



Date:- 20 Feb, 2019

Data Sheet Issue:- A1

Advance data

Insulated Gate Bi-Polar Transistor

Type T0425VC33G

Absolute Maximum Ratings

| | VOLTAGE RATINGS | MAXIMUM LIMITS | UNITS |
|----------------|--|----------------|-------|
| V_{CES} | Collector – emitter voltage | 3300 | V |
| $V_{DC\ link}$ | Permanent DC voltage for 100 FIT failure rate. | 1800 | V |
| V_{GES} | Peak gate – emitter voltage | ± 20 | V |

| | RATINGS | MAXIMUM LIMITS | UNITS |
|----------------|--|----------------|-------------|
| $I_{C(DC)}$ | DC collector current, IGBT | 425 | A |
| I_{CRM} | Repetitive peak collector current, $t_p=1ms$, IGBT | 850 | A |
| $I_{F(DC)}$ | Continuous DC forward current, Diode | 425 | A |
| I_{FRM} | Repetitive peak forward current, $t_p=1ms$, Diode | 850 | A |
| I_{FSM} | Peak non-repetitive surge $t_p=10ms$, $V_{RM}=60\%V_{RRM}$, Diode (Note 4) | 2545 | A |
| I_{FSM2} | Peak non-repetitive surge $t_p=10ms$, $V_{RM}\leq 10V$, Diode (Note 4) | 2800 | A |
| P_{MAX} | Maximum power dissipation, IGBT (Note 2) | 2.75 | kW |
| P_D | Maximum power dissipation, Diode (Note 2) | 1.74 | kW |
| $(di/dt)_{cr}$ | Critical diode di/dt (note 3) | 1000 | A/ μs |
| T_j | Operating temperature range. | -40 to +125 | $^{\circ}C$ |
| T_{stg} | Storage temperature range. | -40 to +125 | $^{\circ}C$ |

Notes: -

- 1) Unless otherwise indicated $T_j = 125^{\circ}C$.
- 2) $T_{sink} = 25^{\circ}C$, double side cooled.
- 3) Maximum commutation loop inductance 1000nH.
- 4) Half-sinewave, $125^{\circ}C$ T_j initial.

Characteristics

IGBT Characteristics

| | PARAMETER | MIN | TYP | MAX | TEST CONDITIONS | UNITS |
|---------------|--|-----|------|------|--|---|
| $V_{CE(sat)}$ | Collector – emitter saturation voltage | - | 2.65 | 2.95 | $I_C = 425A, V_{GE} = 15V, T_j = 25^\circ C$ | V |
| | | - | 3.4 | 3.7 | $I_C = 425A, V_{GE} = 15V$ | V |
| V_{T0} | Threshold voltage | - | - | 1.69 | Current range: 142 – 425A | V |
| r_T | Slope resistance | - | - | 4.74 | | mΩ |
| $V_{GE(TH)}$ | Gate threshold voltage | - | 5.2 | - | $V_{CE} = V_{GE}, I_C = 36mA$ | V |
| I_{CES} | Collector – emitter cut-off current | - | 4 | 11 | $V_{CE} = V_{CES}, V_{GE} = 0V$ | mA |
| I_{GES} | Gate leakage current | - | - | ±7 | $V_{GE} = \pm 20V$ | μA |
| C_{ies} | Input capacitance | - | 58 | - | $V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$ | nF |
| $t_{d(on)}$ | Turn-on delay time | - | 1.6 | - | $I_C = 425A, V_{CE} = 1800V, di/dt = 850A/\mu s$ $V_{GE} = \pm 15V, L_s = 500nH$ $R_{G(ON)} = 5.1\Omega, R_{G(OFF)} = 33\Omega, C_{GE} = 183nF$ Integral diode used as freewheel diode (Note 3, 4 & 5) | μs |
| $t_r(V)$ | Rise time | - | 2 | - | | μs |
| $Q_{g(on)}$ | Turn-on gate charge | - | 8.1 | - | | μC |
| E_{on} | Turn-on energy | - | 1.1 | - | | J |
| $t_{d(off)}$ | Turn-off delay time | - | 4.9 | - | | μs |
| $t_f(I)$ | Fall time | - | 1.2 | - | | μs |
| $Q_{g(off)}$ | Turn-off gate charge | - | 6 | - | | μC |
| E_{off} | Turn-off energy | - | 1.12 | - | | J |
| I_{SC} | Short circuit current | - | 1600 | - | | $V_{GE} = +15V, V_{CC} = 1800V, V_{CEmax} \leq V_{CES}, t_p \leq 10\mu s$ |

Diode Characteristics

| | PARAMETER | MIN | TYP | MAX | TEST CONDITIONS | UNITS |
|----------|----------------------------------|-----|------|------|--|-------|
| V_F | Forward voltage | - | 2.65 | 2.95 | $I_F = 425A, T_j = 25^\circ C$ | V |
| | | - | 3.0 | 3.3 | $I_F = 425A$ | V |
| V_{T0} | Threshold voltage | - | - | 1.72 | Current range 142 - 425A | V |
| r_T | Slope resistance | - | - | 3.72 | | mΩ |
| I_{rm} | Peak reverse recovery current | - | 305 | - | $I_F = 425A, V_{GE} = \pm 15V, di/dt = 850A/\mu s$ | A |
| Q_{rr} | Recovered charge | - | 440 | - | | μC |
| t_{rr} | Reverse recovery time, 50% chord | - | 1.7 | - | | μs |
| E_r | Reverse recovery energy | - | 0.48 | - | | J |

Thermal Characteristics

| | PARAMETER | MIN | TYP | MAX | TEST CONDITIONS | UNITS |
|------------|--|-----|------|------|-----------------------|-------|
| R_{thJK} | Thermal resistance junction to sink, IGBT | - | - | 36.4 | Double side cooled | K/kW |
| | | - | - | 59.4 | Collector side cooled | K/kW |
| | | - | - | 94.3 | Emitter side cooled | K/kW |
| R_{thJK} | Thermal resistance junction to sink, Diode | - | - | 57.6 | Double side cooled | K/kW |
| | | - | - | 88.2 | Cathode side cooled | K/kW |
| | | - | - | 166 | Anode side cooled | K/kW |
| F | Mounting force | 12 | - | 16 | Note 2 | kN |
| W_t | Weight | - | 0.65 | - | | kg |

Notes:-

- 1) Unless otherwise indicated $T_j = 125^\circ C$.
- 2) Consult application note 2008AN01 for detailed mounting requirements
- 3) C_{GE} is additional gate – emitter capacitance added to output of gate drive
- 4) E_{on} integration time 15μs from 10% rising I_G .
- 5) E_{off} integration time 15μs from 90% falling V_{GE} .

Curves

Figure 1 – Typical collector-emitter saturation voltage characteristics

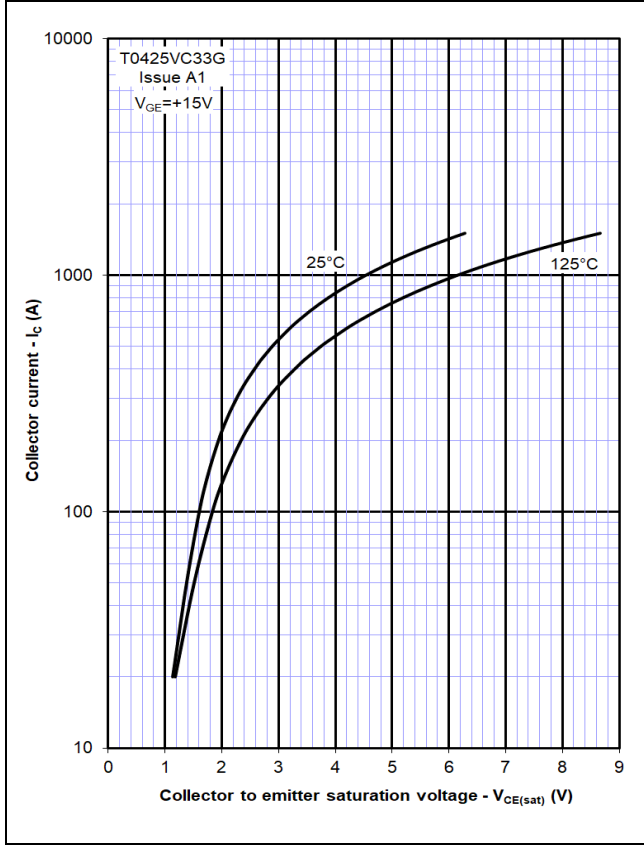


Figure 2 – Typical output characteristic

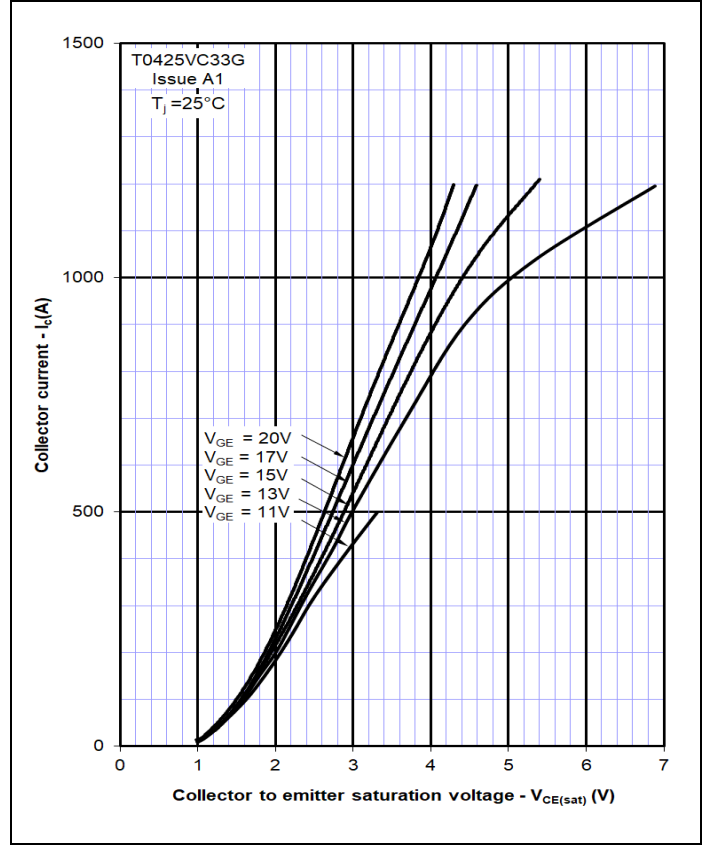


Figure 3 – Typical output characteristic

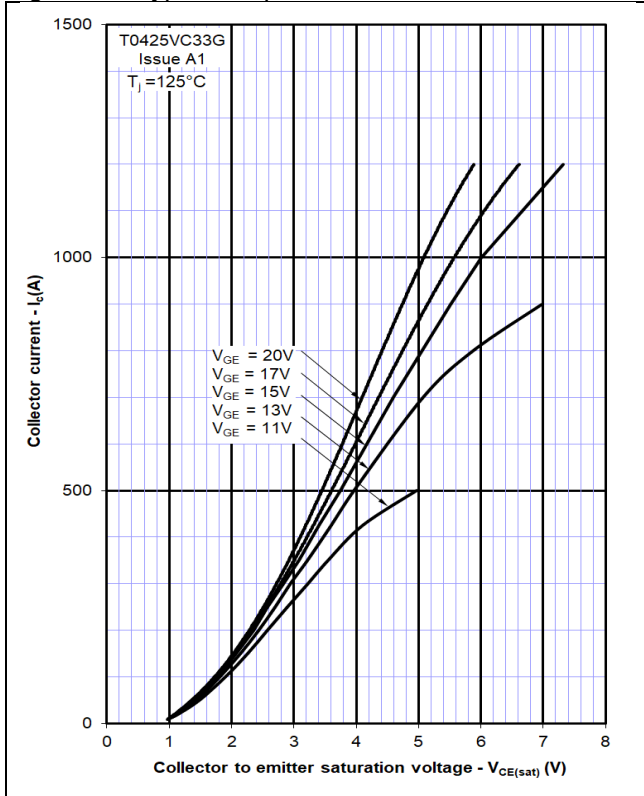


Figure 4 – Typical turn-on delay time vs gate resistance

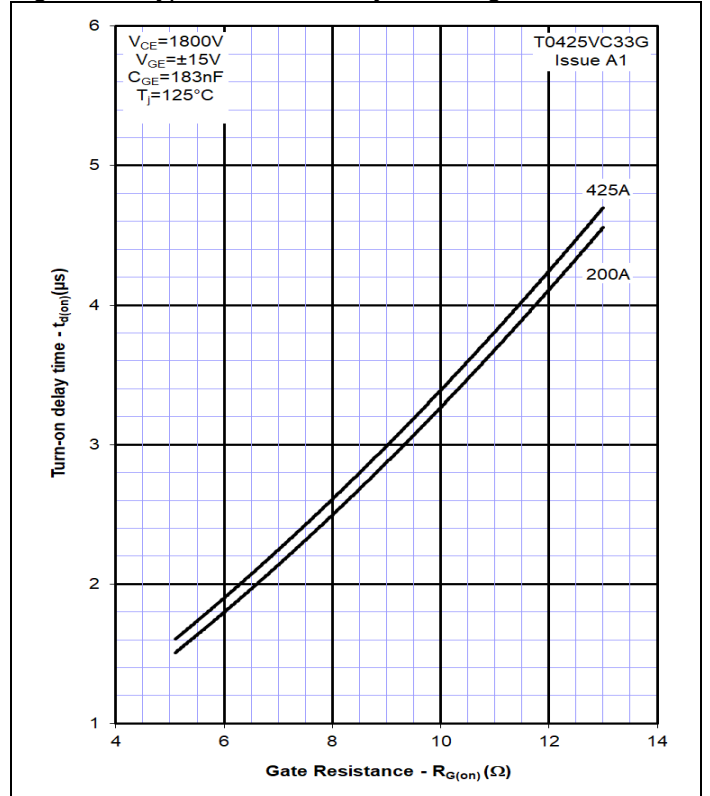


Figure 5 – Typical turn-off delay time vs. gate resistance

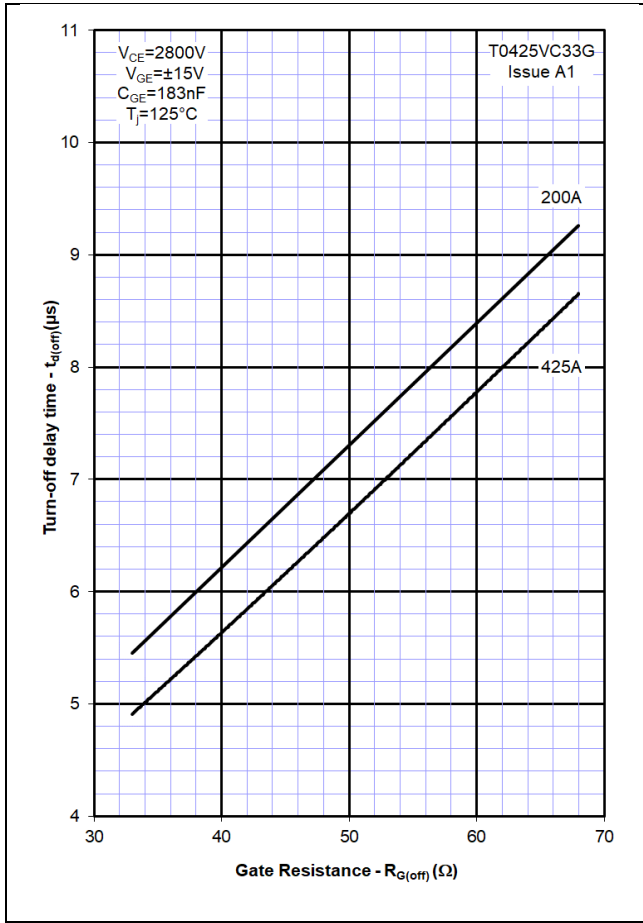


Figure 6 – Typical turn-on energy vs. collector current

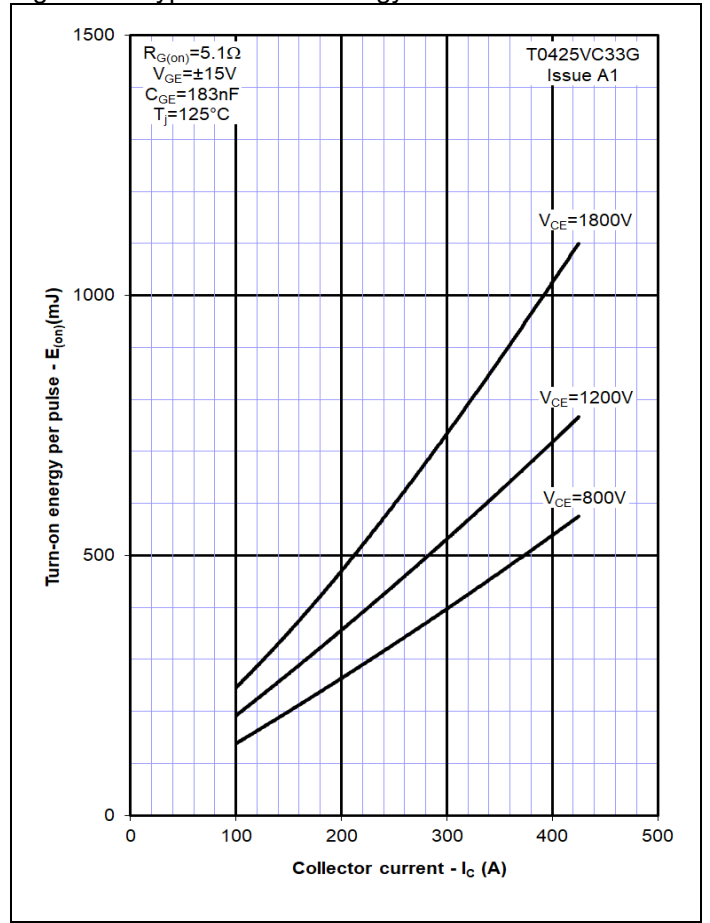


Figure 7 – Typical turn-on energy vs. di/dt

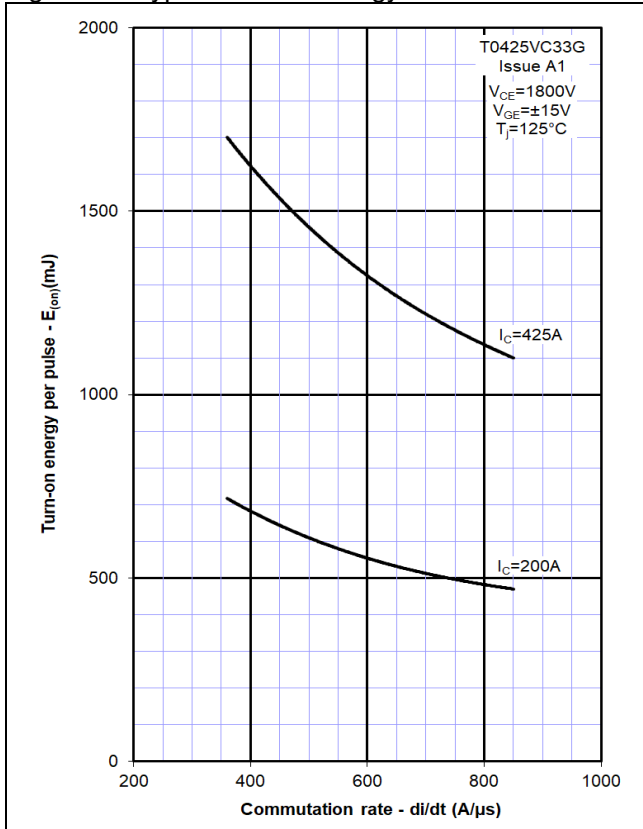


Figure 8 – Typical turn-off energy vs. collector current

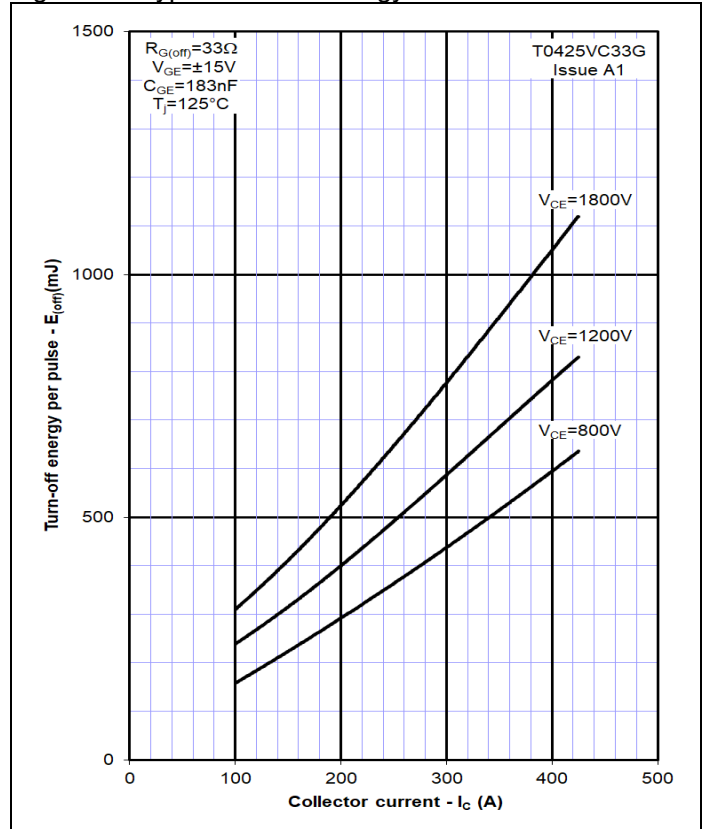


Figure 9 – Turn-off energy vs voltage

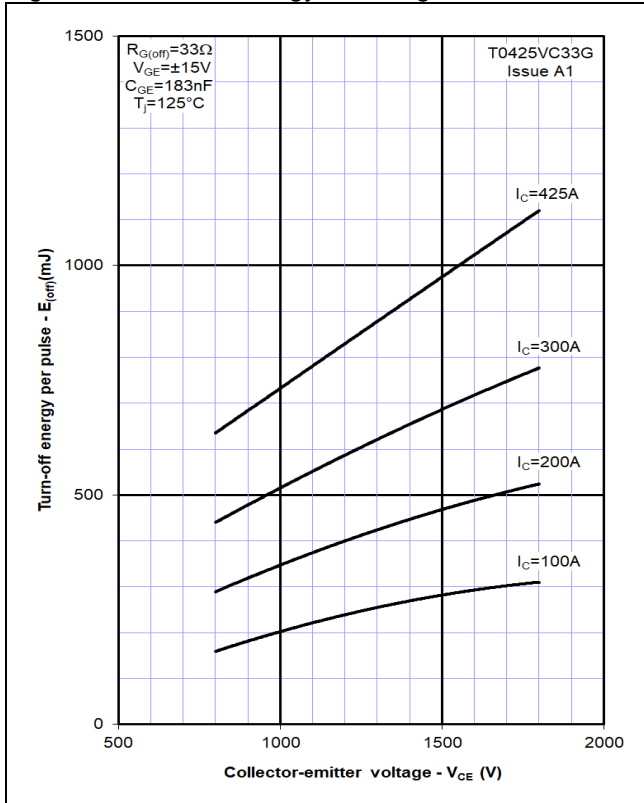


Figure 10 – Safe operating area (IGBT)

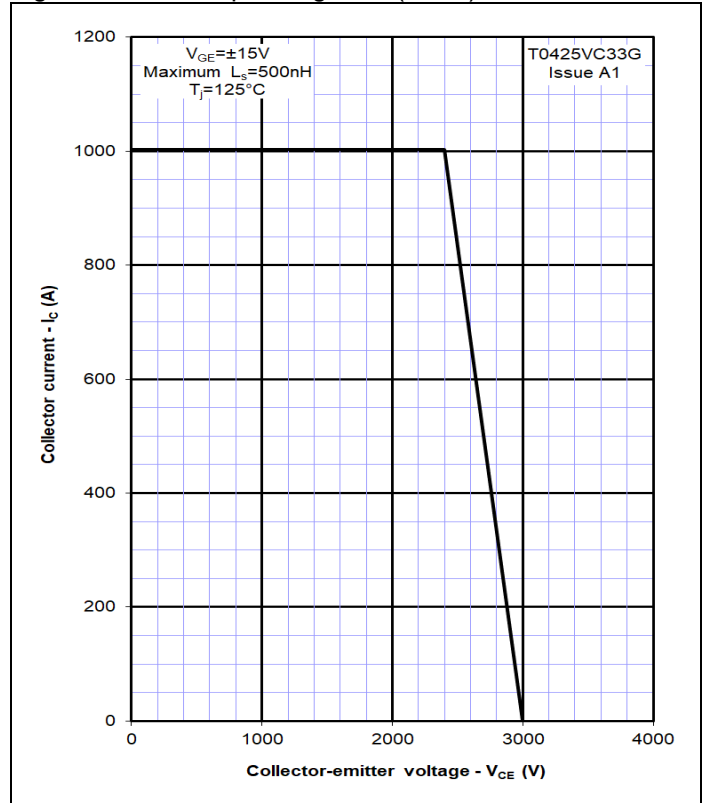


Figure 11 – Typical diode forward characteristics

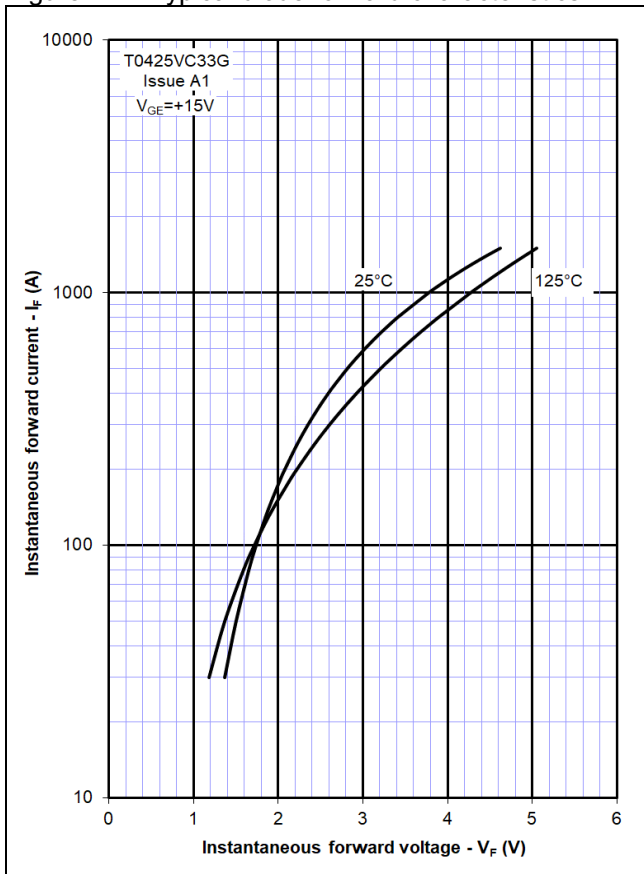


Figure 12 – Typical recovered charge

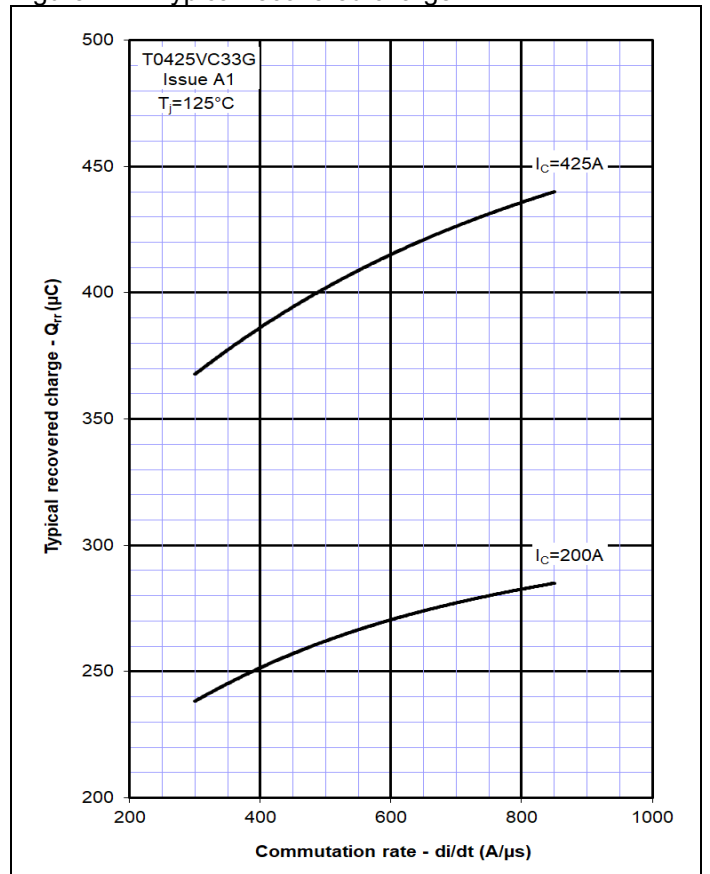


Figure 13 – Typical reverse recovery current

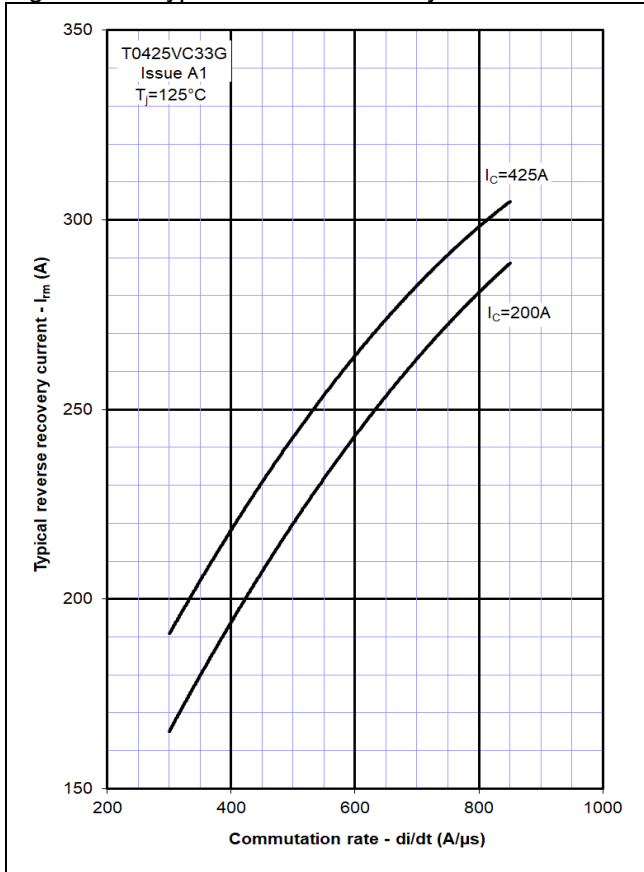


Figure 14 – Typical reverse recovery time

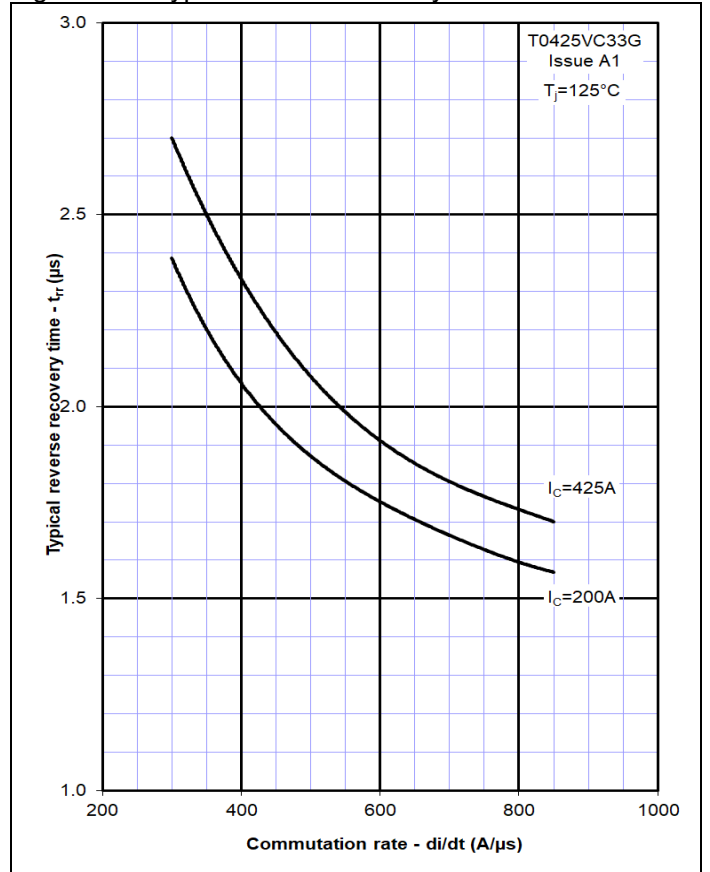


Figure 15 – Typical reverse recovery energy

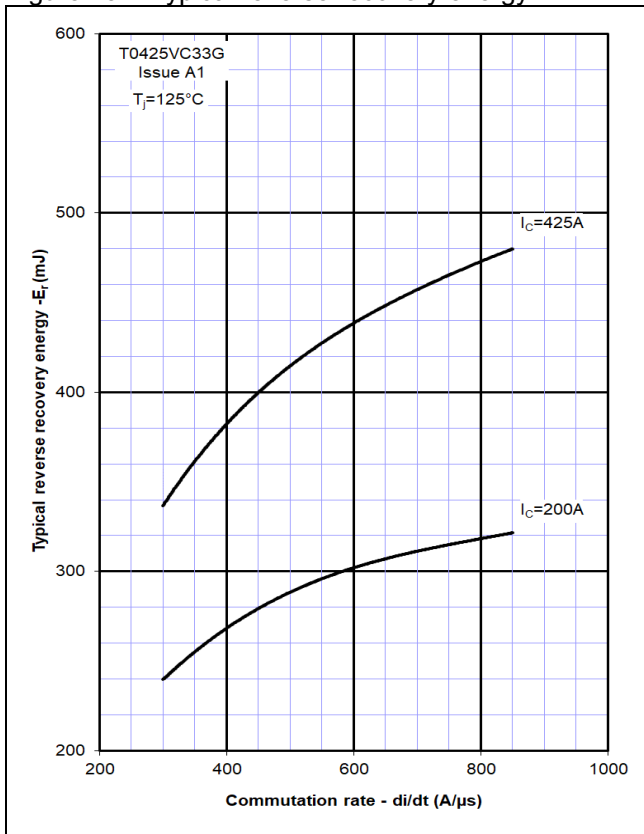


Figure 16 – Safe operating area (Diode)

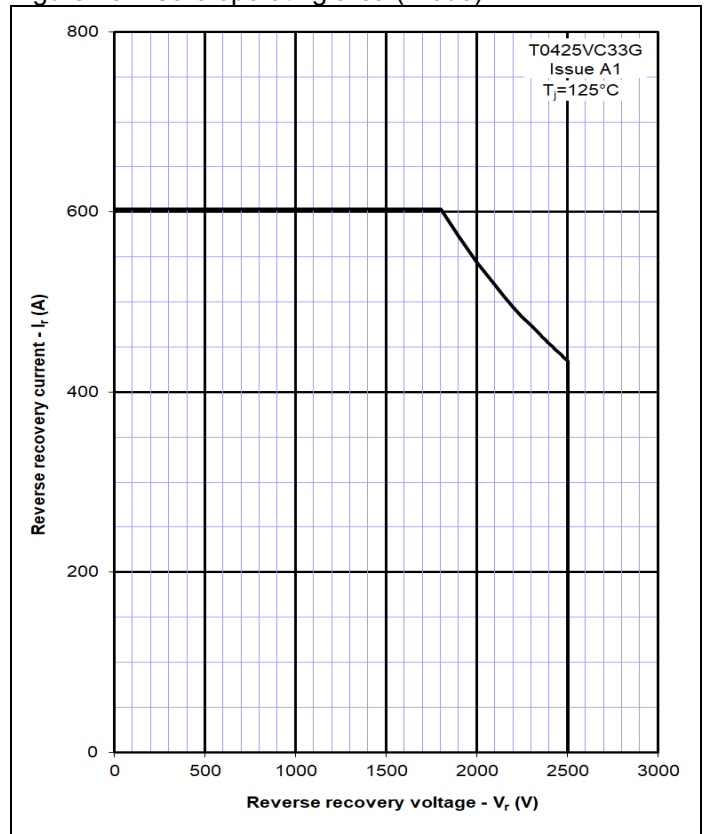


Figure 17 – Transient thermal impedance (IGBT)

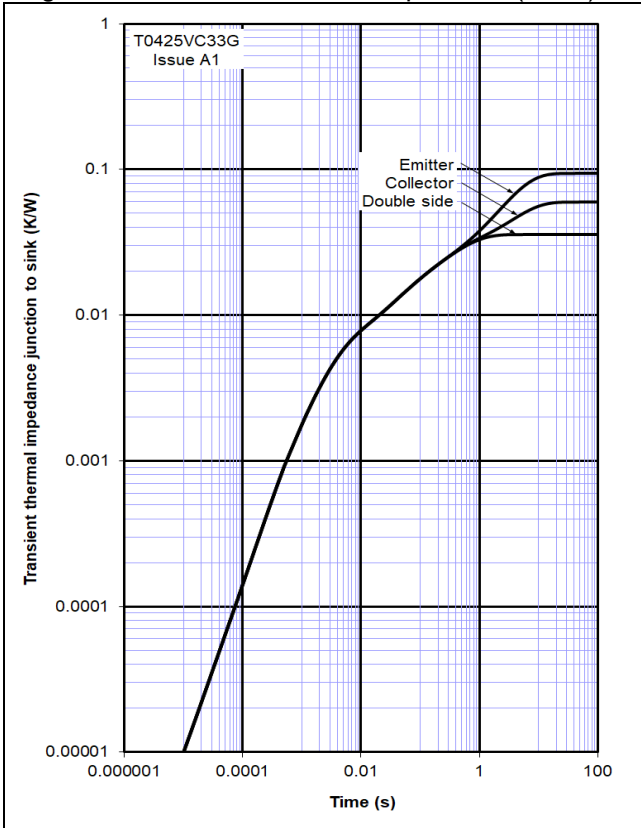
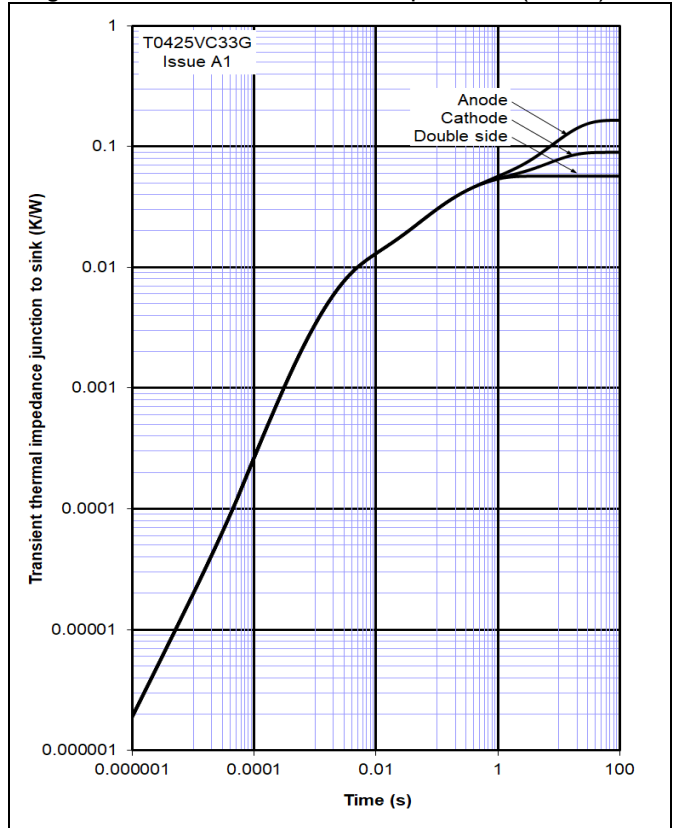
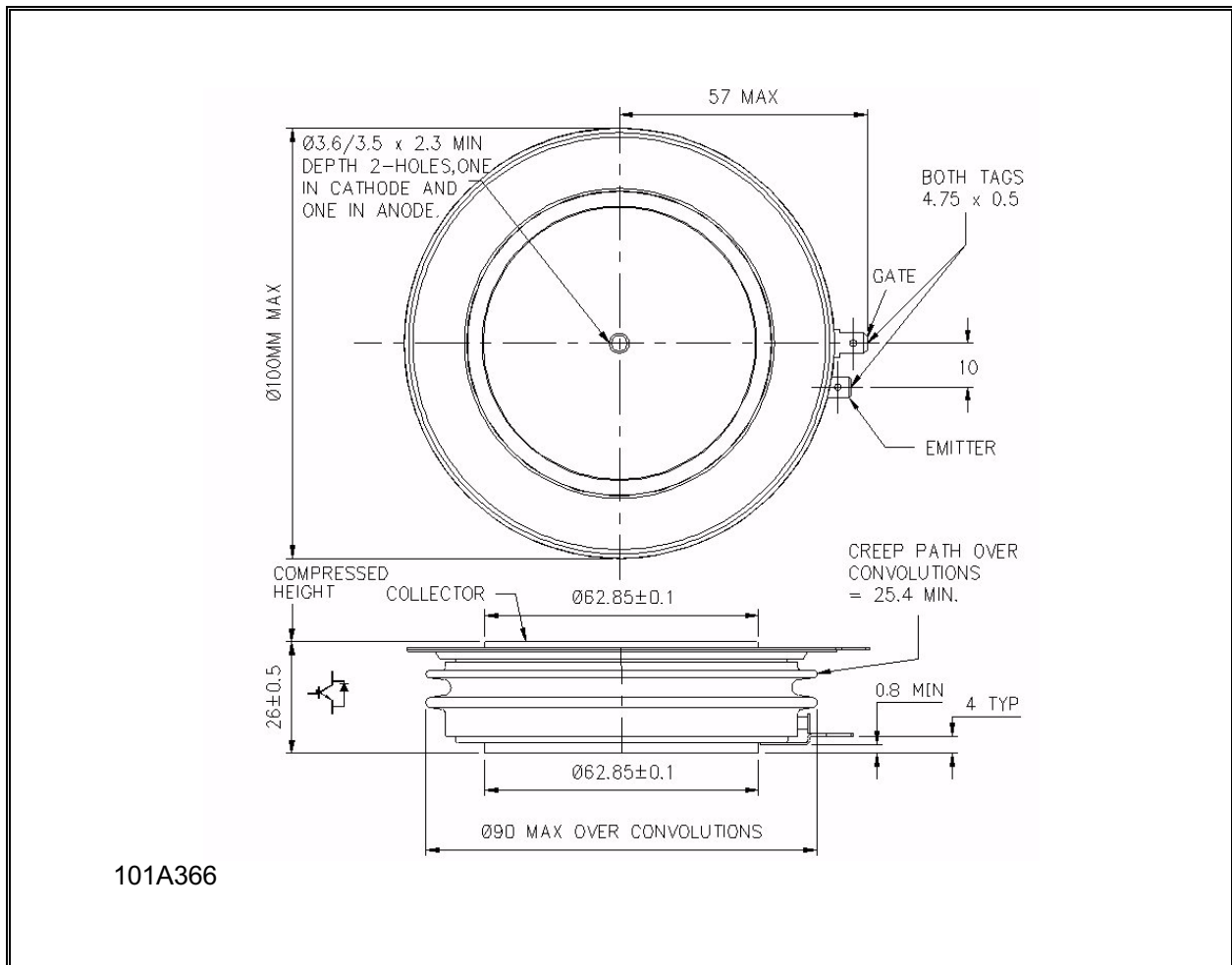


Figure 18 – Transient thermal impedance (Diode)



Outline Drawing & Ordering Information



ORDERING INFORMATION

(Please quote 10 digit code as below)

| T0425 | VC | 33 | G |
|-----------------|--------------------|--------------------------------------|-------------------|
| Fixed type Code | Fixed Outline Code | Voltage Grade $V_{CES}/100$ 33 | Fixed format code |

 Typical order code: T0425VC33G ($V_{CES} = 3300\text{V}$)

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