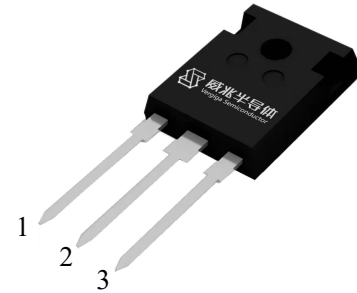
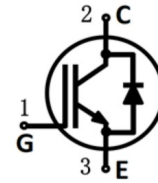


**HCKW25N120H2** is a **1200V25A** IGBT discrete with high speed soft switching of Trench Field stop technology. The product with a anti-parallel diode, has the characteristics of low  $V_{CESAT}$ , high junction temperature and strong robustness. It is very suitable for products with high switching frequency.

## ■ Features

- CoolWatt®II Trench-FS technology
- Low  $V_{CESAT}$
- Low switching losses
- With anti-parallel fast recovery diode
- Positive temperature coefficient
- High reliability



**TO-247**

## ■ Applications

- Industrial welding
- UPS
- Induction Heating

| Part ID      | $V_{CE}$ (V) | $I_{CNOM}$ (A) | $V_{CESAT@25^{\circ}C}$ (V) | Package | Marking  |
|--------------|--------------|----------------|-----------------------------|---------|----------|
| HCKW25N120H2 | 1200         | 25             | 2.05                        | TO-247  | K25H1202 |

## ■ Maximum Rated Values

| Symbol      | Parameter                        | Condition                  | Value | Unit |
|-------------|----------------------------------|----------------------------|-------|------|
| $V_{CES}$   | Collector-emitter voltage        | $T_{vj}=25^{\circ}C$       | 1200  | V    |
| $I_C$       | DC collector current             | $T_C = 25^{\circ}C$        | 50    | A    |
|             |                                  | $T_C = 100^{\circ}C$       | 25    |      |
| $I_{Cpuls}$ | Pulse collector current          | $T_{vj} \leq 150^{\circ}C$ | 75    | A    |
| $V_{RRM}$   | Repetitive peak reverse voltage  | $T_{vj}=25^{\circ}C$       | 1200  | V    |
| $I_F$       | Diode continuous forward current | $T_C = 25^{\circ}C$        | 30    | A    |
|             |                                  | $T_C = 100^{\circ}C$       | 15    |      |
| $I_{Fpuls}$ | Diode pulse current              | $T_{vj} \leq 150^{\circ}C$ | 45    | A    |

|           |                                |   |                      |                    |
|-----------|--------------------------------|---|----------------------|--------------------|
| $V_{GE}$  | Gate-emitter voltage           | $T_{vj}=25^{\circ}\text{C}$<br>Transient ( $t_p \leq 10\mu\text{s}, D < 0.01$ ) | $\pm 20$<br>$\pm 30$ | V                  |
| $P_{tot}$ | Power dissipation              | $T_C = 25^{\circ}\text{C}$  | 375                  | W                  |
| $T_{vj}$  | Operating junction temperature |   | -40~+ 175            | $^{\circ}\text{C}$ |
| $T_{stg}$ | Storage temperature            |   | -50~ + 150           | $^{\circ}\text{C}$ |
| M         | Mounting torque                | M3  | 0.6                  | Nm                 |

## ■ Thermal Characteristic

| Symbol          | Parameter                             | Maximum | Unit |
|-----------------|---------------------------------------|---------|------|
| $R_{thJC-IGBT}$ | IGBT thermal resistance junction-case | 0.40    | K/W  |
| $R_{thJC-FRD}$  | FRD thermal resistance junction-case  | 1.32    | K/W  |
| $R_{thJA}$      | Thermal resistance junction-ambient   | 40      | K/W  |

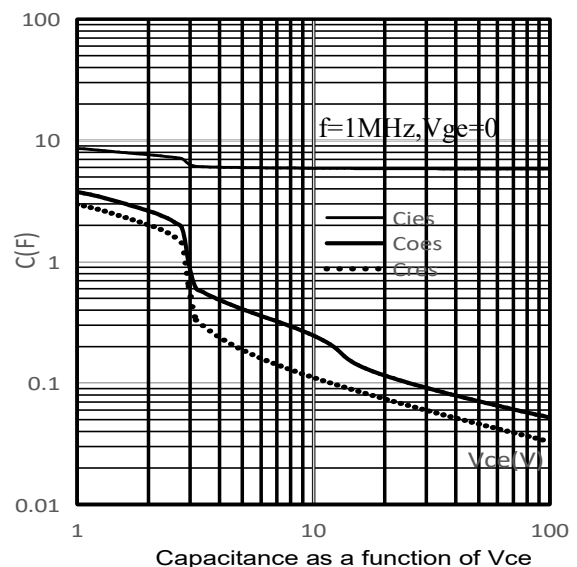
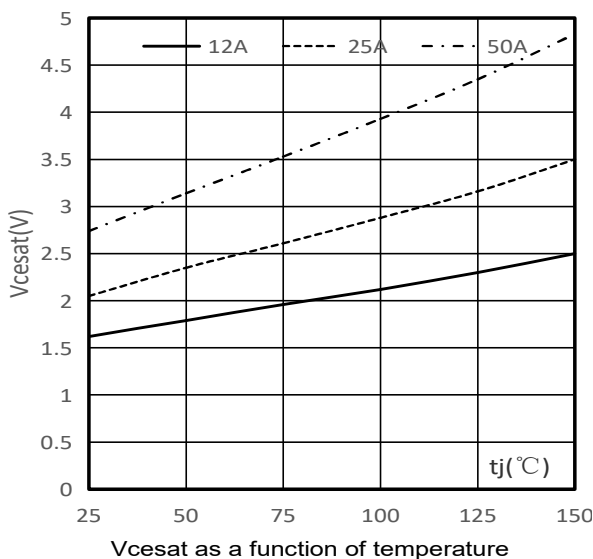
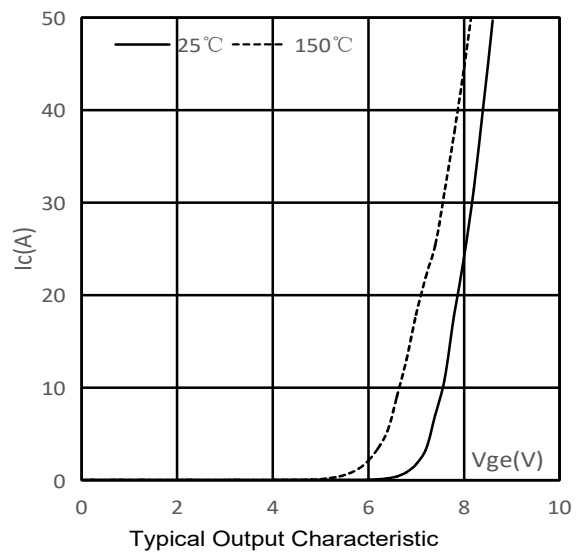
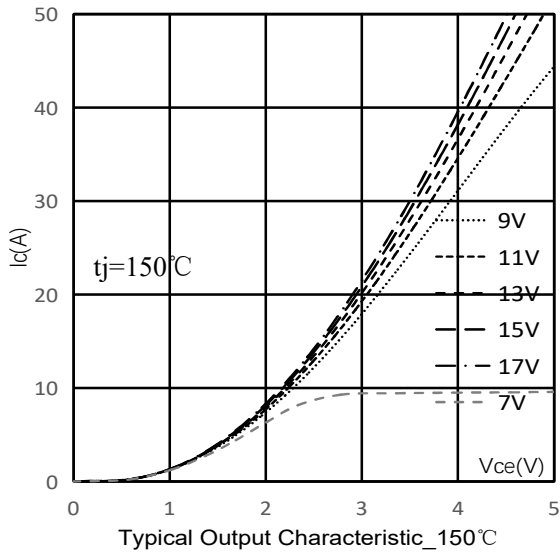
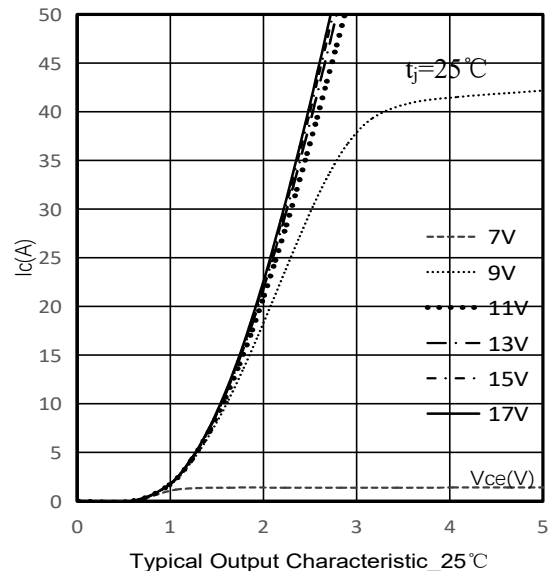
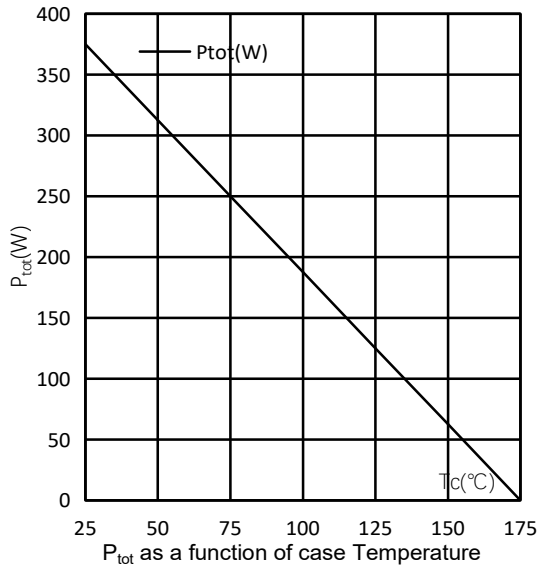
## ■ Electrical Characteristic

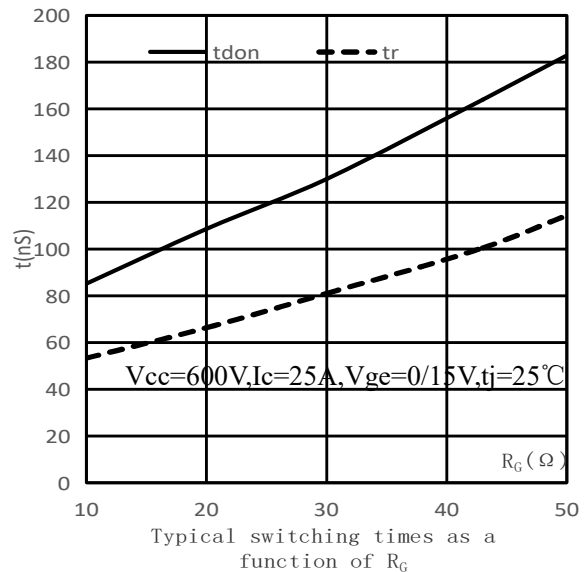
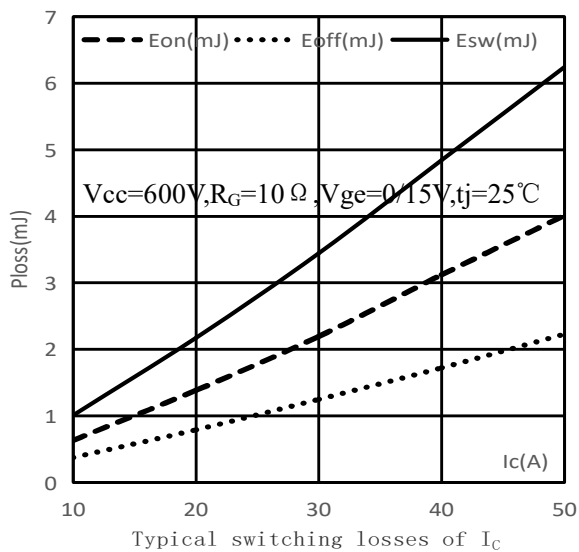
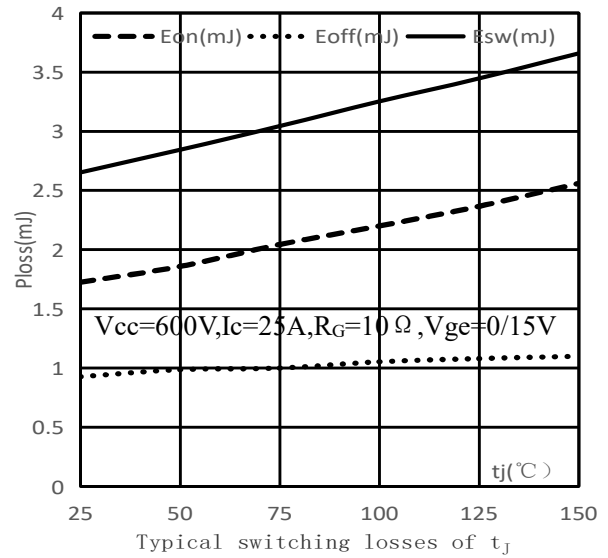
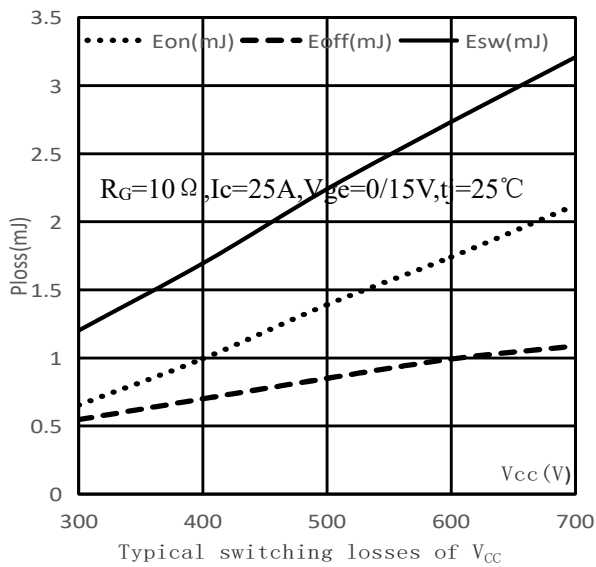
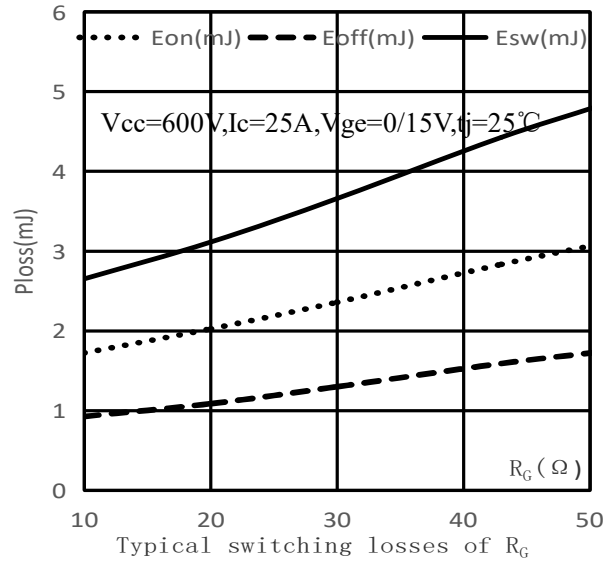
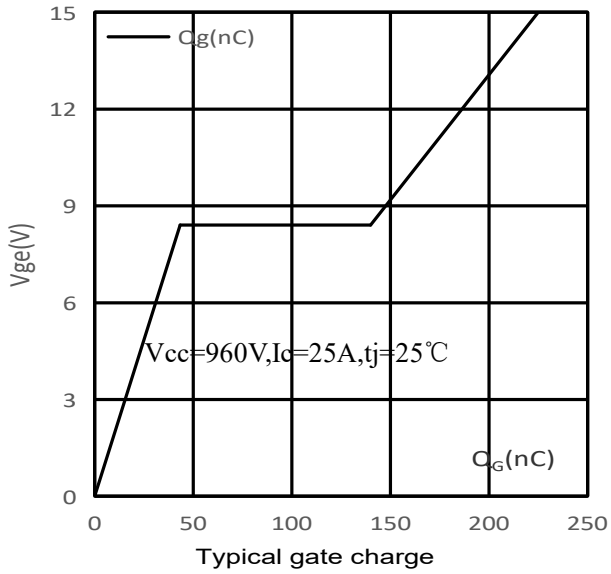
| Symbol        | Parameter                            | Test conditions  | Value  |              |              | Unit     |
|---------------|--------------------------------------|--|--------|--------------|--------------|----------|
|               |                                      |  | Min.   | Typ.         | Max.         |          |
| $V_{(BR)CES}$ | Collector-emitter breakdown voltage  | $V_{GE} = 0\text{V}$ ,<br>$I_C = 0.25\text{mA}$ , $T_{vj} = 25^{\circ}\text{C}$                                  | 1200   | —            | —            | V        |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $V_{GE} = 15\text{V}$ , $I_C = 25\text{A}$ , $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$     | —<br>— | 2.05<br>3.50 | —<br>—       |          |
| $V_{GE(th)}$  | Gate-emitter threshold voltage       | $V_{GE} = V_{CE}$ , $I_C = 1.0\text{mA}$ , $T_{vj} = 25^{\circ}\text{C}$   | 4.90   | 5.40         | 5.90         |          |
| $V_F$         | Diode forward voltage                | $V_{GE} = 0\text{V}$ , $I_F = 15\text{A}$ , $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$      | —<br>— | 1.55<br>1.50 | 1.90<br>—    |          |
| $I_{GES}$     | Zero collector voltage gate current  | $V_{GE} = 20\text{V}$ , $V_{CE} = 0\text{V}$   | —      | —            | 200          | nA       |
| $I_{CES}$     | Zero gate voltage collector current  | $V_{CE} = 1200\text{V}$ , $V_{GE} = 0\text{V}$ , $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | —<br>— | —<br>—       | 0.25<br>1.00 | mA       |
| $R_{Gin}$     | Integrated gate resistor             | —  | —      | 0            | —            | $\Omega$ |
| $C_{ies}$     | Input capacitance                    | $V_{GE} = 0\text{V}$ , $V_{CE} = 30\text{V}$ ,<br>$f = 1\text{MHz}$ , $T_{vj} = 25^{\circ}\text{C}$              | —      | 5990         | —            | pF       |
| $C_{oes}$     | Output capacitance                   |  | —      | 92.7         | —            |          |
| $C_{res}$     | Reverse transfer capacitance         |  | —      | 67.3         | —            |          |
| $Q_g$         | Gate charge                          | $V_{GE} = 0/15\text{V}$ , $V_{cc} = 960\text{V}$ , $I_C = 40\text{A}$ ,<br>$T_{vj} = 25^{\circ}\text{C}$         | —      | 226          | —            | nC       |
| $Q_{ge}$      | Gate-emitter charge                  |  | —      | 45.1         | —            |          |
| $Q_{gc}$      | Gate-collector charge                |  | —      | 95.1         | —            |          |
| $V_{GE(pl)}$  | Gate-emitter plateau voltage         | $V_{GE} = 0/15\text{V}$ , $V_{cc} = 960\text{V}$ , $I_C = 40\text{A}$ ,<br>$T_{vj} = 25^{\circ}\text{C}$         | —      | 8.47         | —            | V        |

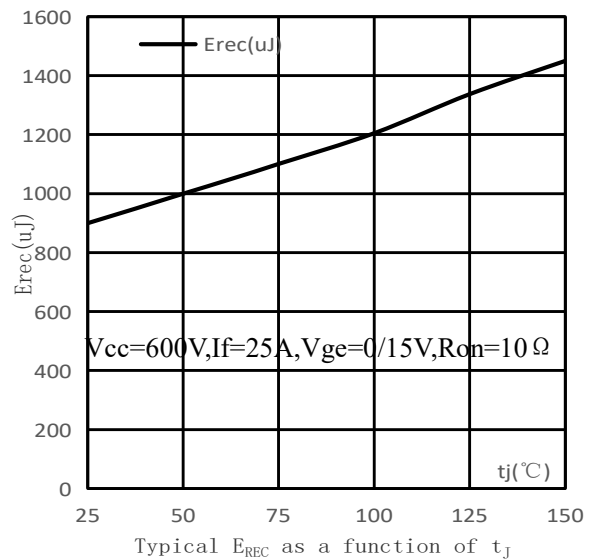
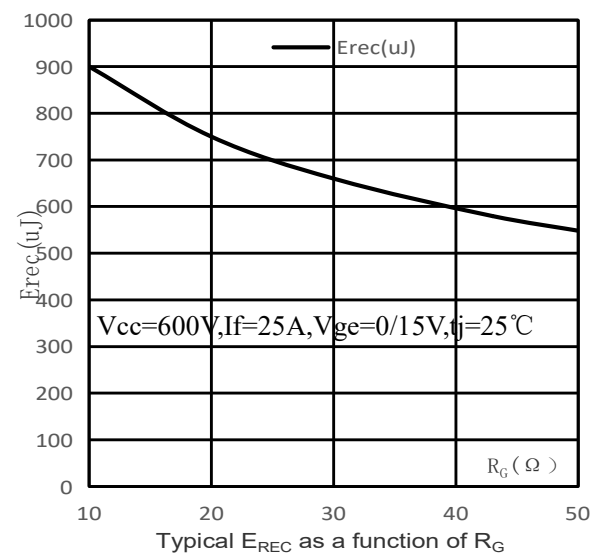
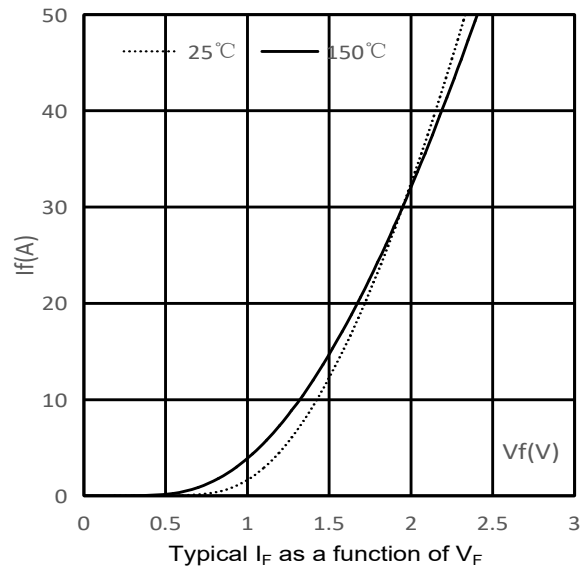
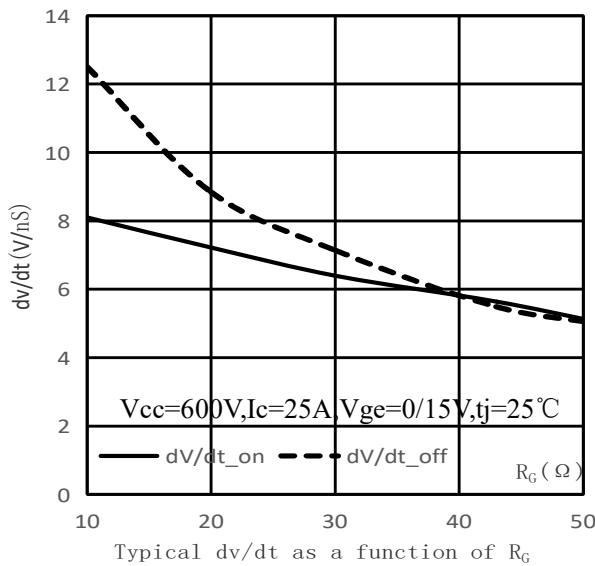
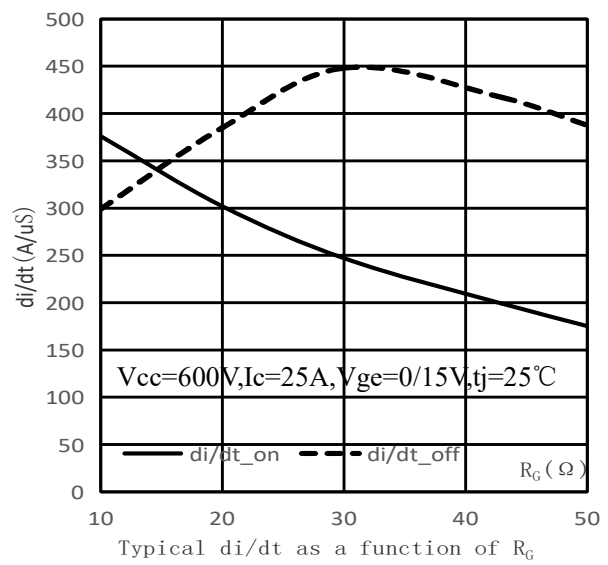
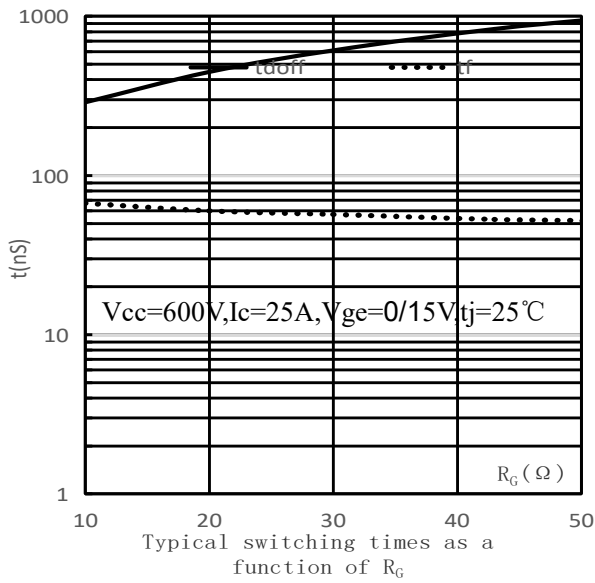
■ **Dynamic Characteristic (With inductive load)**

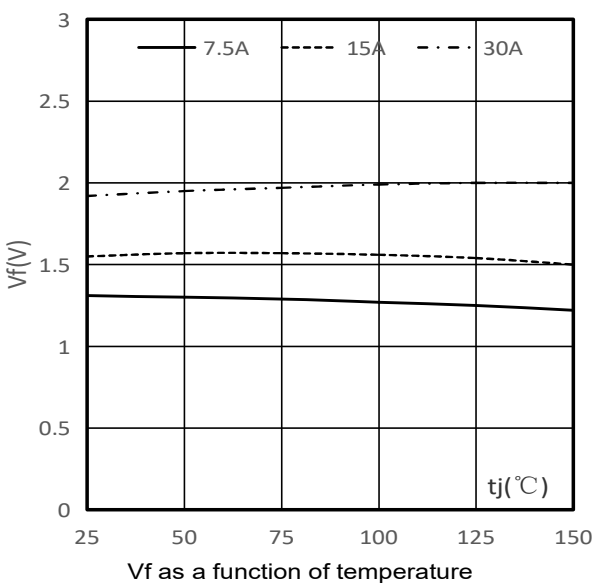
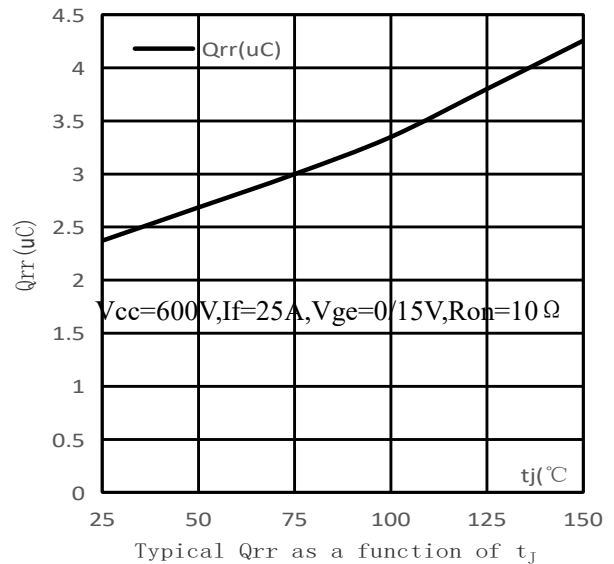
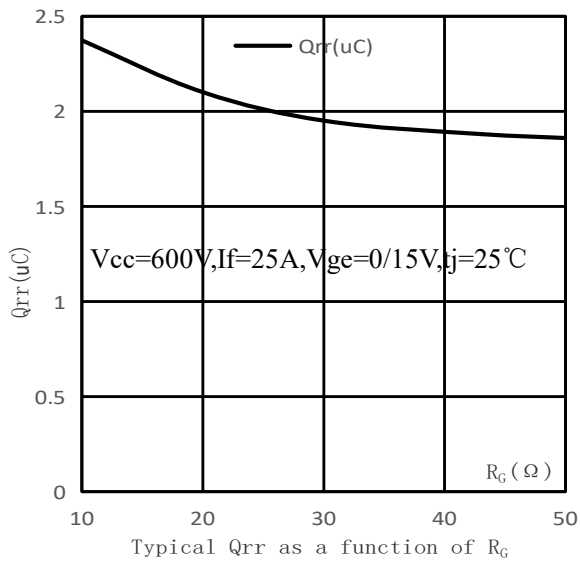
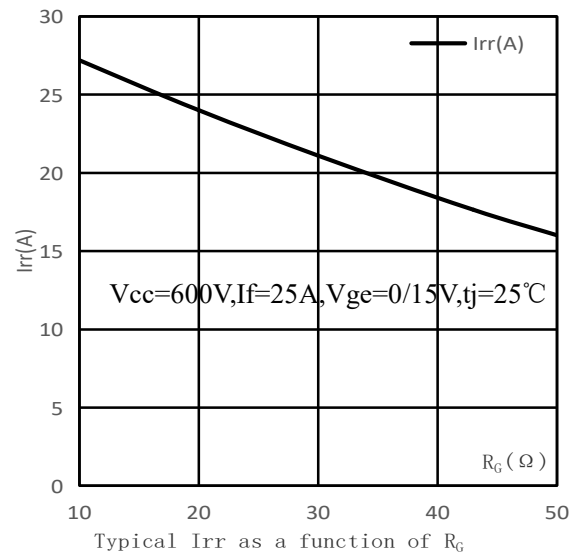
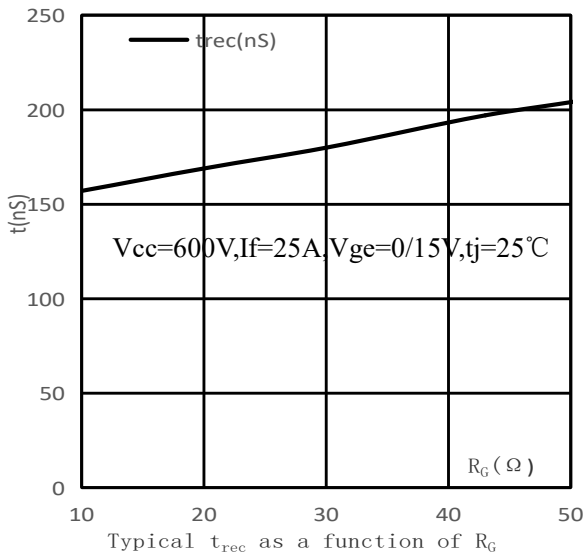
| Symbol                              | Parameter   | Test conditions  | Value |      |      | Unit |
|-------------------------------------|---|--|-------|------|------|------|
|                                     |   |  | Min.  | Typ. | Max. |      |
| <b>IGBT Characteristic_25°C :</b>   |   |  |       |      |      |      |
| $T_{d(on)}$                         | Turn-on delay time  | $V_{CC}=600V, I_C=25A,$<br>$R_{on}=10\ \Omega, R_{off}=10\ \Omega,$<br>$C_{ge}=0nF, V_{GE}=0/15V,$<br>$L_{load}=200uH, T_{vj}=25^\circ C$  | —     | 85.2 | —    | ns   |
| $T_r$                               | Rise time   |  | —     | 53.3 | —    |      |
| $T_{d(off)}$                        | Turn-off delay time   |  | —     | 289  | —    |      |
| $t_f$                               | Fall time   |  | —     | 66.9 | —    |      |
| $E_{on}$                            | Turn-on energy  |  | —     | 1.73 | —    | mJ   |
| $E_{off}$                           | Turn-off energy   |  | —     | 0.93 | —    |      |
| $E_{total}$                         | Total switch energy   |  | —     | 2.66 | —    |      |
| <b>IGBT Characteristic_150°C :</b>  |   |  |       |      |      |      |
| $T_{d(on)}$                         | Turn-on delay time  | $V_{CC}=600V, I_C=25A,$<br>$R_{on}=10\ \Omega, R_{off}=10\ \Omega,$<br>$C_{ge}=0nF, V_{GE}=0/15V,$<br>$L_{load}=200uH, T_{vj}=150^\circ C$ | —     | 76.4 | —    | ns   |
| $T_r$                               | Rise time   |  | —     | 50.8 | —    |      |
| $T_{d(off)}$                        | Turn-off delay time   |  | —     | 319  | —    |      |
| $t_f$                               | Fall time   |  | —     | 60.0 | —    |      |
| $E_{on}$                            | Turn-on energy  |  | —     | 2.56 | —    | mJ   |
| $E_{off}$                           | Turn-off energy   |  | —     | 1.06 | —    |      |
| $E_{total}$                         | Total switch energy   |  | —     | 3.62 | —    |      |
| <b>Diode Characteristic_25°C :</b>  |   |  |       |      |      |      |
| $E_{rec}$                           | Reverse recovery energy   | $I_F = 25A, V_R=600V,$<br>$V_{GE} = 0/15\ V, R_{ON}=10\ \Omega, T_{vj}=25^\circ C$   | —     | 0.90 | —    | mJ   |
| $t_{rr}$                            | Diode reverse recovery time   |  | —     | 157  | —    | nS   |
| $Q_{rr}$                            | Diode reverse recovery charge                                       |  | —     | 2.37 | —    | uC   |
| $I_{rrm}$                           | Diode peak reverse recovery current                                 |  | —     | 27.2 | —    | A    |
| $di_{rr}/dt$                        | Diode peak rate of fall of reverse Recovery current during $t_{rr}$ |  | —     | 372  | —    | A/uS |
| <b>Diode Characteristic_150°C :</b> |   |  |       |      |      |      |
| $E_{rec}$                           | Reverse recovery energy   | $I_F = 25A, V_R=600V, V_{GE} = 0/15$<br>$V, R_{ON}=10\ \Omega, T_{vj}=150^\circ C$   | —     | 1.55 | —    | mJ   |
| $t_{rr}$                            | Diode reverse recovery time   |  | —     | 270  | —    | nS   |
| $Q_{rr}$                            | Diode reverse recovery charge                                       |  | —     | 4.26 | —    | uC   |
| $I_{rrm}$                           | Diode peak reverse recovery current                                 |  | —     | 33.0 | —    | A    |
| $di_{rr}/dt$                        | Diode peak rate of fall of reverse Recovery current during $t_{rr}$ |  | —     | 190  | —    | A/uS |

### ■ Characteristic Curve

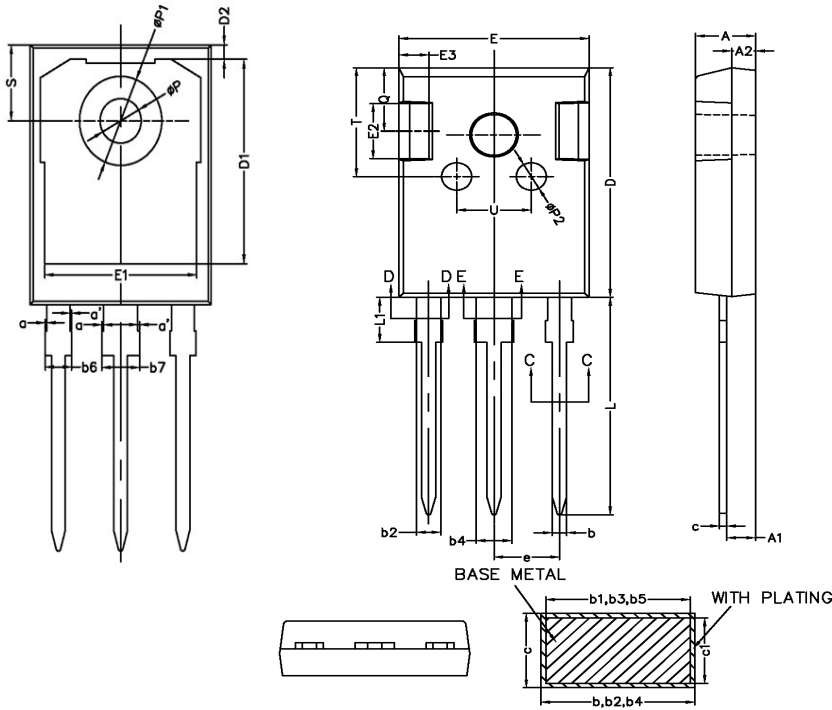








### TO-247 Package Outline Data



Unit:mm

| SYMBOL | MIN   | NOM   | MAX   |
|--------|-------|-------|-------|
| A      | 4.90  | 5.00  | 5.10  |
| A1     | 2.31  | 2.41  | 2.51  |
| A2     | 1.90  | 2.00  | 2.10  |
| a      | 0     | —     | 0.15  |
| a'     | 0     | —     | 0.15  |
| b      | 1.16  | —     | 1.26  |
| b1     | 1.15  | 1.2   | 1.22  |
| b2     | 1.96  | —     | 2.06  |
| b3     | 1.95  | 2.00  | 2.02  |
| b4     | 2.96  | —     | 3.06  |
| b5     | 2.95  | 3.00  | 3.02  |
| b6     | —     | —     | 2.25  |
| b7     | —     | —     | 3.25  |
| c      | 0.59  | —     | 0.66  |
| c1     | 0.58  | 0.60  | 0.62  |
| D      | 20.90 | 21.00 | 21.10 |
| D1     | 16.25 | 16.55 | 16.85 |
| D2     | 1.05  | 1.20  | 1.35  |
| E      | 15.70 | 15.80 | 15.90 |
| E1     | 13.10 | 13.30 | 13.50 |
| E2     | 4.90  | 5.00  | 5.10  |
| E3     | 2.40  | 2.50  | 2.60  |
| e      | 5.34  | 5.44  | 5.54  |
| L      | 19.80 | 19.92 | 20.10 |
| L1     | —     | —     | 4.30  |
| P      | 3.50  | 3.60  | 3.70  |
| P1     | —     | —     | 7.40  |
| P2     | 2.40  | 2.50  | 2.60  |
| Q      | 5.60  | —     | 6.00  |
| S      | 6.05  | 6.15  | 6.25  |
| T      | 9.80  | —     | 10.20 |
| U      | 6.00  | —     | 6.40  |