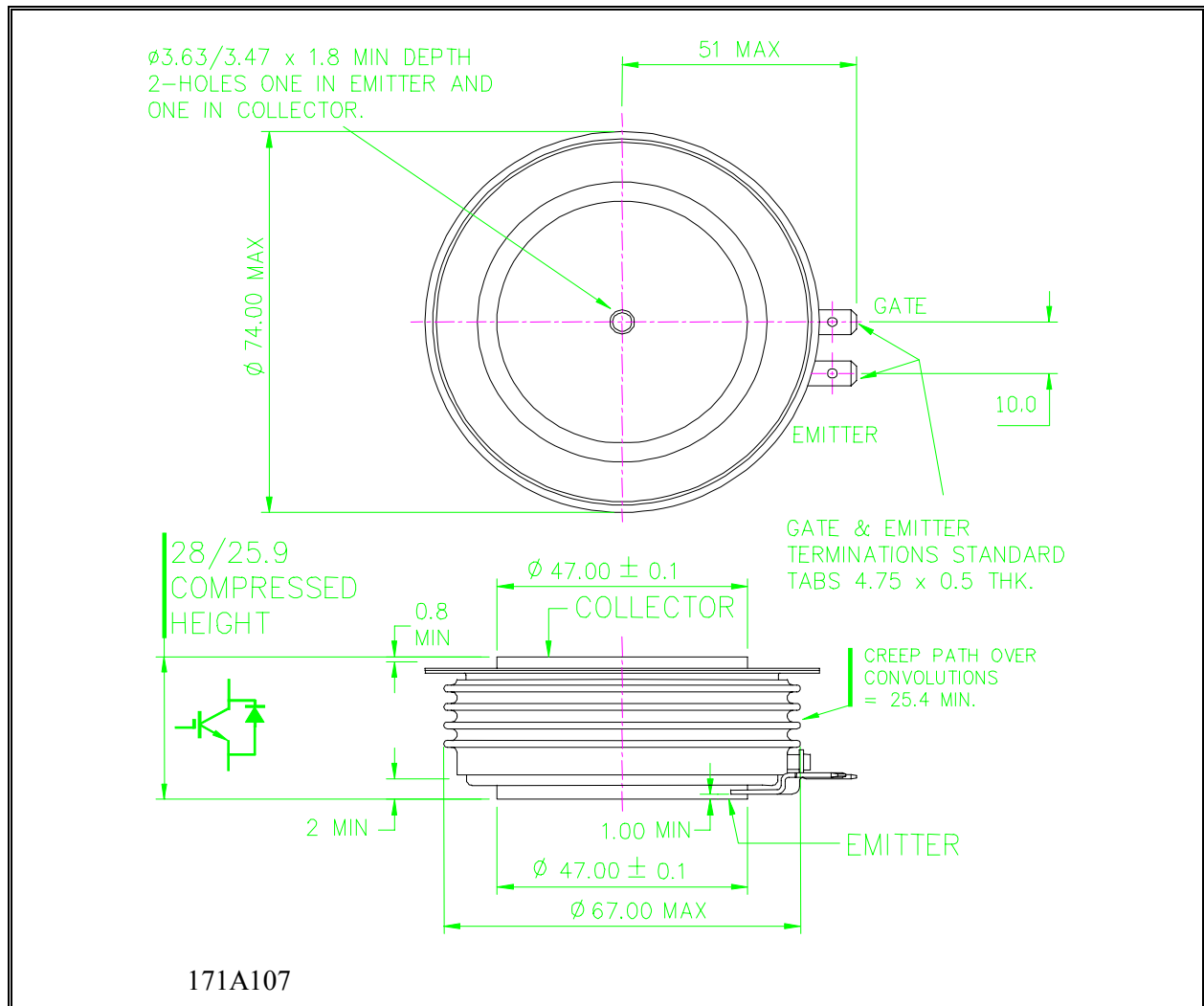


Figure 18 – Transient thermal impedance (Diode)



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ORDERING INFORMATION			
(Please quote 10 digit code as below)			
T0360	NA	25	A
Fixed type code	Fixed Outline Code	Voltage Grade 2500V	Fixed format code

Typical order code: T0360NA25A (V<sub>CES</sub> = 2500V)

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