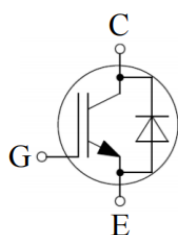


## IGBT Discrete

|                        |             |          |
|------------------------|-------------|----------|
| $V_{CE}$               | <b>650</b>  | <b>V</b> |
| $I_C$                  | <b>100</b>  | <b>A</b> |
| $V_{CE(SAT)} I_C=100A$ | <b>1.35</b> | <b>V</b> |

### Circuit



### Applications

- General purpose inverters
- Motor drives
- Uninterruptible power supply
- Medium to low switching frequency power converters

### Features

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175°C
- Positive temperature coefficient
- High ruggedness, temperature stable

## Maximum Ratings

| Parameter   | Symbol      | Value      | Unit |
|---|-------------|------------|------|
| Collector-Emitter Breakdown Voltage   | $V_{CE}$    | 650        | V    |
| DC Collector Current, limited by $T_{jmax}$<br>$T_C=25^\circ C$ value limited by bondwire<br>$T_C=100^\circ C$  | $I_C$       | 160<br>100 | A    |
| Diode Forward Current, limited by $T_{jmax}$<br>$T_C=25^\circ C$ value limited by bondwire<br>$T_C=100^\circ C$ | $I_F$       | 160<br>100 | 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 $V_{CE} \leq 650V$ ,<br>$T_j \leq 150^\circ C$                                     |             | 400        | A    |
| Pulsed Collector Current, $V_{GE}=15V$ ,<br>$t_p$ limited by $T_{jmax}$   | $I_{CM}$    | 400        | A    |
| Diode Pulsed Current, $t_p$ limited by $T_{jmax}$   | $I_{Fpuls}$ | 400        | A    |
| Power Dissipation, $T_j=175^\circ C, T_c=25^\circ C$  | $P_{tot}$   | 428        | W    |



|  |       |            |    |
|--|-------|------------|----|
| 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  | $BV_{CES}$    | $V_{GE}=0V, I_C=250\mu A$  | 650  |                      | -            | V    |
| Gate Threshold Voltage               | $V_{GE(th)}$  | $V_{GE}=V_{CE}, I_C=1.20mA$  | 3.25 | 3.75                 | 4.25         | V    |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V, I_C=100A$<br>$T_j=25^\circ\text{C}$ ,<br>$T_j=125^\circ\text{C}$<br>$T_j=150^\circ\text{C}$ | 1.00 | 1.35<br>1.50<br>1.55 | 1.70         | V    |
| Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{CE}=650V, V_{GE}=0V$<br>$T_j=25^\circ\text{C}$ ,<br>$T_j=150^\circ\text{C}$                          |      |                      | 0.25<br>3.00 | mA   |
| Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0V, V_{GE}=\pm 20V$  |      |                      | 200          | nA   |

| Parameter                    | Symbol    | Conditions                                       | Min. | Typ. | Max. | Unit |
|------------------------------|-----------|--|------|------|------|------|
| <b>Dynamic</b>               |           |  |      |      |      |      |
| Input Capacitance            | $C_{ies}$ | $V_{CE}=25V, V_{GE}=0V,$<br>$f=1MHz$             | -    | 4.96 | -    | nF   |
| Reverse Transfer Capacitance | $C_{res}$ |  | -    | 0.05 | -    |      |
| Gate Charge                  | $Q_G$     | $V_{CC}=300V, I_C=100A,$<br>$V_{GE}=-5V\sim+15V$ | -    | 0.34 | -    | 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 | $V_F$  | $I_F = 100\text{A}$<br>$T_j = 25^\circ\text{C}$ ,<br>$T_j = 125^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ |      | 1.40<br>1.35<br>1.30 | 1.90 | V    |

**Switching Characteristic, Inductive Load**

| Parameter  | Symbol       | Conditions   | Min. | Typ. | Max. | Unit |
|--|--------------|--|------|------|------|------|
| <b>Dynamic , at <math>T_j = 25^\circ\text{C}</math></b>  |              |  |      |      |      |      |
| Turn-on Delay Time                                       | $t_{d(on)}$  | $V_{CC} = 300\text{V}$ ,<br>$I_C = 100\text{A}$ ,<br>$V_{GE} = -5\text{V} \sim 15\text{V}$ ,<br>$R_g = 10\Omega$<br>Inductive Load | -    | 19   | -    | ns   |
| Rise Time  | $t_r$        |  | -    | 95   | -    | ns   |
| Turn-on Energy   | $E_{on}$     |  | -    | 4.0  | -    | mJ   |
| Turn-off Delay Time                                      | $t_{d(off)}$ |  | -    | 204  | -    | ns   |
| Fall Time  | $t_f$        |  | -    | 44   | -    | ns   |
| Turn-off Energy  | $E_{off}$    |  | -    | 1.1  | -    | mJ   |
| Total switching energy                                   | $E_{ts}$     |  | -    | 5.1  | -    | mJ   |
| <b>Dynamic , at <math>T_j = 125^\circ\text{C}</math></b> |              |  |      |      |      |      |
| Turn-on Delay Time                                       | $t_{d(on)}$  | $V_{CC} = 300\text{V}$ ,<br>$I_C = 100\text{A}$ ,<br>$V_{GE} = -5\text{V} \sim 15\text{V}$ ,<br>$R_g = 10\Omega$<br>Inductive Load | -    | 22   | -    | ns   |
| Rise Time  | $t_r$        |  | -    | 88   | -    | ns   |
| Turn-on Energy   | $E_{on}$     |  | -    | 4.1  | -    | mJ   |
| Turn-off Delay Time                                      | $t_{d(off)}$ |  | -    | 220  | -    | ns   |
| Fall Time  | $t_f$        |  | -    | 55   | -    | ns   |
| Turn-off Energy  | $E_{off}$    |  | -    | 1.4  | -    | mJ   |
| Total switching energy                                   | $E_{ts}$     |  | -    | 5.5  | -    | mJ   |
| <b>Dynamic , at <math>T_j = 150^\circ\text{C}</math></b> |              |  |      |      |      |      |
| Turn-on Delay Time                                       | $t_{d(on)}$  | $V_{CC} = 300\text{V}$ ,<br>$I_C = 100\text{A}$ ,<br>$V_{GE} = -5\text{V} \sim 15\text{V}$ ,<br>$R_g = 10\Omega$<br>Inductive Load | -    | 23   | -    | ns   |
| Rise Time  | $t_r$        |  | -    | 84   | -    | ns   |
| Turn-on Energy   | $E_{on}$     |  | -    | 4.2  | -    | mJ   |
| Turn-off Delay Time                                      | $t_{d(off)}$ |  | -    | 226  | -    | ns   |
| Fall Time  | $t_f$        |  | -    | 59   | -    | ns   |
| Turn-off Energy  | $E_{off}$    |  | -    | 1.6  | -    | mJ   |
| Total switching energy                                   | $E_{ts}$     |  | -    | 5.8  | -    | mJ   |

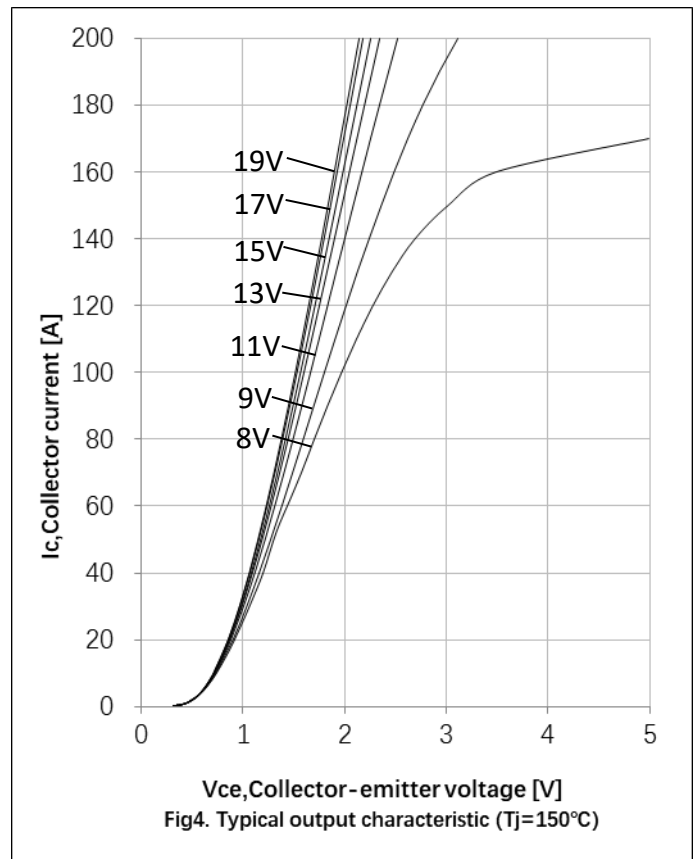
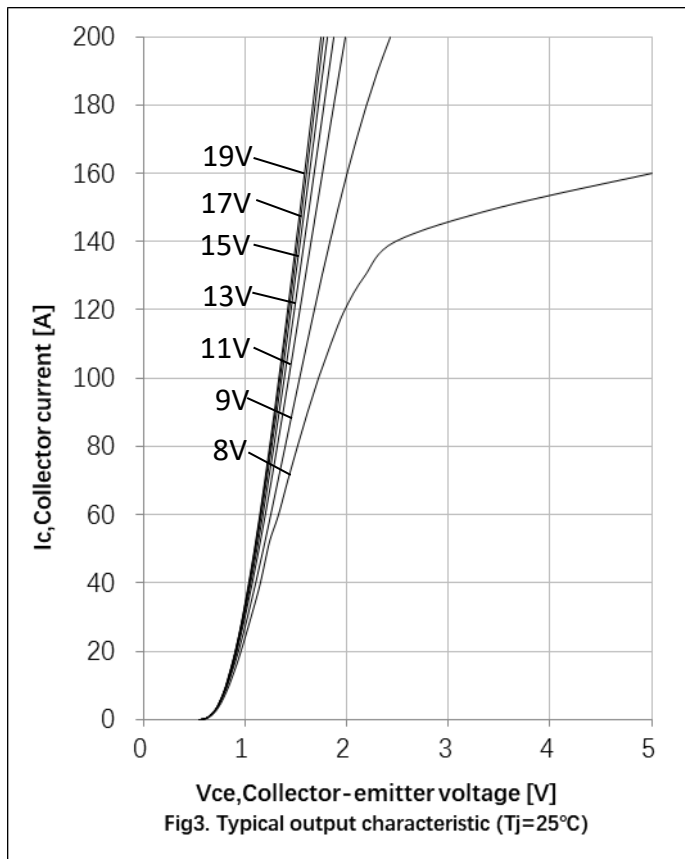
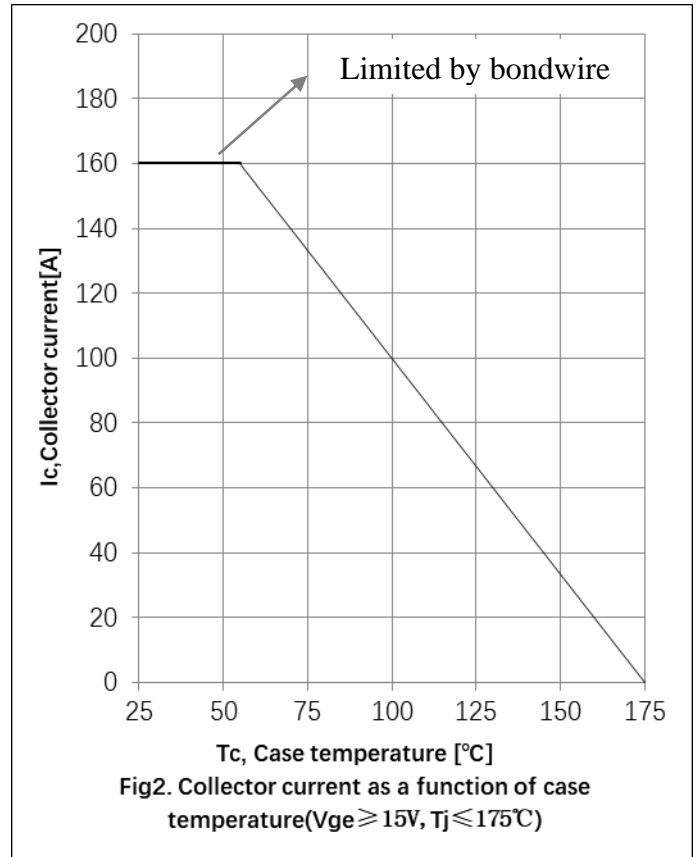
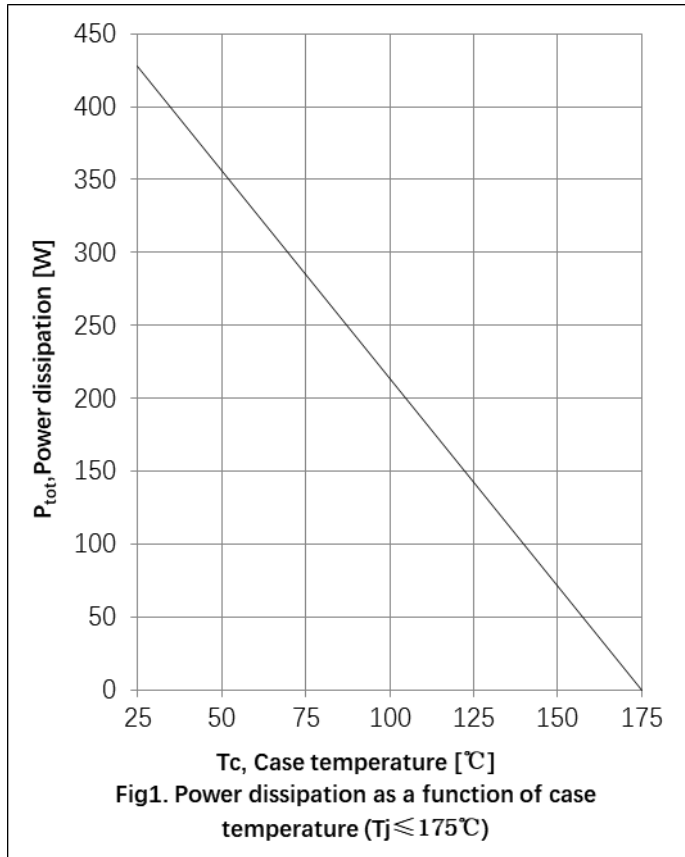


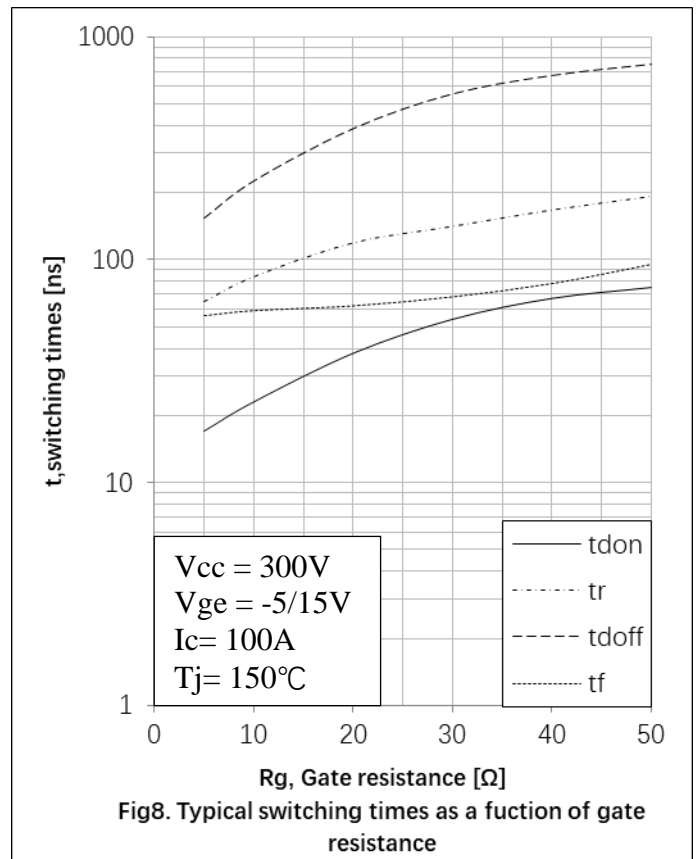
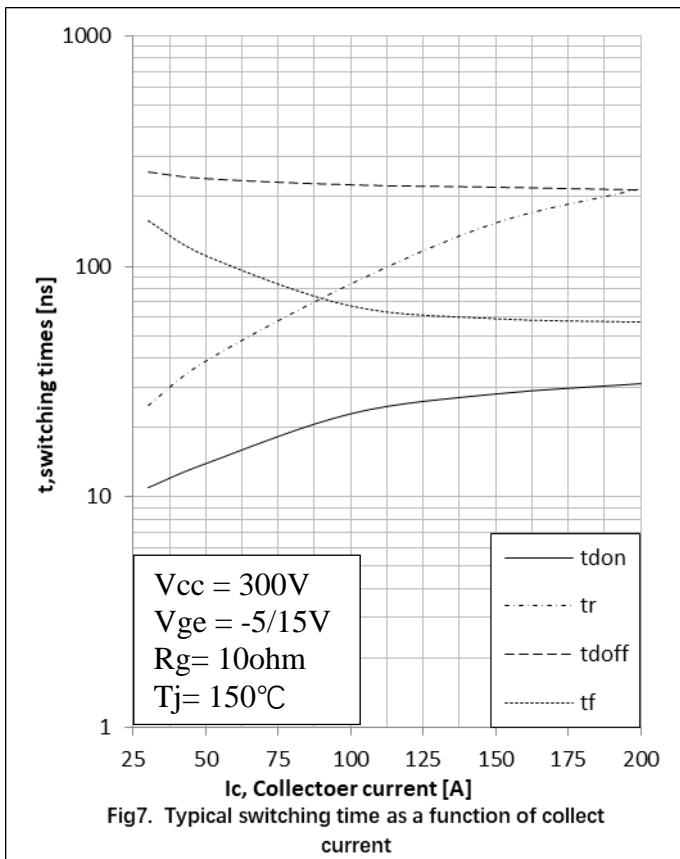
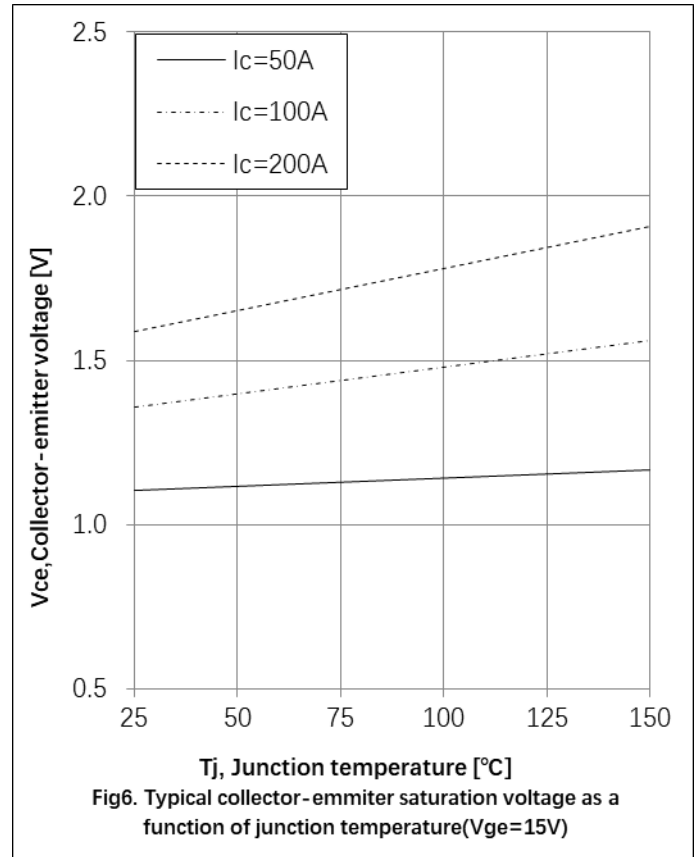
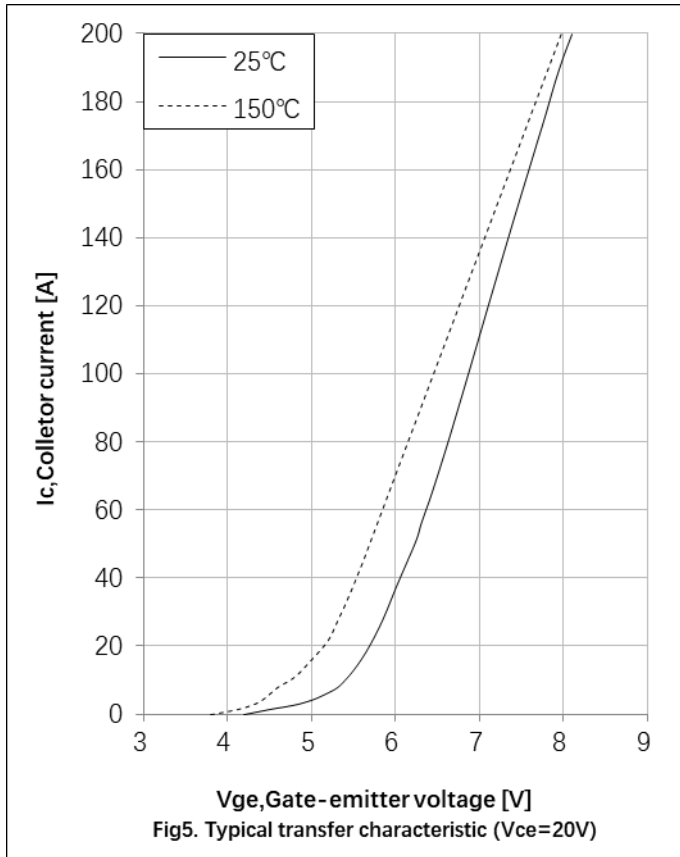
## Electrical Characteristics of the DIODE

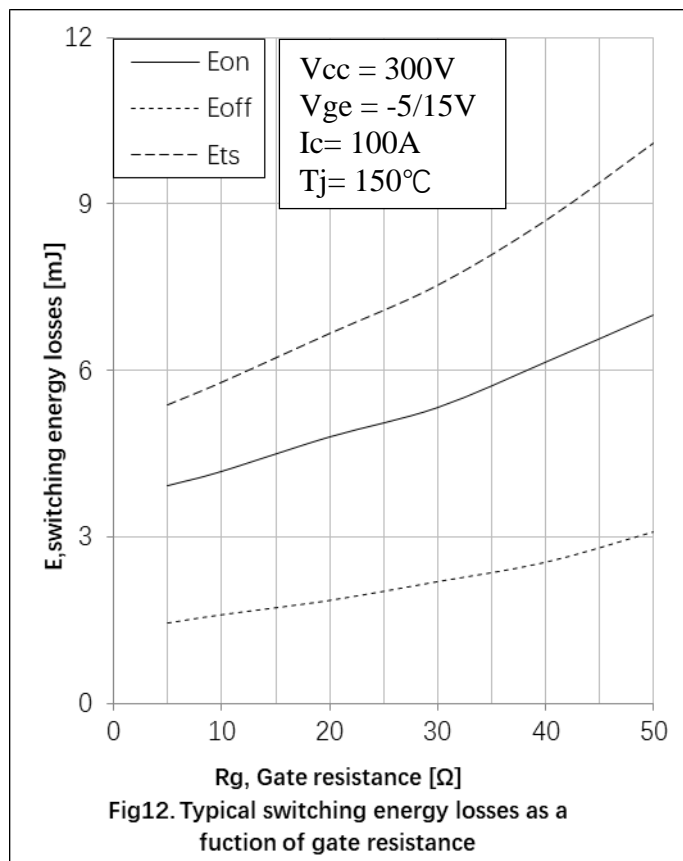
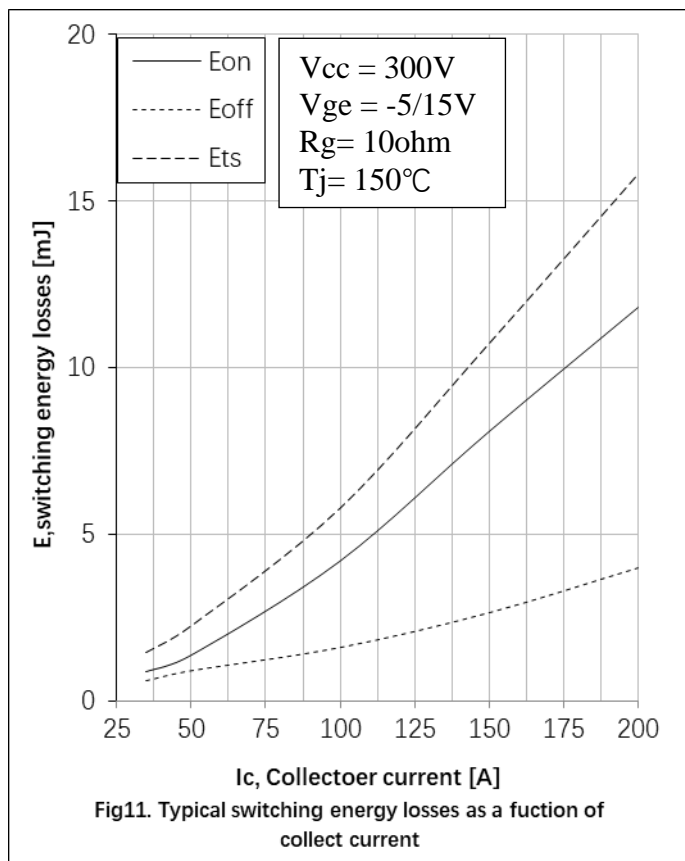
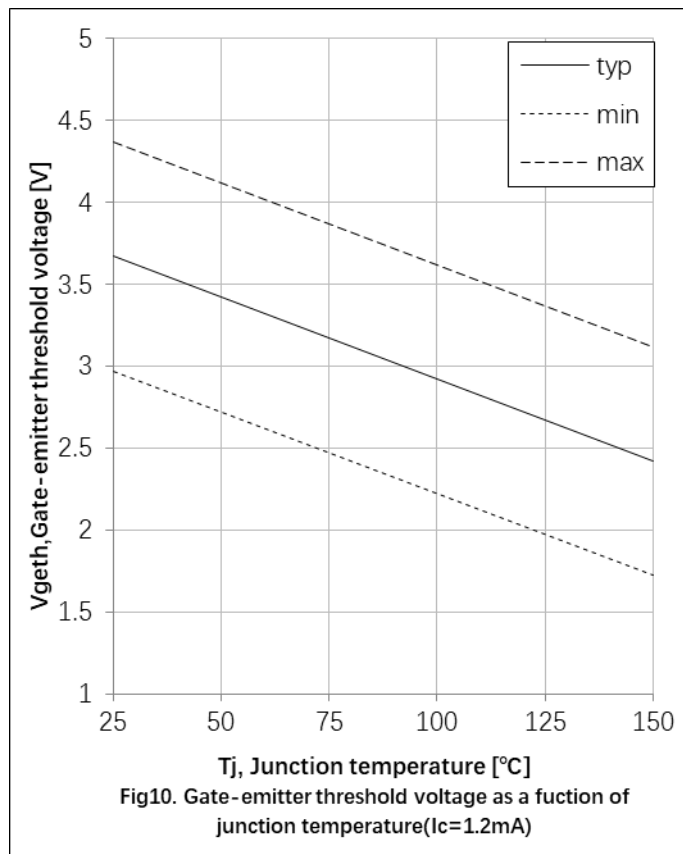
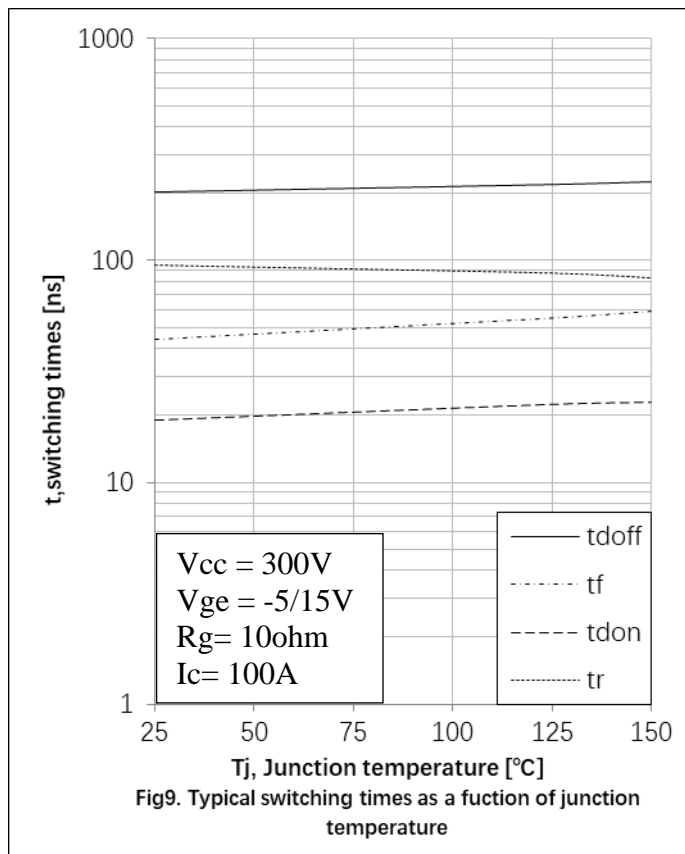
| Parameter                                | Symbol           | Conditions   | Min. | Typ. | Max. | Unit |
|--|------------------|--|------|------|------|------|
| <b>Dynamic , at T<sub>j</sub>= 25°C</b>  |                  |  |      |      |      |      |
| Reverse Recovery Current                 | I <sub>rr</sub>  | I <sub>F</sub> =100A,<br>V <sub>R</sub> =300V<br>-di/dt=550A/μs, | -    | 23   | -    | A    |
| Reverse Recovery Charge                  | Q <sub>rr</sub>  |  | -    | 1.8  | -    | uC   |
| Diode reverse recovery time              | t <sub>rr</sub>  |  | -    | 116  | -    | ns   |
| Reverse Recovery Energy                  | E <sub>rec</sub> |  | -    | 0.16 | -    | mJ   |
| <b>Dynamic , at T<sub>j</sub>= 125°C</b> |                  |  |      |      |      |      |
| Reverse Recovery Current                 | I <sub>rr</sub>  | I <sub>F</sub> =100A,<br>V <sub>R</sub> =300V<br>-di/dt=550A/μs, | -    | 36   | -    | A    |
| Reverse Recovery Charge                  | Q <sub>rr</sub>  |  | -    | 4.2  | -    | uC   |
| Diode reverse recovery time              | t <sub>rr</sub>  |  | -    | 158  | -    | ns   |
| Reverse Recovery Energy                  | E <sub>rec</sub> |  | -    | 0.47 | -    | mJ   |
| <b>Dynamic , at T<sub>j</sub>= 150°C</b> |                  |  |      |      |      |      |
| Reverse Recovery Current                 | I <sub>rr</sub>  | I <sub>F</sub> =100A,<br>V <sub>R</sub> =300V<br>-di/dt=550A/μs, | -    | 41   | -    | A    |
| Reverse Recovery Charge                  | Q <sub>rr</sub>  |  | -    | 5.7  | -    | uC   |
| Diode reverse recovery time              | t <sub>rr</sub>  |  | -    | 197  | -    | ns   |
| Reverse Recovery Energy                  | E <sub>rec</sub> |  | -    | 0.61 | -    | mJ   |

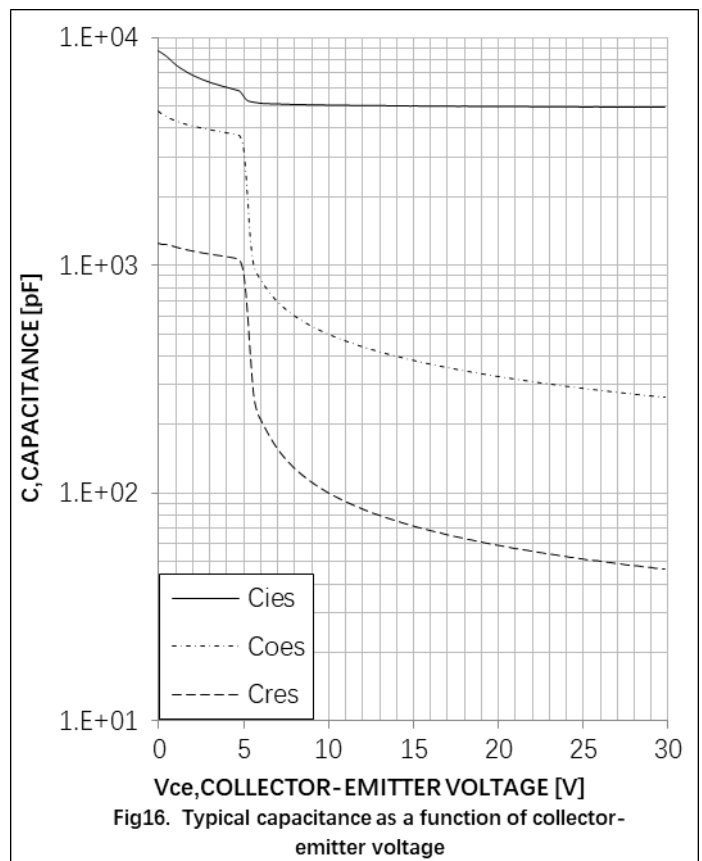
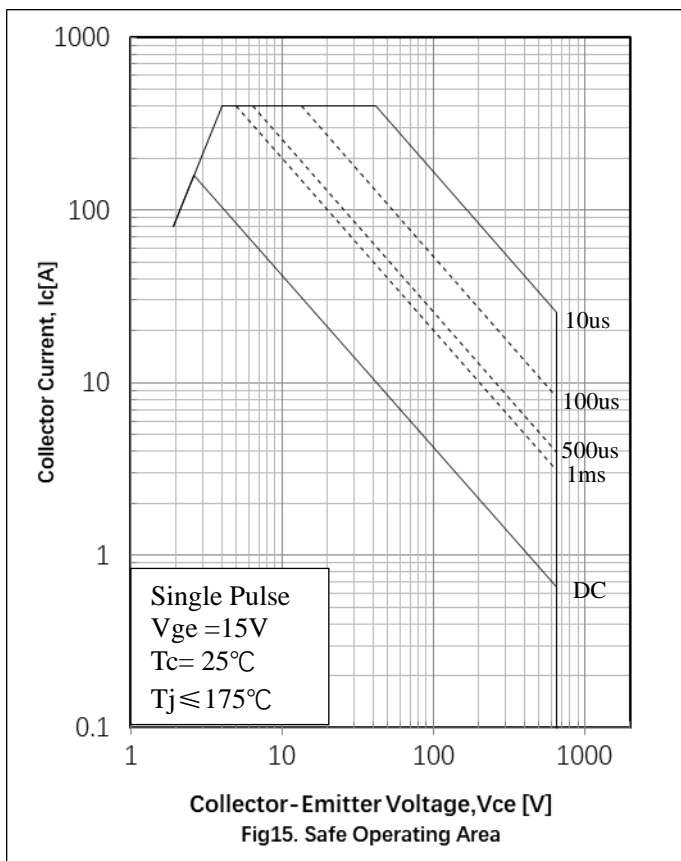
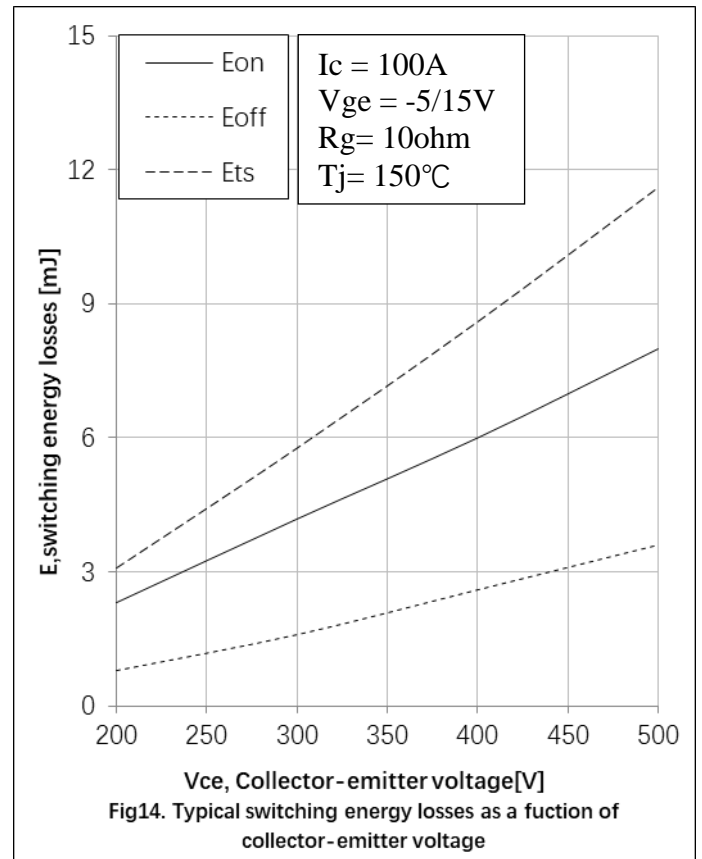
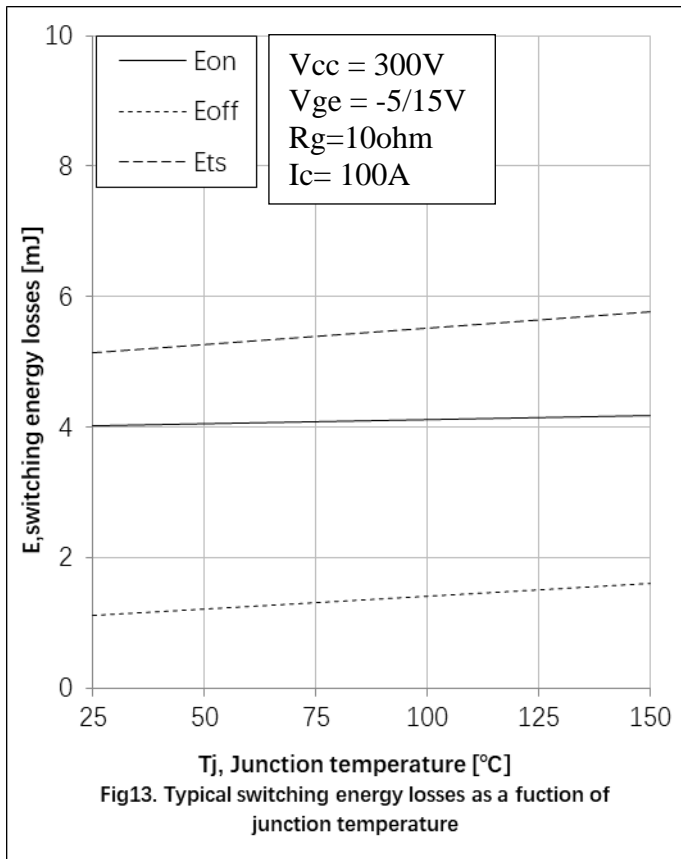
## Thermal Resistance

| Parameter                                 | Symbol               | Max. Value | Unit |
|---|----------------------|------------|------|
| IGBT Thermal Resistance, Junction - Case  | R <sub>th(j-c)</sub> | 0.35       | K/W  |
| Diode Thermal Resistance, Junction - Case | R <sub>th(j-c)</sub> | 0.45       | K/W  |
| Thermal Resistance, Junction - Ambient    | R <sub>th(j-a)</sub> | 40         | K/W  |

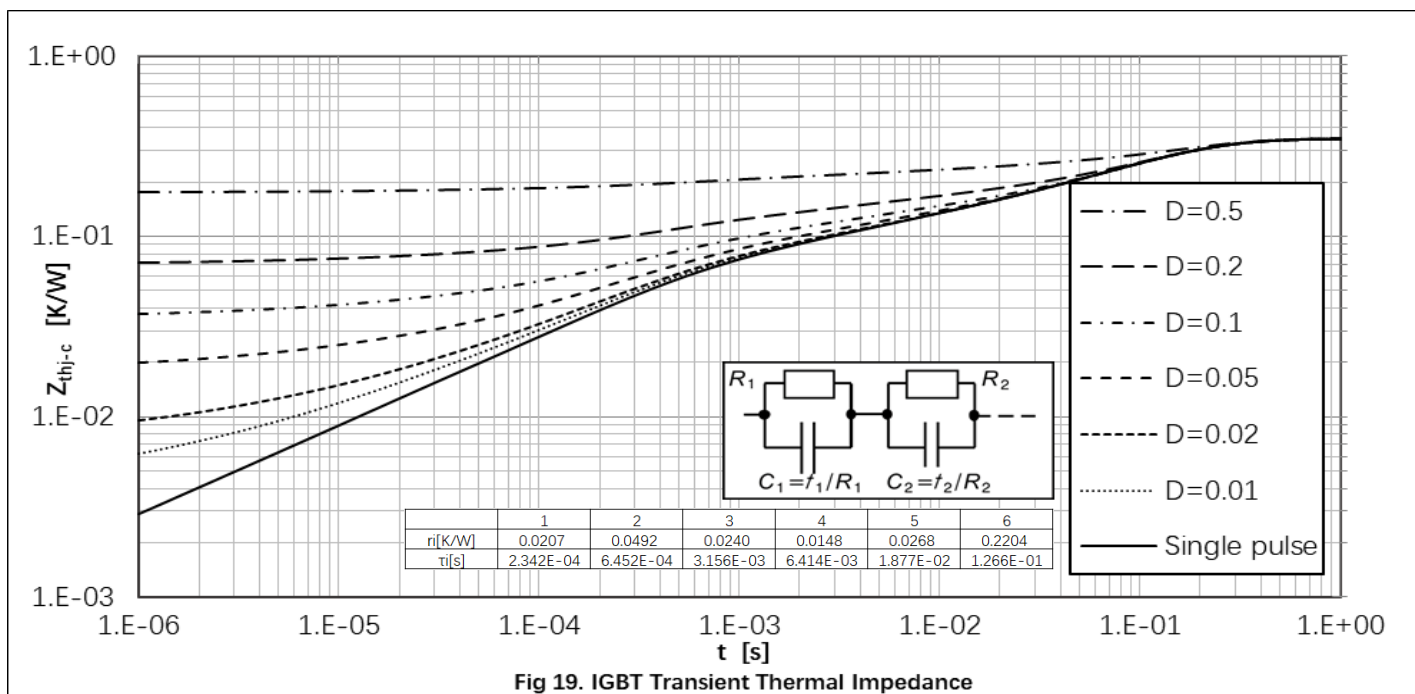
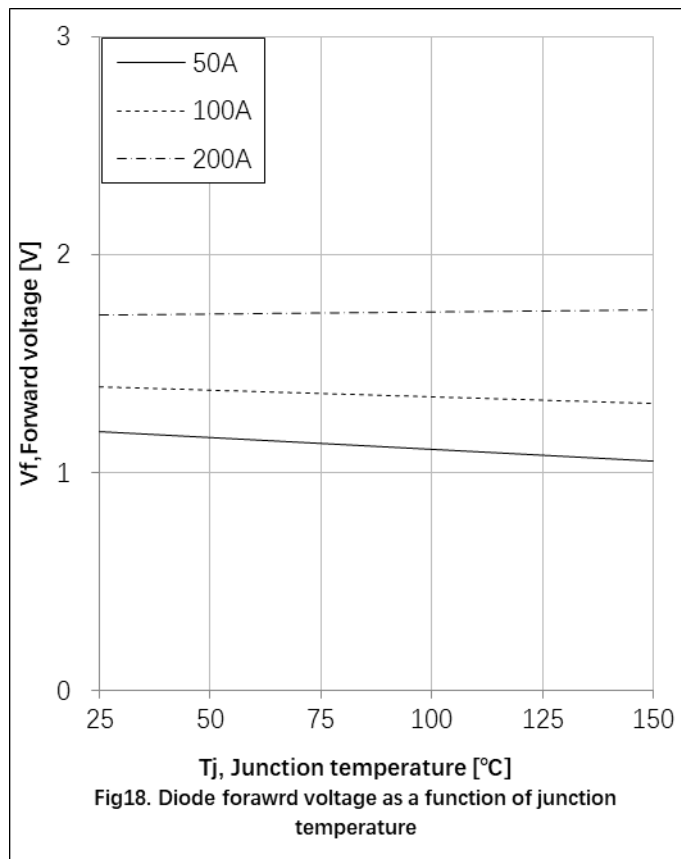
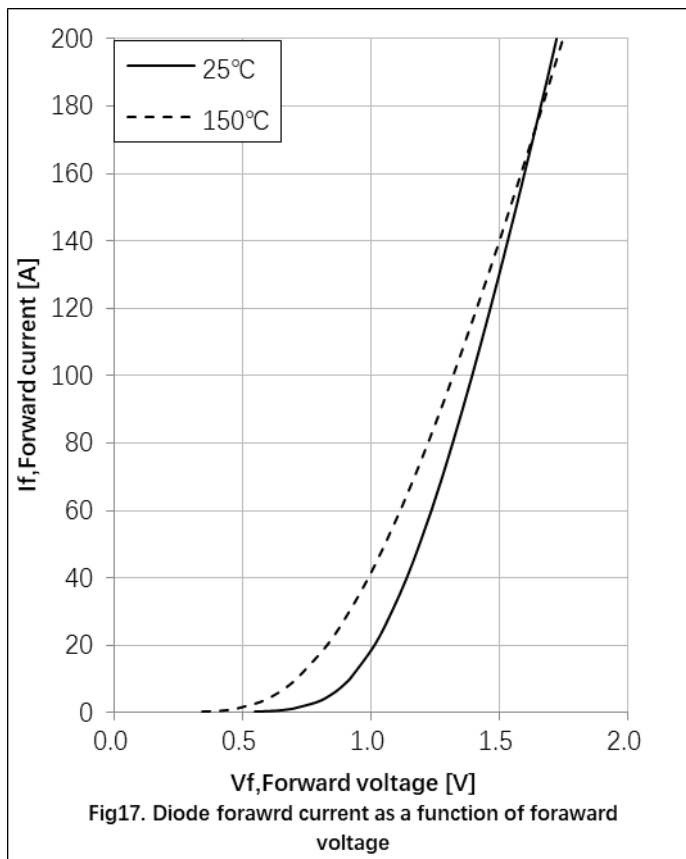


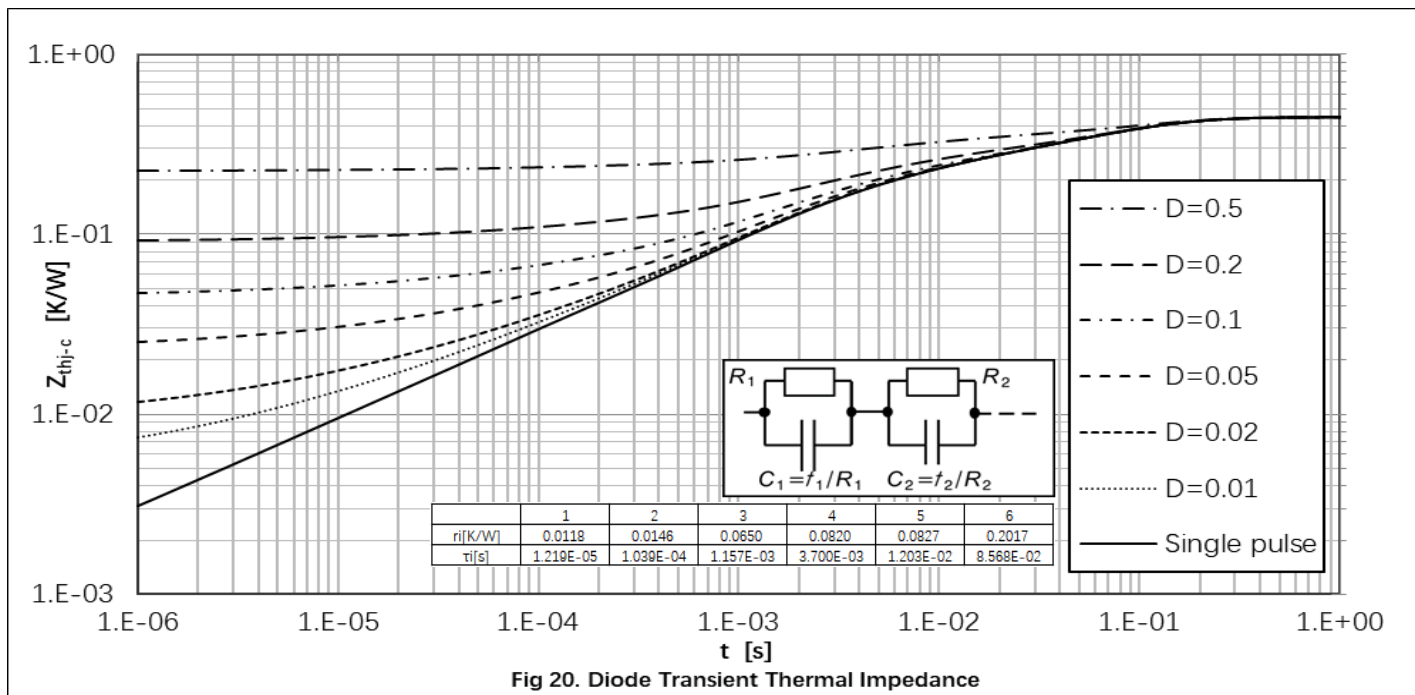




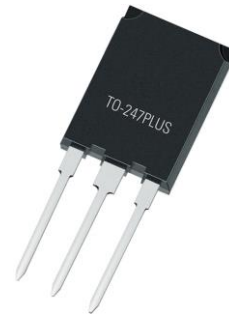
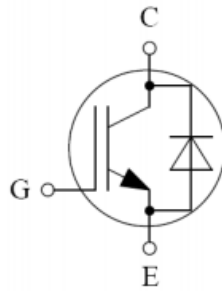






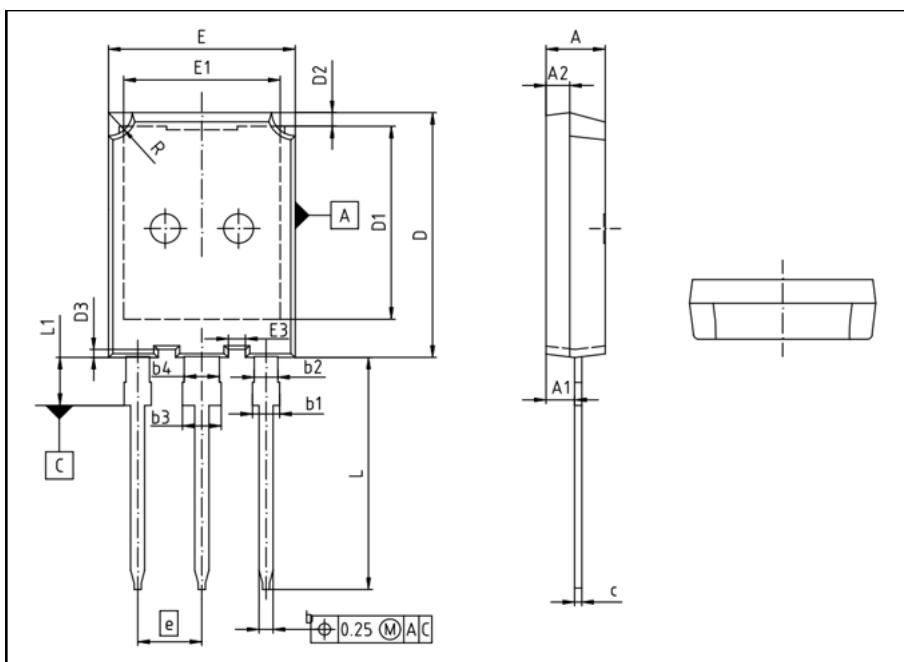


## Circuit Diagram



## ● Package Outline Information

### CASE: TO 247plus



| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 4.90        | 5.10  |
| A1  | 2.31        | 2.51  |
| A2  | 1.90        | 2.10  |
| b   | 1.16        | 1.26  |
| b1  | 1.86        | 2.16  |
| b2  | 1.96        | 2.06  |
| c   | 0.58        | 0.64  |
| D   | 20.90       | 21.10 |
| D1  | 16.25       | 16.85 |
| D2  | 1.05        | 1.35  |
| D3  | 0.58        | 0.78  |
| E   | 15.70       | 15.90 |
| E1  | 13.10       | 13.50 |
| E3  | 1.35        | 1.55  |
| e   | 5.44(BSC)   |       |
| L   | 19.78       | 20.08 |
| L1  | 4.03        | 4.23  |
| R   | 1.90        | 2.10  |