IXYS
A Littelfuse Technology

**Date:- 30th April, 2019**

**Data Sheet Issue:- 2**

# Insulated Gate Bi-Polar Transistor
## Type T0800EB45G

### Absolute Maximum Ratings

| | VOLTAGE RATINGS | MAXIMUM LIMITS | UNITS |
|---|---|---|---|
| $V_{CES}$ | Collector – emitter voltage | 4500 | V |
| $V_{DC\ link}$ | Permanent DC voltage for 100 FIT failure rate. | 2800 | V |
| $V_{GES}$ | Peak gate – emitter voltage | ±20 | V |

| | RATINGS | MAXIMUM LIMITS | UNITS |
|---|---|---|---|
| $I_C$ | DC collector current, IGBT | 800 | A |
| $I_{CRM}$ | Repetitive peak collector current, $t_p$=1ms, IGBT | 1600 | A |
| $I_{F(DC)}$ | Continuous DC forward current, Diode | 800 | A |
| $I_{FRM}$ | Repetitive peak forward current, $t_p$=1ms, Diode | 1600 | A |
| $I_{FSM}$ | Peak non-repetitive surge $t_p$=10ms, $V_{RM}$=60%$V_{RRM}$, Diode (Note 4) | 5.72 | kA |
| $I_{FSM2}$ | Peak non-repetitive surge $t_p$=10ms, $V_{RM}$≤10V, Diode (Note 4) | 6.3 | kA |
| $P_{MAX}$ | Maximum power dissipation, IGBT (Note 2) | 6.4 | kW |
| $P_D$ | Maximum power dissipation, Diode (Note 2) | 4.05 | 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 400nH.
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 | - | 2.75 | 3.2 | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 25°C | V |
| | | - | 3.50 | 3.9 | $I_C$ = 800A, $V_{GE}$ = 15V | V |
| $V_{T0}$ | Threshold voltage | - | - | 1.74 | Current range: 267A – 800A | V |
| $r_T$ | Slope resistance | - | - | 2.70 | | mΩ |
| $V_{GE(TH)}$ | Gate threshold voltage | - | 5.2 | - | $V_{CE}$ = $V_{GE}$, $I_C$ = 85mA | V |
| $I_{CES}$ | Collector – emitter cut-off current | | 20 | 50 | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0V | mA |
| $I_{GES}$ | Gate leakage current | - | - | ±15 | $V_{GE}$ = ±20V | µA |
| $C_{ies}$ | Input capacitance | - | 135 | - | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | nF |
| $t_{d(on)}$ | Turn-on delay time | - | 1.8 | - | | µs |
| $t_r(V)$ | Rise time | - | 3.3 | - | $I_C$ = 800A, $V_{CE}$ =2800V, di/dt=1700A/µs | µs |
| $Q_{g(on)}$ | Turn-on gate charge | - | 5 | - | $V_{GE}$ = ±15V, $L_s$=200nH | µC |
| $E_{on}$ | Turn-on energy | - | 6.3 | - | $R_{G(ON)}$= 6.8Ω, $R_{G(OFF)}$=10Ω, $C_{GE}$= 90nF | J |
| $t_{d(off)}$ | Turn-off delay time | - | 3.0 | - | Integral diode used as freewheel diode | µs |
| $t_f(I)$ | Fall time | - | 2.4 | - | (Note 3 & 4) | µs |
| $Q_{g(off)}$ | Turn-off gate charge | - | 8 | - | | µC |
| $E_{off}$ | Turn-off energy | - | 3.7 | - | | J |
| $I_{SC}$ | Short circuit current | - | 2800 | - | $V_{GE}$=+15V, $V_{CC}$=2800V, $V_{CEmax}$≤$V_{CES}$, $t_p$≤10µs | A |

Diode Characteristics

| | PARAMETER | MIN | TYP | MAX | TEST CONDITIONS | UNITS |
|---|---|---|---|---|---|---|
| $V_F$ | Forward voltage | - | 3.35 | 3.6 | $I_F$ = 800A, $T_j$ =25°C | V |
| | | - | 3.50 | 3.8 | $I_F$ = 800A | V |
| $V_{To}$ | Threshold voltage | - | - | 2.05 | Current range 267A - 800A | V |
| $r_T$ | Slope resistance | - | - | 2.19 | | mΩ |
| $I_{rm}$ | Peak reverse recovery current | - | 800 | - | | A |
| $Q_{rr}$ | Recovered charge | - | 1020 | - | $I_F$ = 800A, $V_r$ = 2800V, $V_{GE}$ = -15V, | µC |
| $t_{rr}$ | Reverse recovery time, 50% chord | - | 1.5 | - | di/dt=1700A/µs | µs |
| $E_r$ | Reverse recovery energy | - | 1.2 | - | | J |

Thermal Characteristics

| | PARAMETER | MIN | TYP | MAX | TEST CONDITIONS | UNITS |
|---|---|---|---|---|---|---|
| $R_{thJK}$ | Thermal resistance junction to sink, IGBT | - | - | 15.6 | Double side cooled | K/kW |
| | | - | - | 25.4 | Collector side cooled | K/kW |
| | | - | - | 40.5 | Emitter side cooled | K/kW |
| $R_{thJK}$ | Thermal resistance junction to sink, Diode | - | - | 24.7 | Double side cooled | K/kW |
| | | - | - | 37.9 | Cathode side cooled | K/kW |
| | | - | - | 70.8 | Anode side cooled | K/kW |
| F | Mounting force | 25 | - | 35 | Note 2 | kN |
| $W_t$ | Weight | - | 1.2 | - | | 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

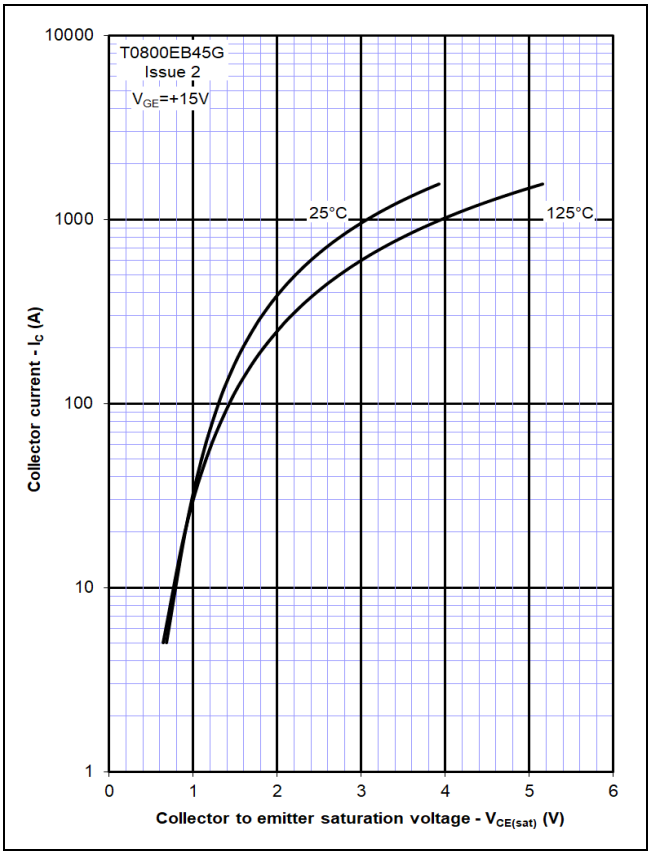



Figure 2 – Typical output characteristic

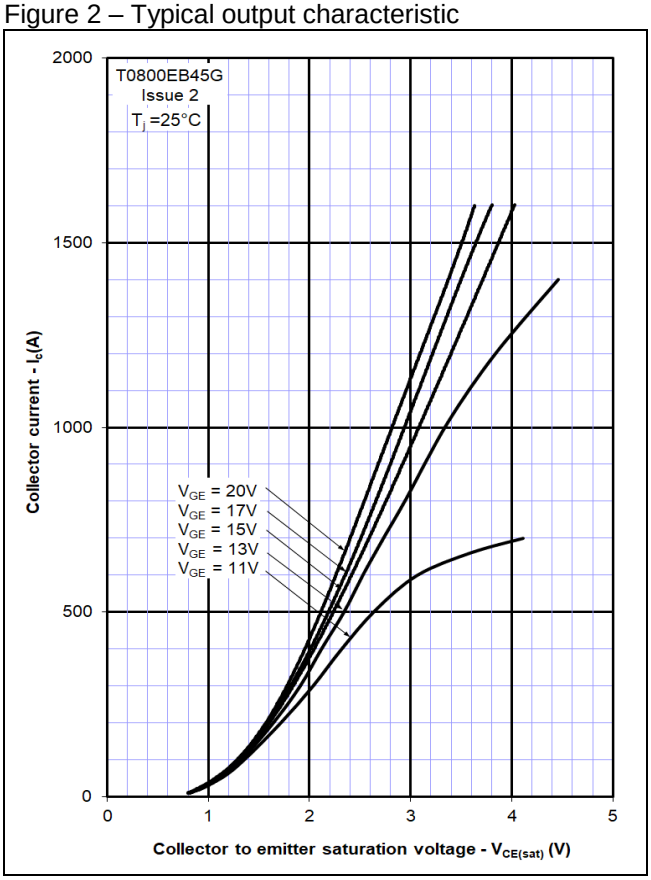



Figure 3 – Typical output characteristic

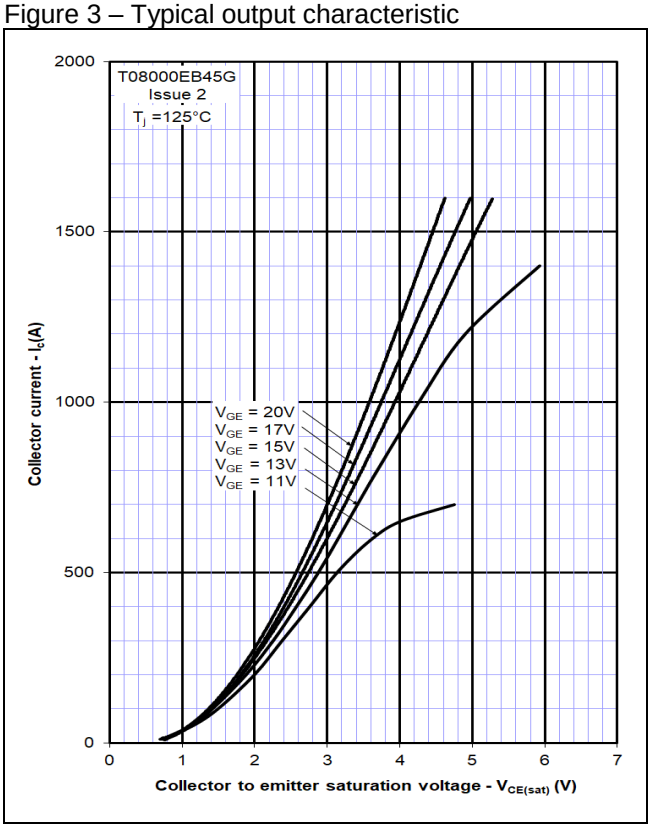



Figure 4 – Typical turn-on delay time vs gate resistance

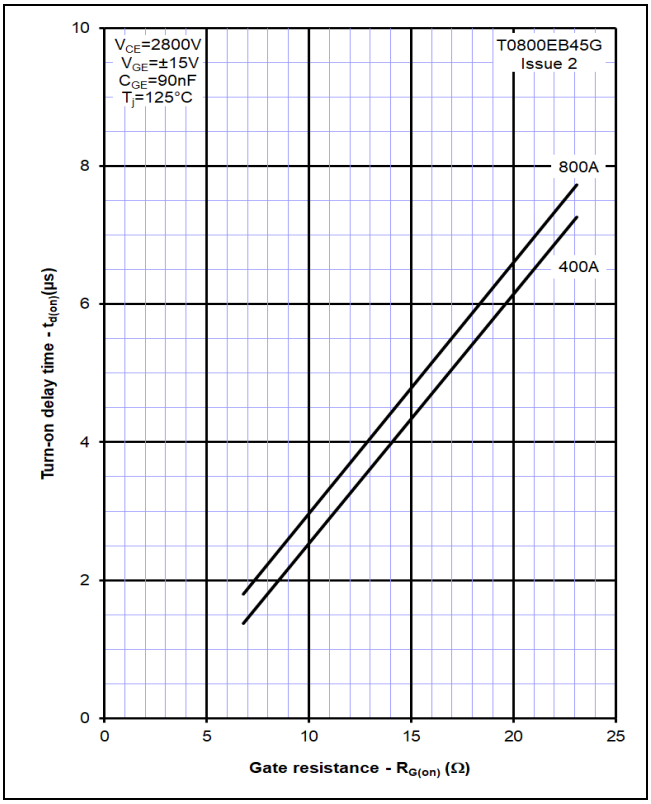


Figure 5 – Typical turn-off delay time vs. gate resistance

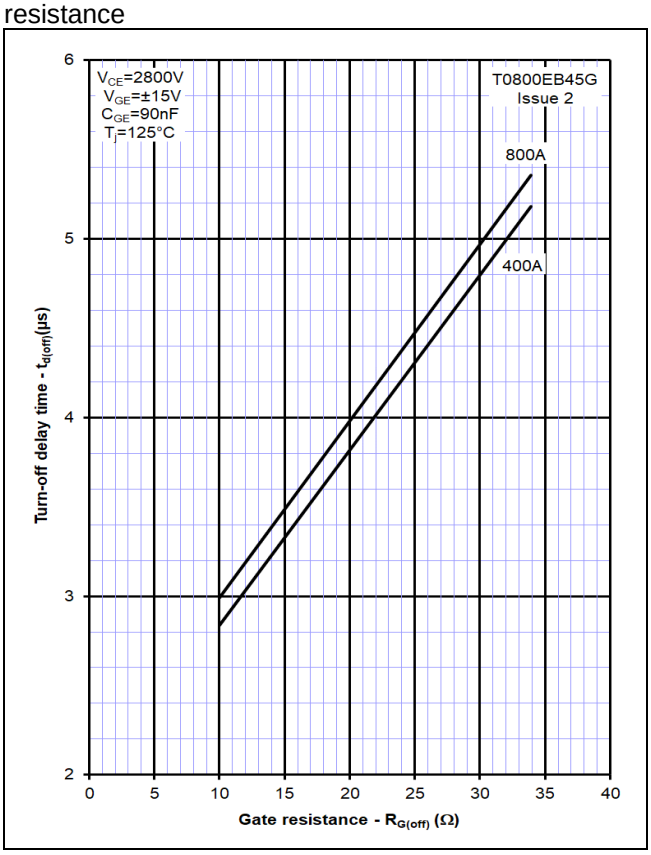



Figure 6 – Typical turn-on energy vs. collector current

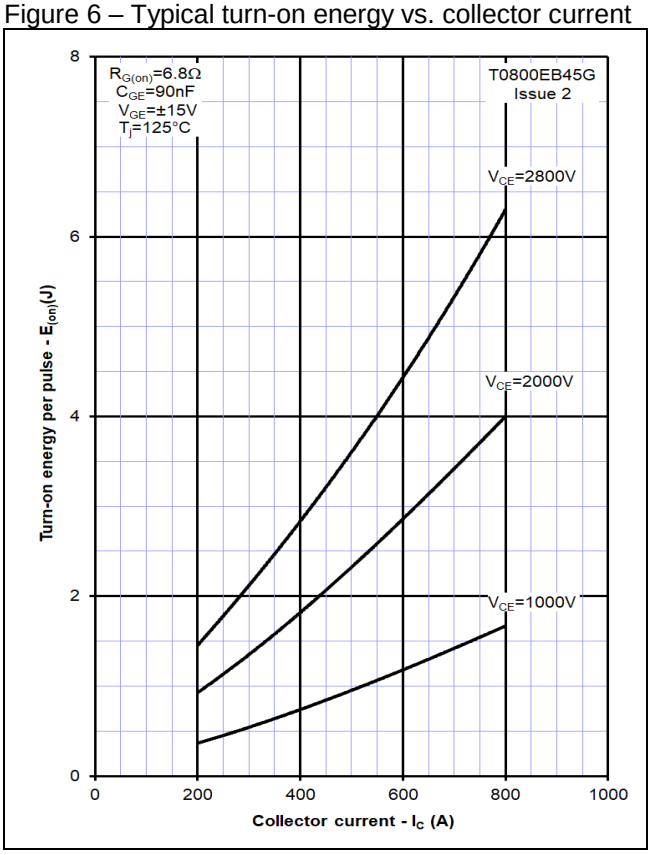



Figure 7 – Typical turn-on energy vs. di/dt

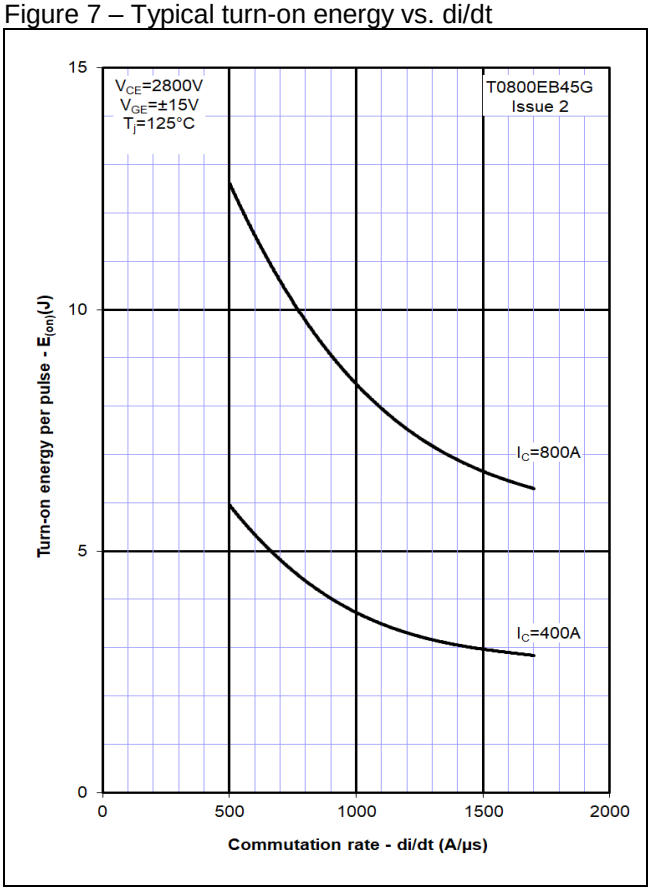



Figure 8 – Typical turn-off energy vs. collector current

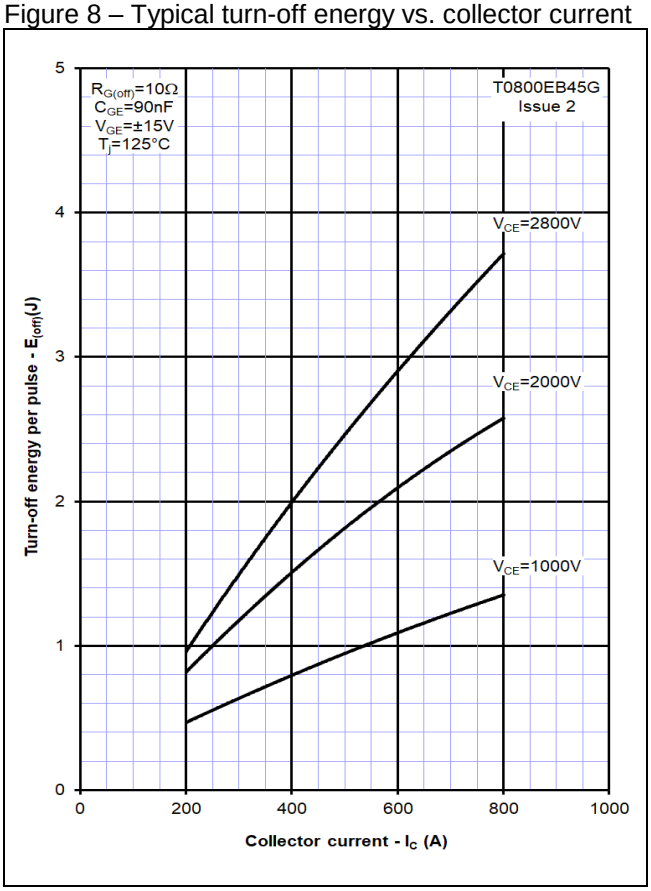


Figure 9 – Turn-off energy vs voltage

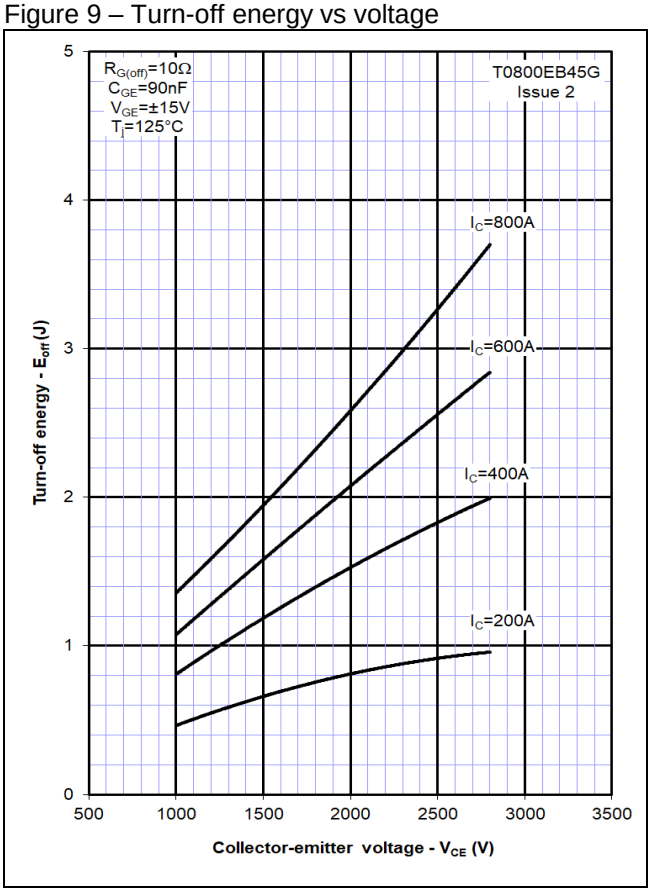



Figure 10 – Safe operating area (IGBT)

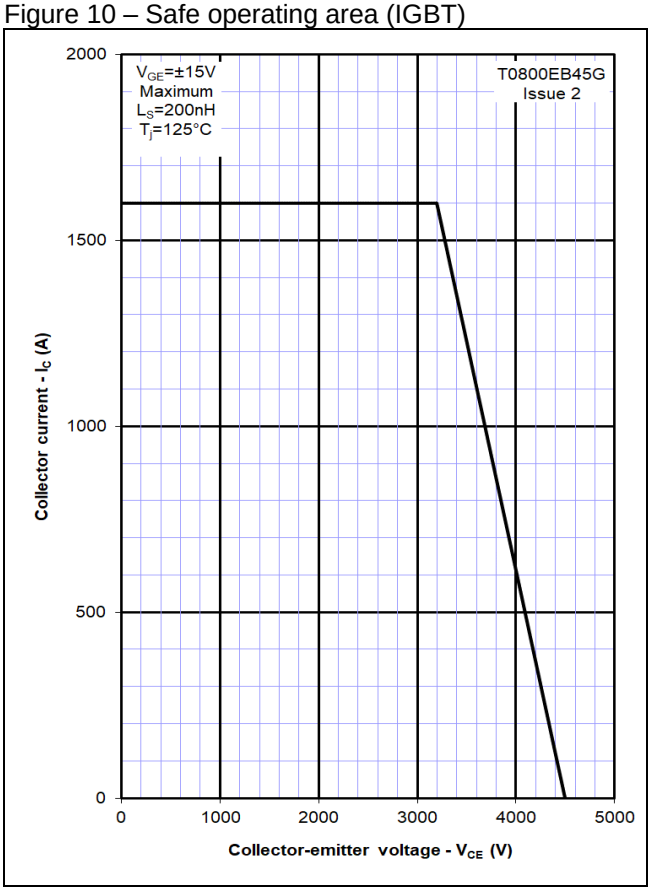



Figure 11 – Typical diode forward characteristics

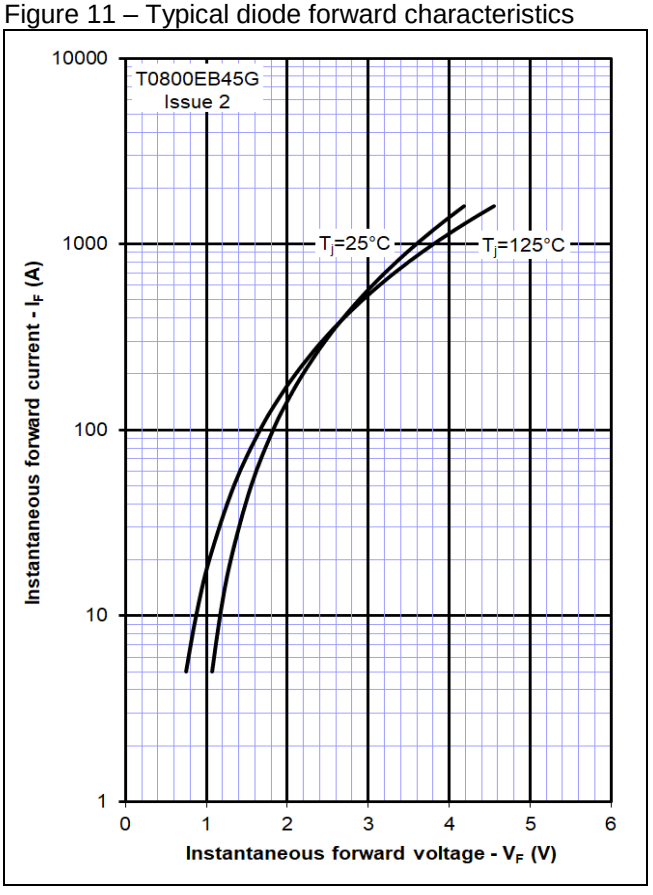



Figure 12 – Typical recovered charge

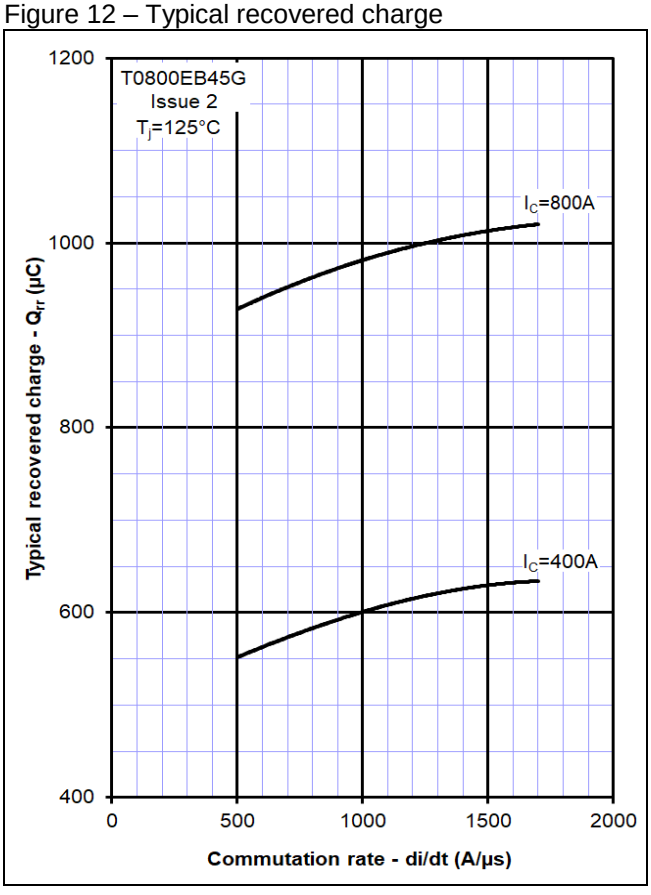


Figure 13 – Typical reverse recovery current

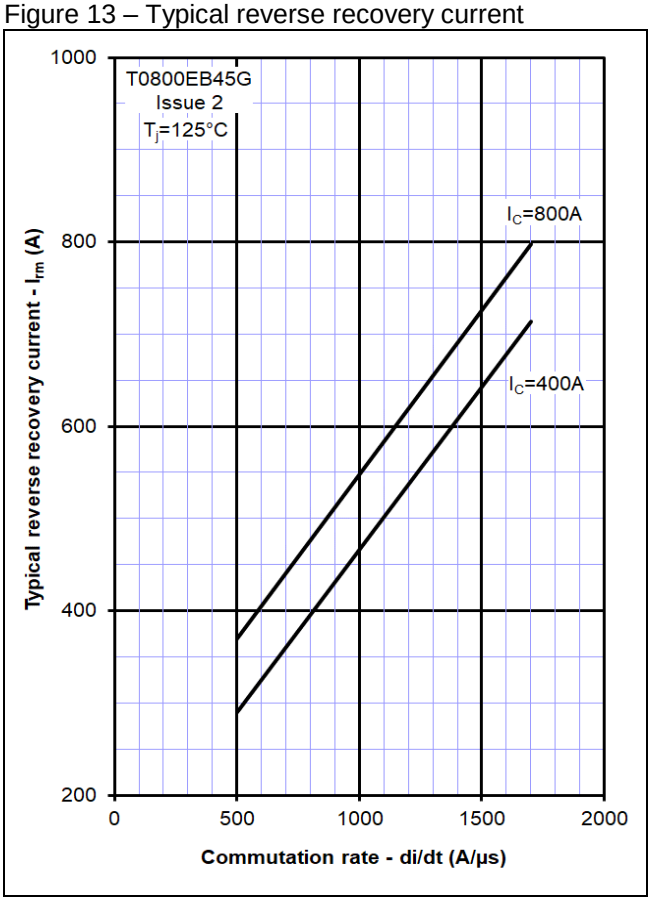



Figure 14 – Typical reverse recovery time

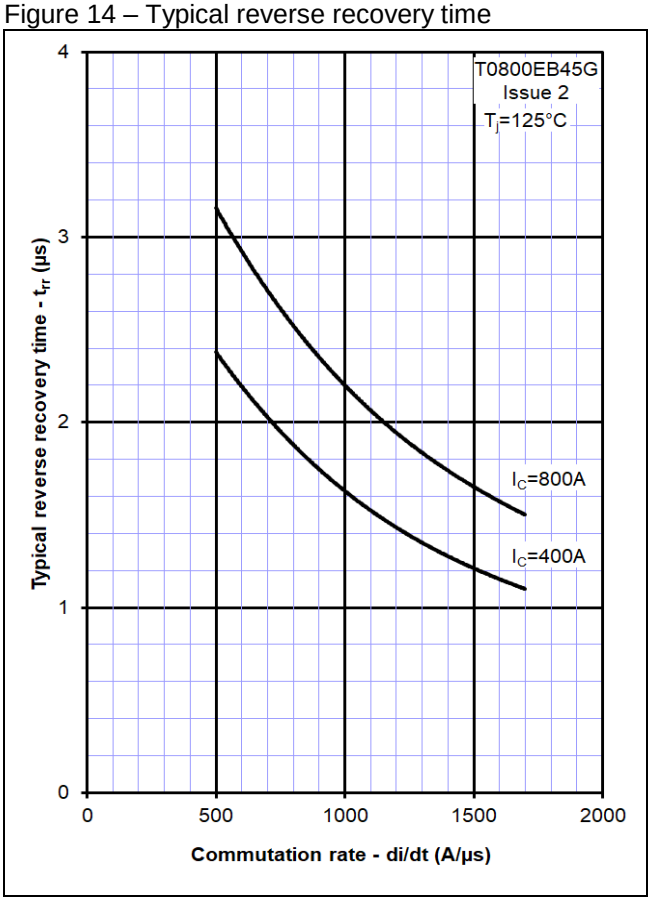



Figure 15 – Typical reverse recovery energy

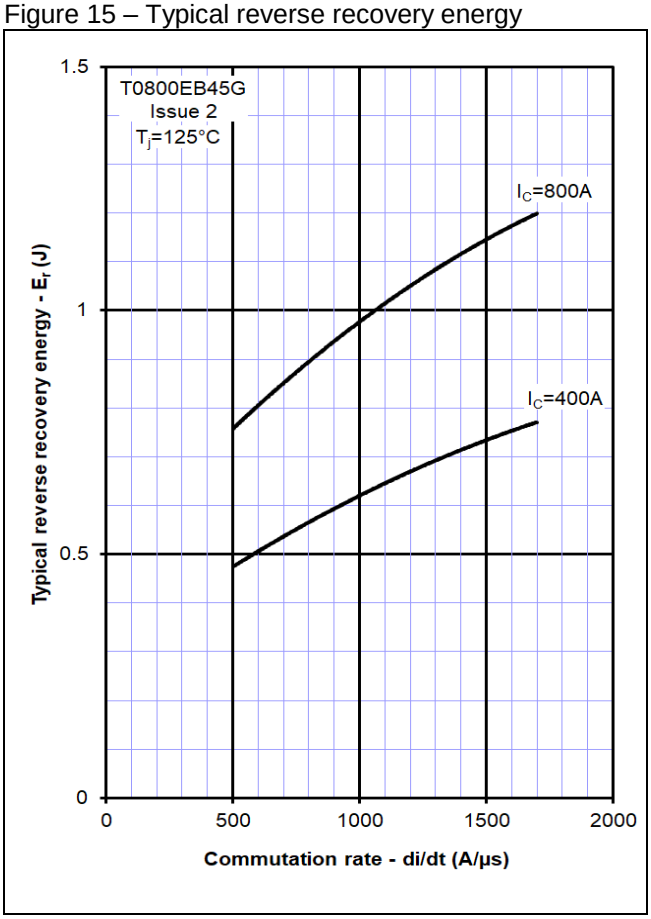



Figure 16 – Safe operating area (Diode)

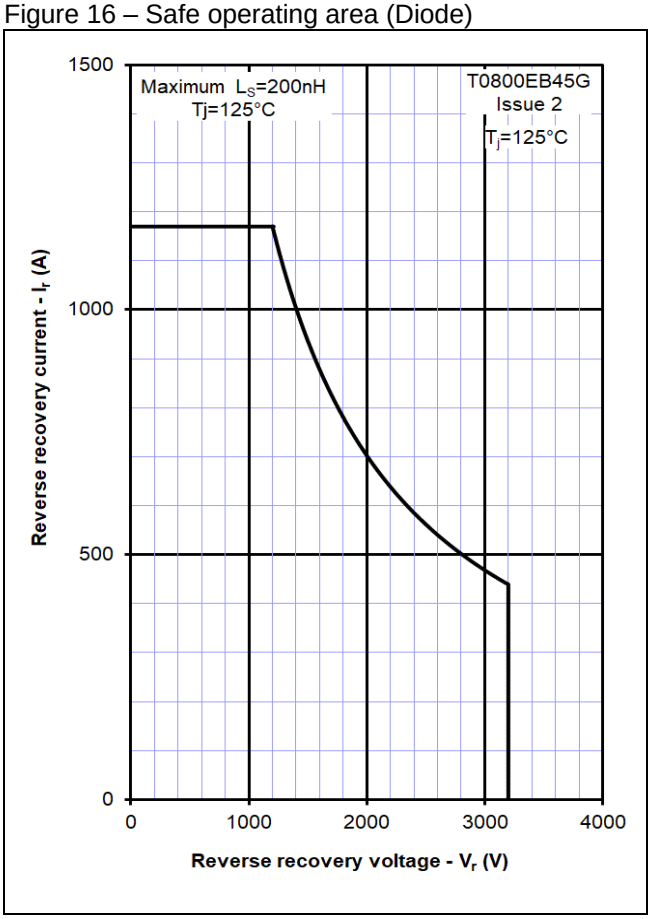


Figure 17 – Transient thermal impedance (IGBT)

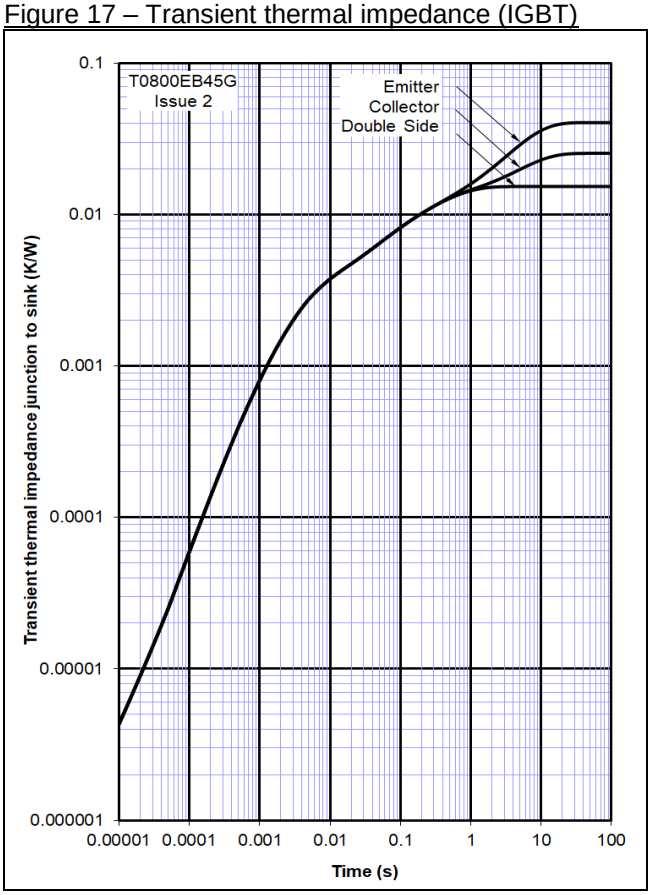
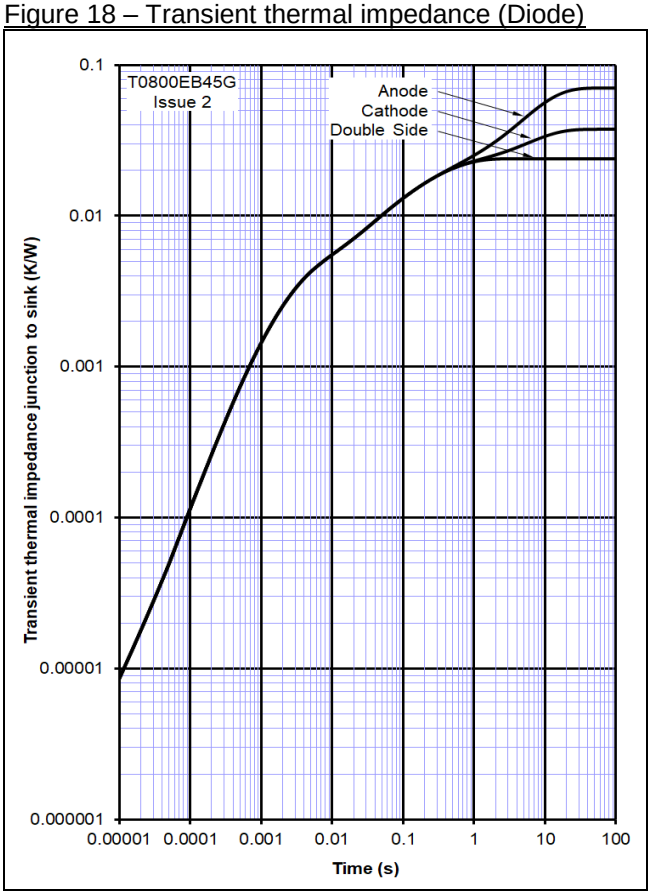
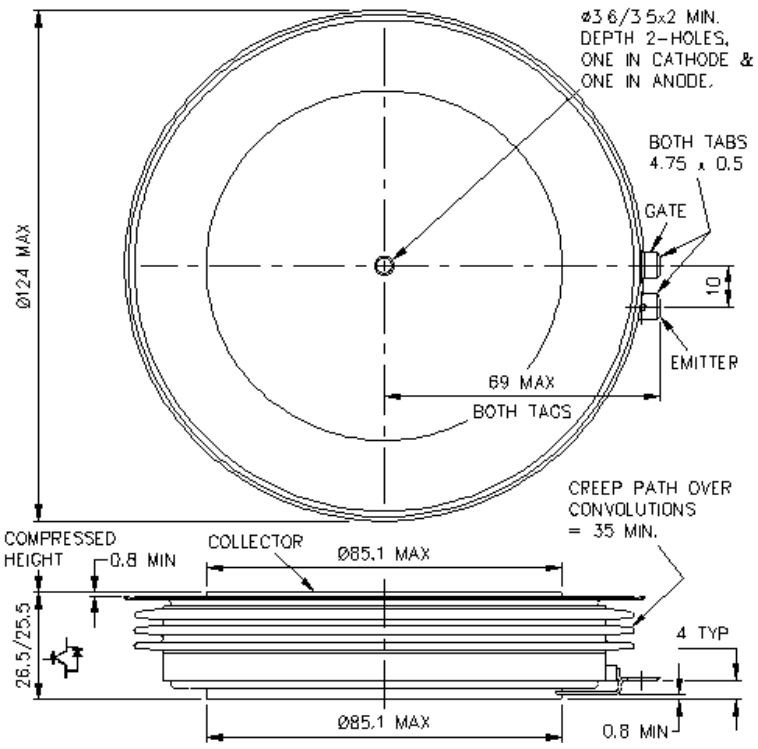



Figure 18 – Transient thermal impedance (Diode)



## Outline Drawing & Ordering Information




101A340

| ORDERING INFORMATION (Please quote 10 digit code as below) | | | |
|---|---|---|---|
| **T0800** | **EB** | **45** | **G** |
| Fixed type Code | Fixed Outline Code | Voltage Grade $V_{CES}$/100 45 | Fixed format code |
| Typical order code: T0800EB45G ($V_{CES}$ = 4500V) | | | |

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