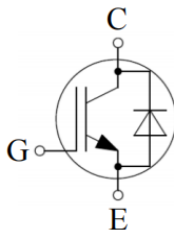


## IGBT Discrete

|                       |      |   |
|-----------------------|------|---|
| $V_{CE}$              | 1200 | V |
| $I_C$                 | 40   | A |
| $V_{CE(SAT)} I_C=40A$ | 1.75 | V |

### Circuit



## Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

## Features

- High breakdown voltage to 1200V for improved reliability
- Maximum junction temperature 175°C
- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- High short circuit capability(10us)

## Maximum Ratings

| Parameter                                                                               | Symbol      | Value    | Unit    |
|-----------------------------------------------------------------------------------------|-------------|----------|---------|
| Collector-Emitter Breakdown Voltage                                                     | $V_{CE}$    | 1200     | V       |
| DC Collector Current, limited by $T_{jmax}$<br>$T_C=25^{\circ}C$<br>$T_C=100^{\circ}C$  | $I_C$       | 80<br>40 | A       |
| Diode Forward Current, limited by $T_{jmax}$<br>$T_C=25^{\circ}C$<br>$T_C=100^{\circ}C$ | $I_F$       | 80<br>40 | A       |
| Continuous Gate-Emitter Voltage                                                         | $V_{GE}$    | $\pm 20$ | V       |
| Transient Gate-Emitter Voltage<br>( $t_p \leq 10\mu s, D < 0.010$ )                     | $V_{GE}$    | $\pm 30$ | V       |
| Turn off Safe Operating Area $V_{CE} \leq 1200V$ ,<br>$T_j \leq 150^{\circ}C$           |             | 160      | A       |
| Pulsed Collector Current, $V_{GE}=15V$ ,<br>$t_p$ limited by $T_{jmax}$                 | $I_{CM}$    | 160      | A       |
| Diode Pulsed Current, $t_p$ limited by $T_{jmax}$                                       | $I_{Fpuls}$ | 160      | A       |
| Short Circuit Withstand Time,<br>$V_{GE}=15V, V_{CC}=600V, V_{CEM} \leq 1200V$          | $T_{sc}$    | 10       | $\mu s$ |
| Power Dissipation, $T_j=175^{\circ}C, T_C=25^{\circ}C$                                  | $P_{tot}$   | 500      | W       |



# DGW40N120CTL0D

**RoHS**  
COMPLIANT

|                                                                          |       |            |    |
|--------------------------------------------------------------------------|-------|------------|----|
| Operating Junction Temperature                                           | $T_j$ | -40...+175 | °C |
| Storage Temperature                                                      | $T_s$ | -55...+150 | °C |
| Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s |       | 260        | °C |

## Electrical Characteristics of the IGBT ( $T_j = 25^\circ\text{C}$ unless otherwise specified):

| Parameter                            | Symbol        | Conditions                                                                                            | Min. | Typ.                 | Max.      | Unit |
|--------------------------------------|---------------|-------------------------------------------------------------------------------------------------------|------|----------------------|-----------|------|
| <b>Static</b>                        |               |                                                                                                       |      |                      |           |      |
| Collector-Emitter Breakdown Voltage  | $BV_{CES}$    | $V_{GE}=0V, I_C=250\mu A$                                                                             | 1200 |                      | -         | V    |
| Gate Threshold Voltage               | $V_{GE(th)}$  | $V_{GE}=V_{CE}, I_C=1.0mA$                                                                            | 4.8  | 5.8                  | 6.5       | V    |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V, I_C=40A$<br>$T_j=25^\circ\text{C}$<br>$T_j=125^\circ\text{C}$<br>$T_j=150^\circ\text{C}$ |      | 1.75<br>1.95<br>2.05 | 2.05      | V    |
| Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{CE}=1200V, V_{GE}=0V$<br>$T_j=25^\circ\text{C}$<br>$T_j=150^\circ\text{C}$                        |      |                      | 0.25<br>4 | mA   |
| Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0V, V_{GE}=\pm 20V$                                                                           |      |                      | 100       | nA   |

| Parameter                    | Symbol    | Conditions                              | Min. | Typ. | Max. | Unit |
|------------------------------|-----------|-----------------------------------------|------|------|------|------|
| <b>Dynamic</b>               |           |                                         |      |      |      |      |
| Input Capacitance            | $C_{ies}$ | $V_{CE}=25V, V_{GE}=0V,$<br>$f=1MHz$    | -    | 3.09 | -    | nF   |
| Reverse Transfer Capacitance | $C_{res}$ |                                         | -    | 1.26 | -    |      |
| Gate Charge                  | $Q_G$     | $V_{CC}=600V, I_C=40A,$<br>$V_{GE}=15V$ | -    | 0.24 | -    | uC   |

**Electrical Characteristics of the Diode** ( $T_j = 25^\circ\text{C}$  unless otherwise specified):

| Parameter             | Symbol | Conditions                                                                                                 | Min. | Typ.                 | Max. | Unit |
|-----------------------|--------|------------------------------------------------------------------------------------------------------------|------|----------------------|------|------|
| <b>Static</b>         |        |                                                                                                            |      |                      |      |      |
| Diode Forward Voltage | $V_F$  | $I_F = 40\text{A}$<br>$T_j = 25^\circ\text{C}$ ,<br>$T_j = 125^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ |      | 2.00<br>1.80<br>1.70 | 2.50 | V    |

**Switching Characteristic, Inductive Load**

| Parameter                          | Symbol              | Conditions                                                                                        | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------|---------------------------------------------------------------------------------------------------|------|------|------|------|
| Dynamic , at T <sub>j</sub> = 25℃  |                     |                                                                                                   |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>CC</sub> = 600V, I <sub>C</sub> =40A,<br>V <sub>GE</sub> = -5V~15V,<br>R <sub>g</sub> =20Ω | -    | 23   | -    | ns   |
| Rise Time                          | t <sub>r</sub>      |                                                                                                   | -    | 75   | -    | ns   |
| Turn-on Energy                     | E <sub>on</sub>     |                                                                                                   | -    | 5.18 | -    | mJ   |
| Turn-off Delay Time                | t <sub>d(off)</sub> |                                                                                                   | -    | 257  | -    | ns   |
| Fall Time                          | t <sub>f</sub>      |                                                                                                   | -    | 175  | -    | ns   |
| Turn-off Energy                    | E <sub>off</sub>    |                                                                                                   | -    | 2.03 | -    | mJ   |
| Dynamic , at T <sub>j</sub> = 125℃ |                     |                                                                                                   |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>CC</sub> = 600V, I <sub>C</sub> =40A,<br>V <sub>GE</sub> = -5V~15V,<br>R <sub>g</sub> =20Ω | -    | 23   | -    | ns   |
| Rise Time                          | t <sub>r</sub>      |                                                                                                   | -    | 71   | -    | ns   |
| Turn-on Energy                     | E <sub>on</sub>     |                                                                                                   | -    | 5.27 | -    | mJ   |
| Turn-off Delay Time                | t <sub>d(off)</sub> |                                                                                                   | -    | 298  | -    | ns   |
| Fall Time                          | t <sub>f</sub>      |                                                                                                   | -    | 267  | -    | ns   |
| Turn-off Energy                    | E <sub>off</sub>    |                                                                                                   | -    | 3.35 | -    | mJ   |
| Dynamic , at T <sub>j</sub> = 150℃ |                     |                                                                                                   |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>CC</sub> = 600V, I <sub>C</sub> =40A,<br>V <sub>GE</sub> = -5V~15V,<br>R <sub>g</sub> =20Ω | -    | 23   | -    | ns   |
| Rise Time                          | t <sub>r</sub>      |                                                                                                   | -    | 69   | -    | ns   |
| Turn-on Energy                     | E <sub>on</sub>     |                                                                                                   | -    | 5.35 | -    | mJ   |
| Turn-off Delay Time                | t <sub>d(off)</sub> |                                                                                                   | -    | 311  | -    | ns   |
| Fall Time                          | t <sub>f</sub>      |                                                                                                   | -    | 311  | -    | ns   |
| Turn-off Energy                    | E <sub>off</sub>    |                                                                                                   | -    | 3.74 | -    | mJ   |

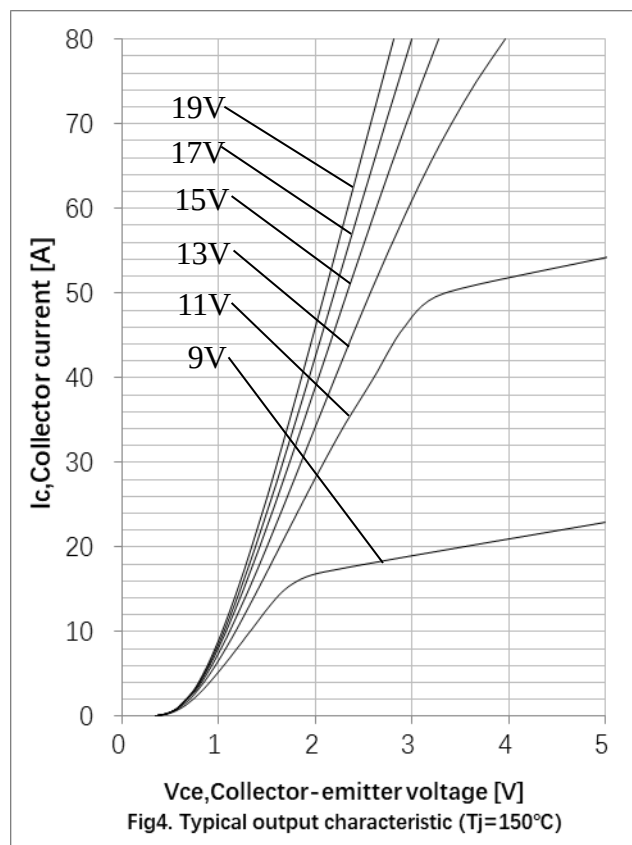
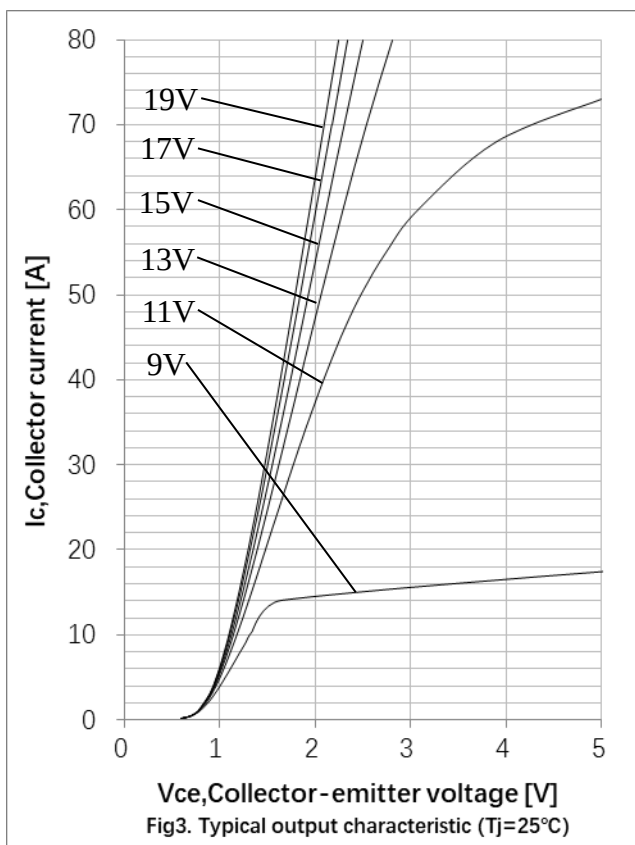
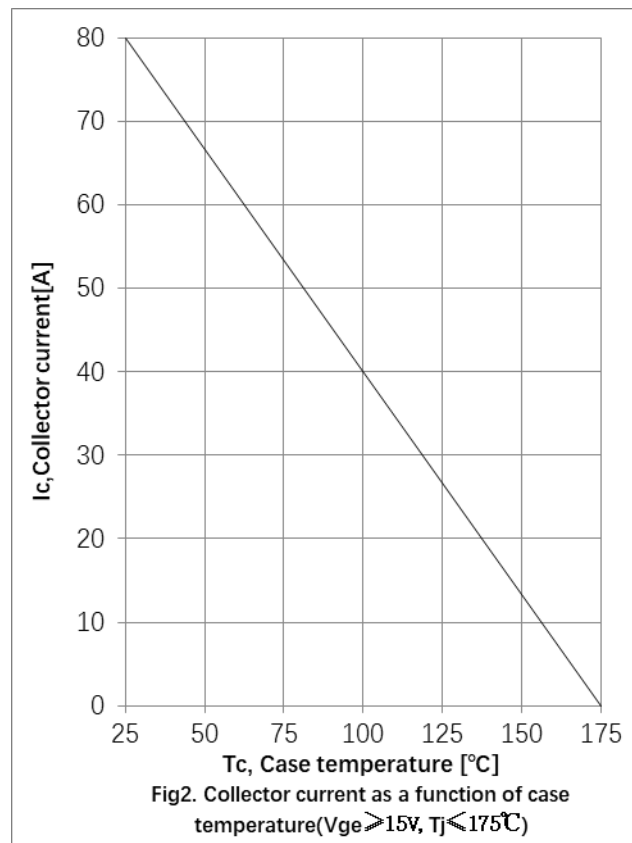
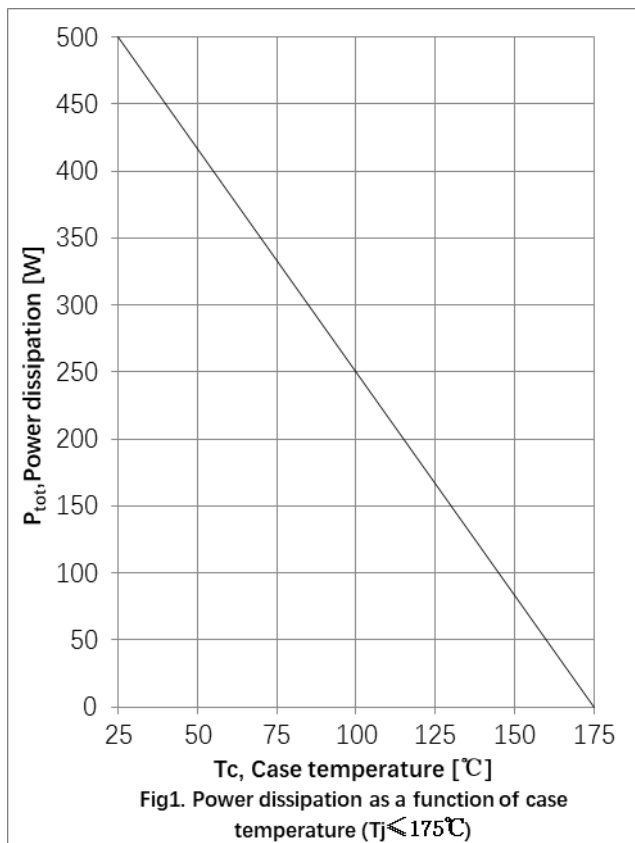


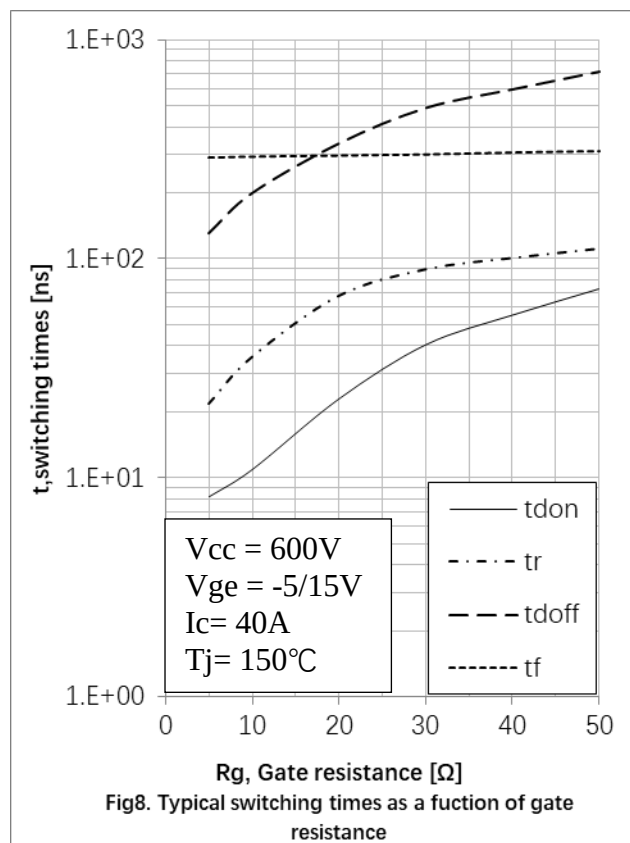
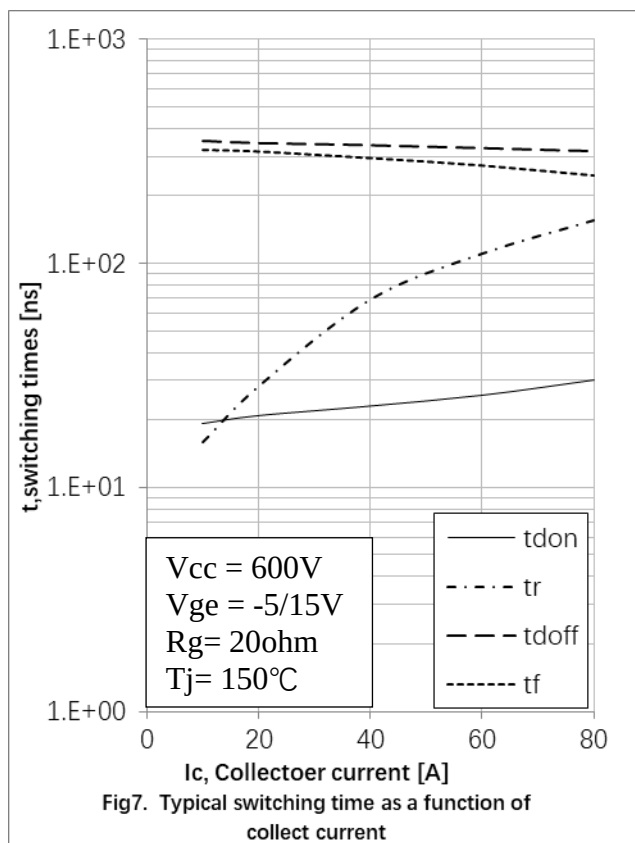
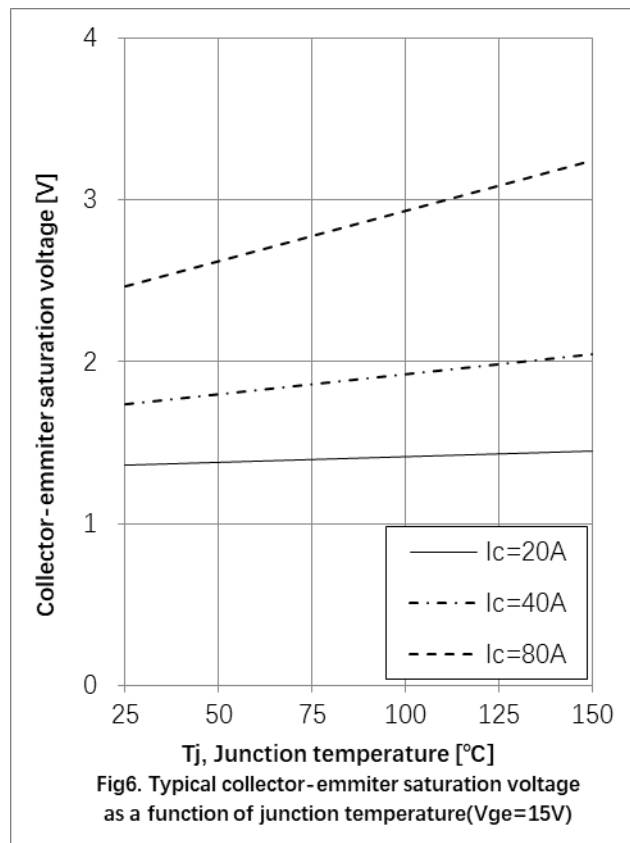
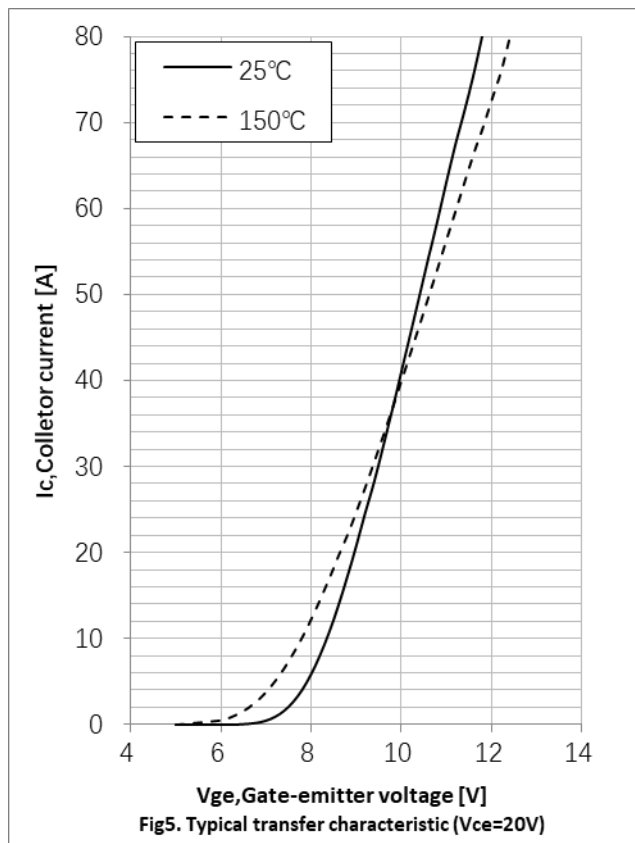
## Electrical Characteristics of the DIODE

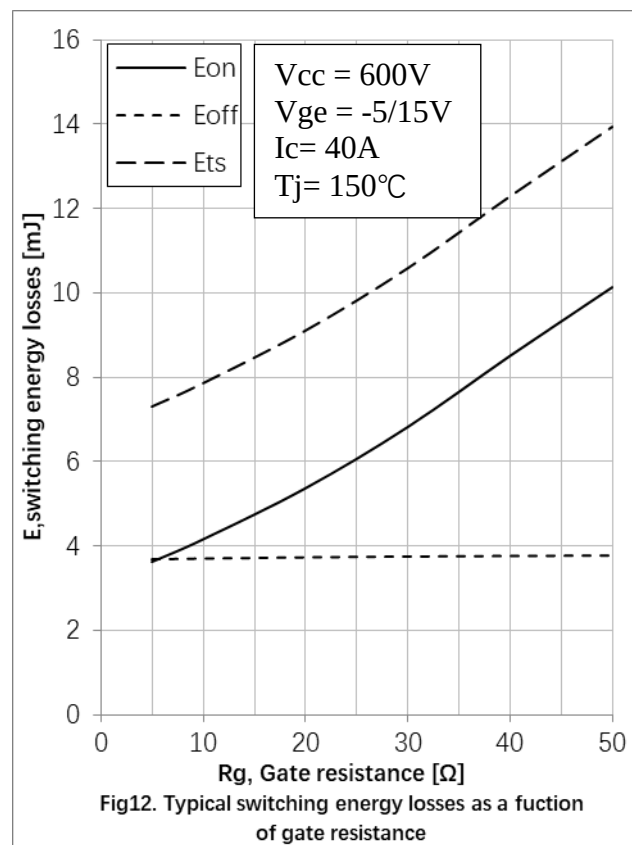
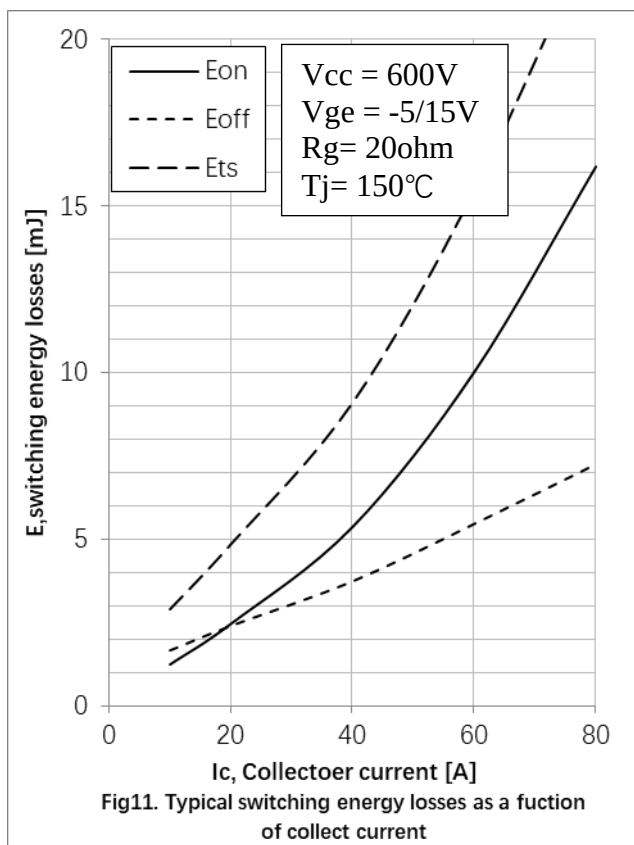
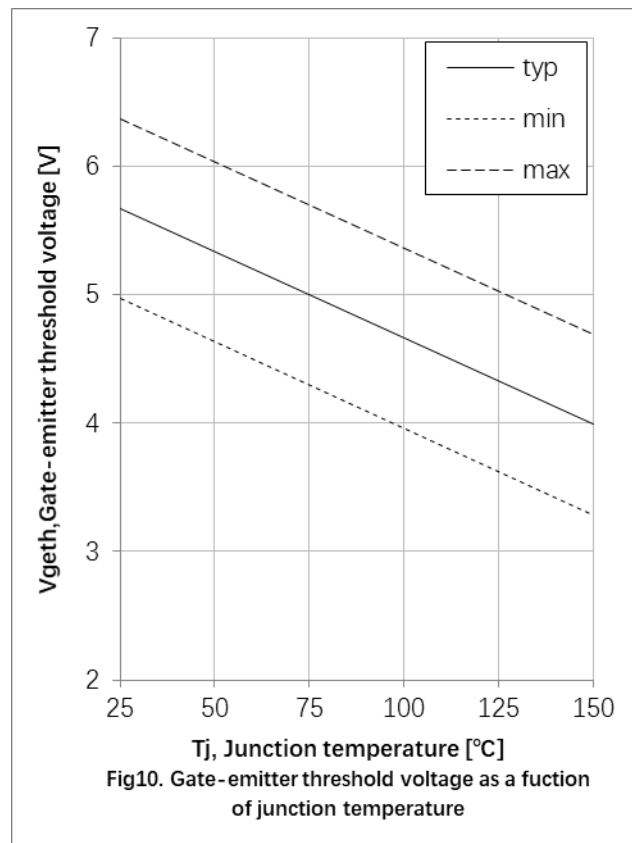
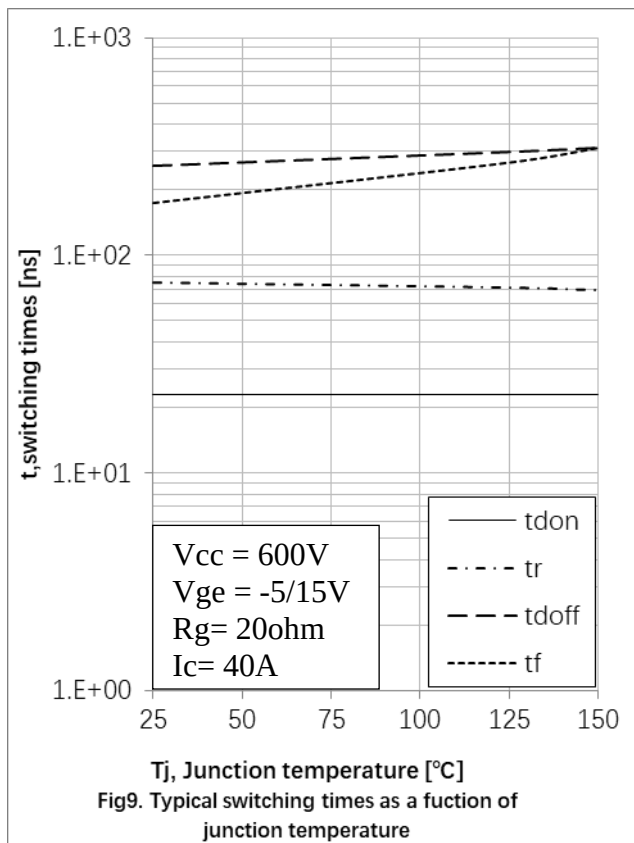
| Parameter                           | Symbol           | Conditions                                                     | Min. | Typ. | Max. | Unit |
|-------------------------------------|------------------|----------------------------------------------------------------|------|------|------|------|
| Dynamic , at T <sub>j</sub> = 25°C  |                  |                                                                |      |      |      |      |
| Reverse Recovery Current            | I <sub>rr</sub>  | I <sub>F</sub> =40A, V <sub>R</sub> =600V,<br>di/dt= -520A/μs, | -    | 16   | -    | A    |
| Diode reverse recovery time         | trr              |                                                                | -    | 523  | -    | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>  |                                                                | -    | 2.94 | -    | uC   |
| Reverse Recovery Energy             | E <sub>rec</sub> |                                                                | -    | 1.15 | -    | mJ   |
| Dynamic , at T <sub>j</sub> = 125°C |                  |                                                                |      |      |      |      |
| Reverse Recovery Current            | I <sub>rr</sub>  | I <sub>F</sub> =40A, V <sub>R</sub> =600V,<br>di/dt= -520A/μs, | -    | 19   | -    | A    |
| Diode reverse recovery time         | trr              |                                                                | -    | 825  | -    | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>  |                                                                | -    | 7.21 | -    | uC   |
| Reverse Recovery Energy             | E <sub>rec</sub> |                                                                | -    | 2.58 | -    | mJ   |
| Dynamic , at T <sub>j</sub> = 150°C |                  |                                                                |      |      |      |      |
| Reverse Recovery Current            | I <sub>rr</sub>  | I <sub>F</sub> =40A, V <sub>R</sub> =600V,<br>di/dt= -520A/μs, | -    | 23   | -    | A    |
| Diode reverse recovery time         | trr              |                                                                | -    | 922  | -    | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>  |                                                                | -    | 8.35 | -    | uC   |
| Reverse Recovery Energy             | E <sub>rec</sub> |                                                                | -    | 3.32 | -    | mJ   |

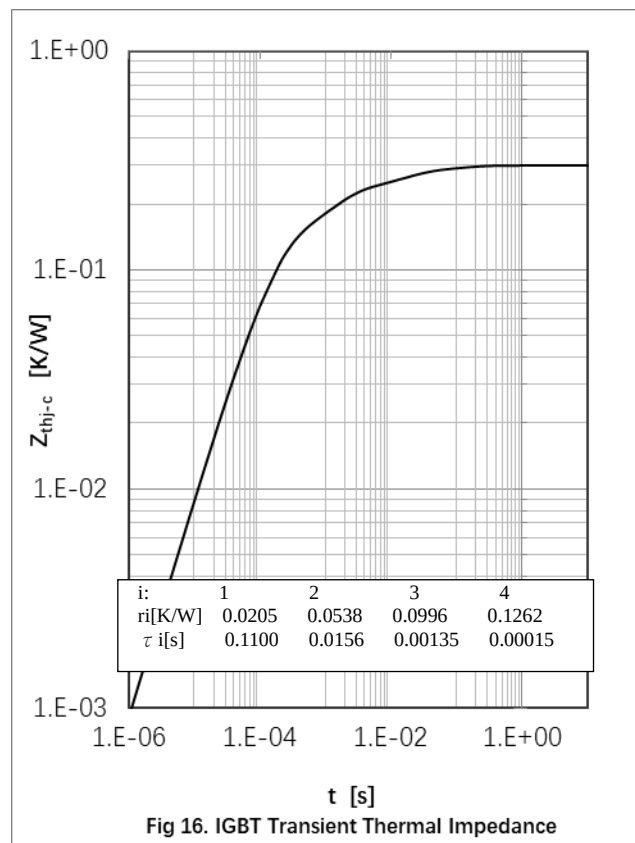
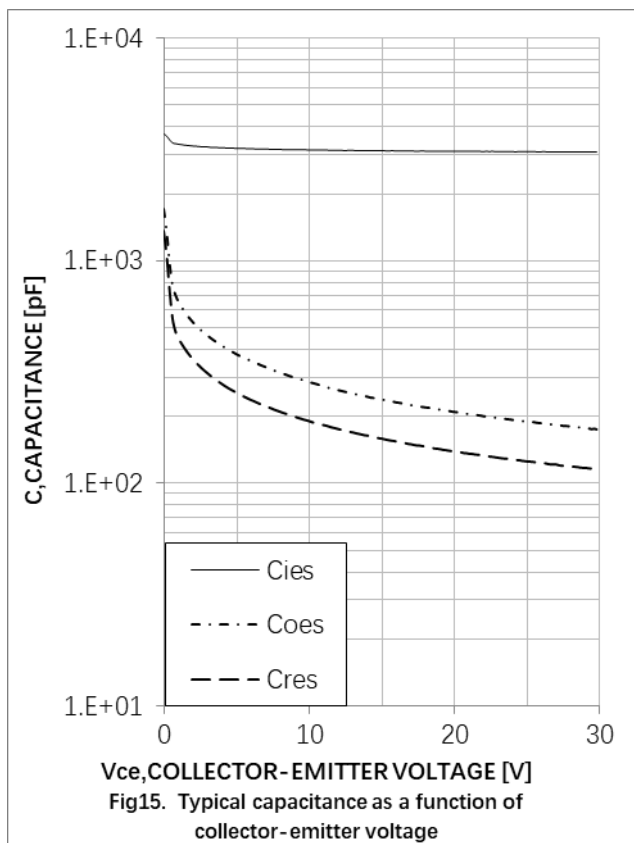
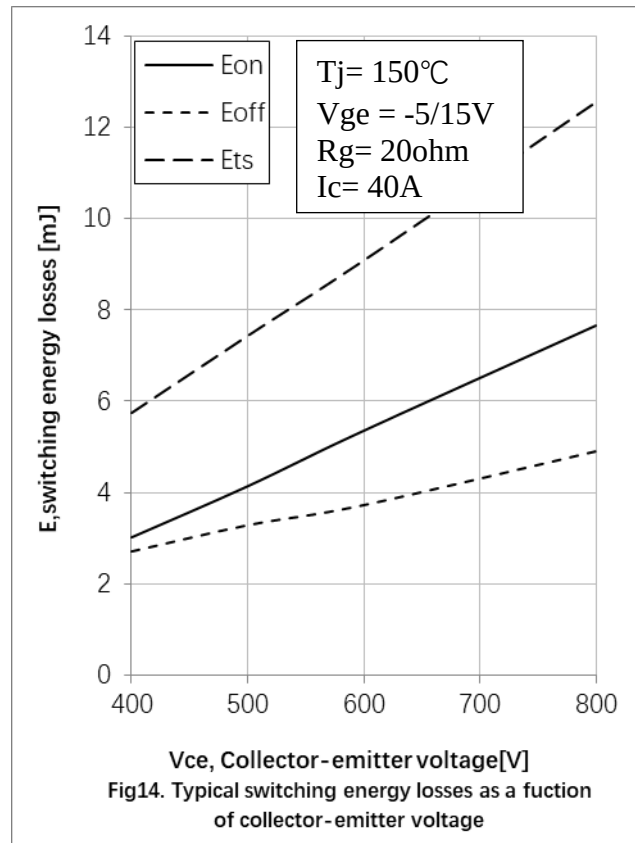
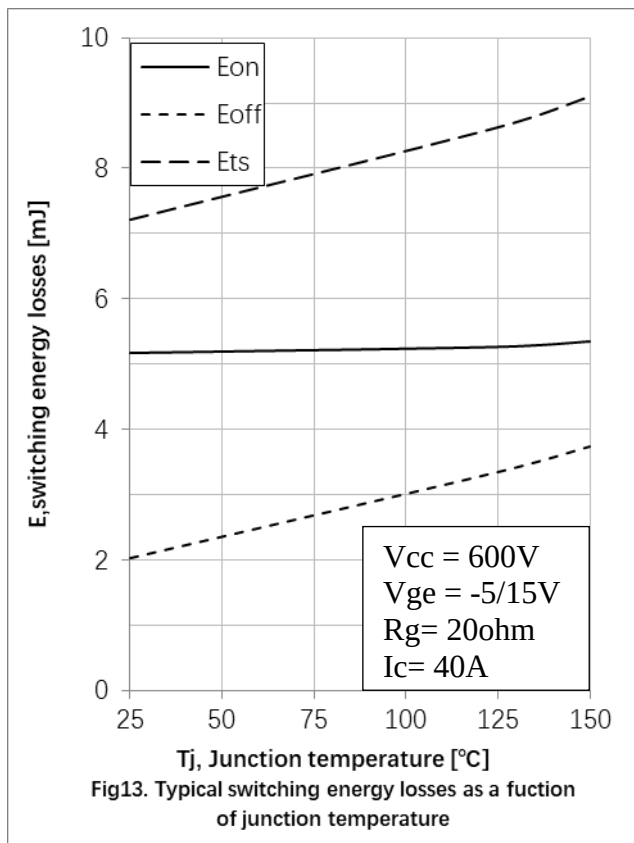
## Thermal Resistance

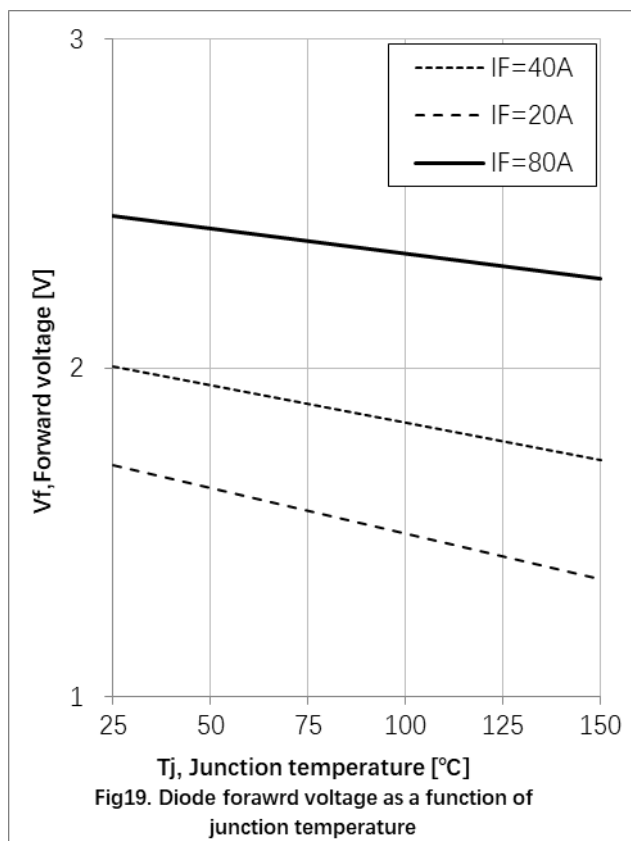
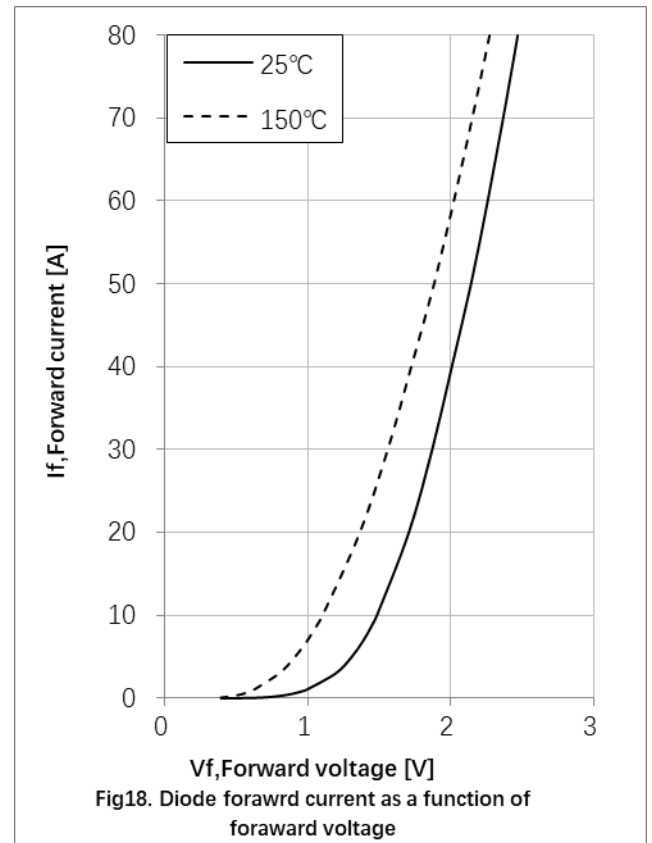
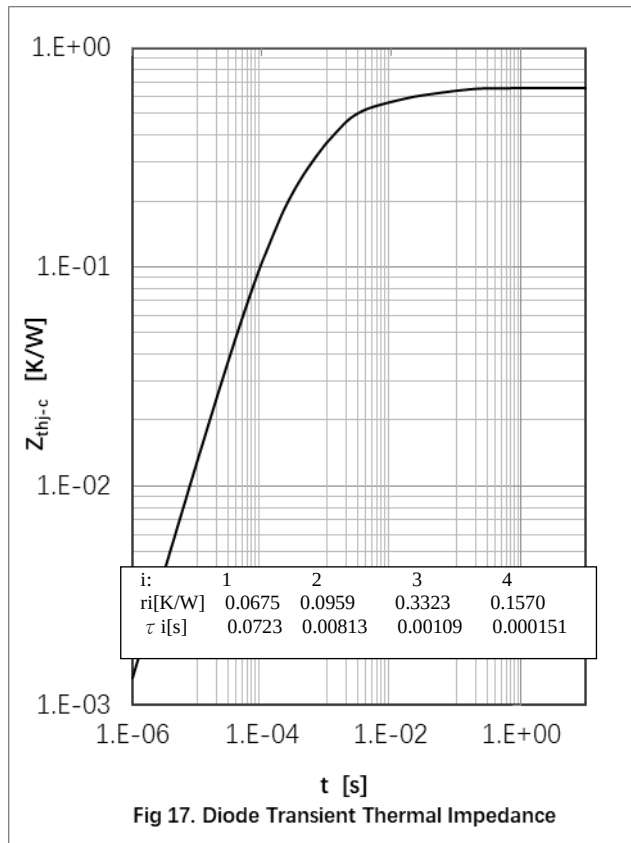
| Parameter                                 | Symbol              | Max. Value | Unit |
|-------------------------------------------|---------------------|------------|------|
| IGBT Thermal Resistance, Junction - Case  | R <sub>θ(j-c)</sub> | 0.30       | K/W  |
| Diode Thermal Resistance, Junction - Case | R <sub>θ(j-c)</sub> | 0.65       | K/W  |
| Thermal Resistance, Junction - Ambient    | R <sub>θ(j-a)</sub> | 40         | K/W  |



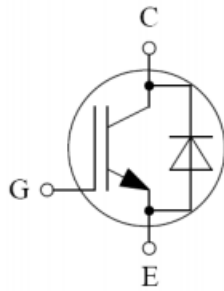






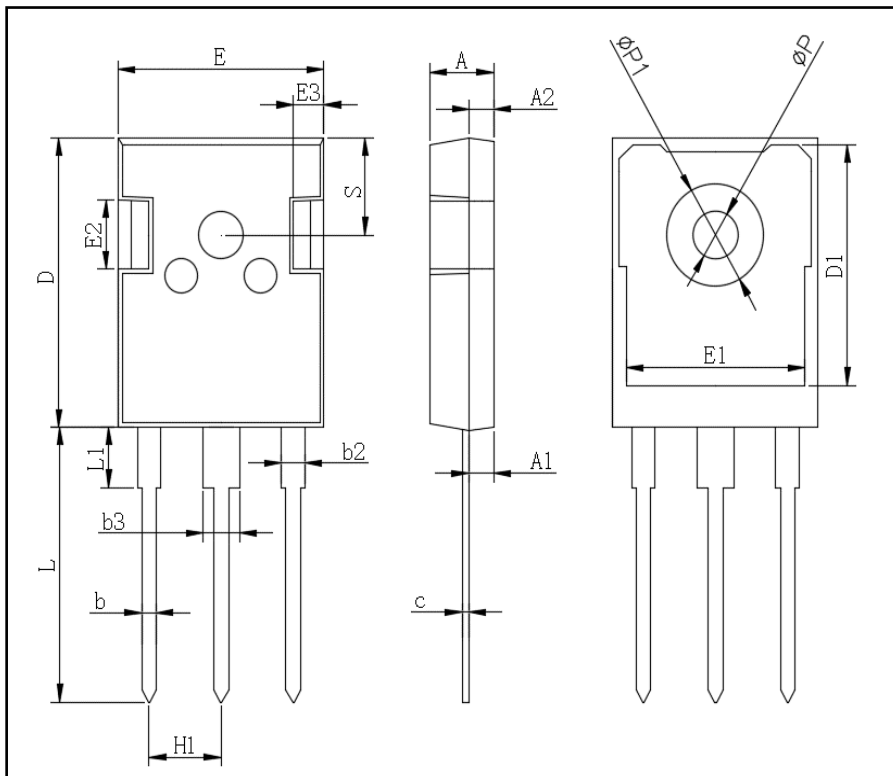


## ● Circuit Diagram



## ● Package Outline Information

CASE: TO 247



| TO-247AB |         |       |
|----------|---------|-------|
| Dim      | Min     | Max   |
| A        | 4.80    | 5.20  |
| A1       | 2.21    | 2.61  |
| A2       | 1.85    | 2.15  |
| b        | 1.0     | 1.4   |
| b2       | 1.91    | 2.21  |
| C        | 0.5     | 0.7   |
| D        | 20.70   | 21.30 |
| D1       | 16.25   | 16.85 |
| E        | 15.50   | 16.10 |
| E1       | 13.0    | 13.6  |
| E2       | 4.80    | 5.20  |
| E3       | 2.30    | 2.70  |
| L        | 19.62   | 20.22 |
| L1       | -       | 4.30  |
| ΦP       | 3.40    | 3.80  |
| ΦP1      | -       | 7.30  |
| S        | 6.15TYP |       |
| H1       | 5.44TYP |       |
| b3       | 2.80    | 3.20  |