

## Intelligent Power Module ( R-Series )

### Maximum Ratings and Characteristics

#### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ )

| Items                                      | Symbols         | Ratings   |          | Units            |
|--|-----------------|-----------|----------|------------------|
|  |                 | Min.      | Max.     |                  |
| DC Bus Voltage                             | $V_{DC}$        | 0         | 450      | V                |
| DC Bus Voltage (surge)                     | $V_{DC(Surge)}$ | 0         | 500      |                  |
| DC Bus Voltage (short operating)           | $V_{SC}$        | 200       | 400      |                  |
| Collector-Emitter Voltage                  | $V_{CES}$       | 0         | 600      |                  |
| Inverter Collector Current                 | Continuous      | $I_C$     | 50       | A                |
|  | 1ms             | $I_{CP}$  | 100      |                  |
|  | Duty=62.6%      | $-I_C$    | 50       |                  |
| Collector Power Dissipation One Transistor | $P_C$           |           | 198      | W                |
| Dynamic Brake Collector Current            | Continuous      | $I_C$     | 30       | A                |
| 1ms  | $I_{CP}$        | 60        |          |                  |
| Forward Current of Diode                   | $I_F$           |           | 30       |                  |
| Collector Power Dissi. DB One Transistor   | $P_C$           |           | 120      | W                |
| Voltage of Power Supply for Driver         | $V_{CC} *1$     | 0         | 20       | V                |
| Input Signal Voltage                       | $V_{IN} *2$     | 0         | $V_Z$    | V                |
| Input Signal Current                       | $I_{IN}$        |           | 1        | mA               |
| Alarm Signal Voltage                       | $V_{ALM} *3$    | 0         | $V_{CC}$ | V                |
| Alarm Signal Current                       | $I_{ALM} *4$    |           | 15       | mA               |
| Junction Temperature                       | $T_J$           |           | 150      | $^\circ\text{C}$ |
| Operating Temperature                      | $T_{OP}$        | -20       | 100      |                  |
| Storage Temperature                        | $T_{stg}$       | -40       | 125      |                  |
| Isolation Voltage                          | A.C. 1min.      | $V_{iso}$ | 2500     | V                |
| Screw Torque                               | Mounting *1     |           | 3.5      | Nm               |
|  | Terminals *1    |           | 3.5      |                  |

Note: \*1: Recommendable Value; 2.5 - 3.0 Nm (M5)

### Outline Drawing

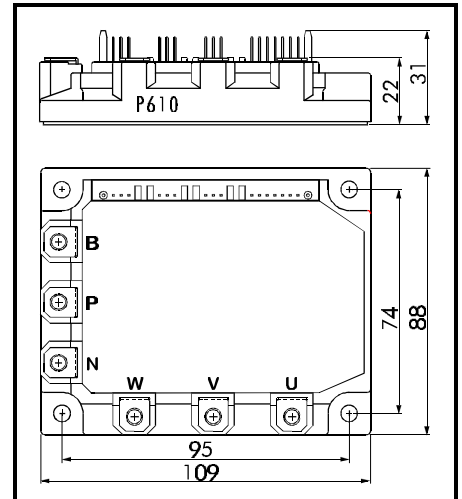


Fig. 1

#### Electrical Characteristics of Power Circuit ( at $T_f=25^\circ\text{C}$ , $V_{CC}=15\text{V}$ )

| Items | Symbols                               | Conditions    | Min.                                       | Typ. | Max. | Units |
|-------|---------------------------------------|---------------|--|------|------|-------|
| INV   | Collector Current At Off Signal Input | $I_{CES}$     | $V_{CE}=600\text{V}$ , Input Terminal Open |      | 1.0  | mA    |
|       | Collector-Emitter Saturation Voltage  | $V_{CE(Sat)}$ | $I_C=50\text{A}$                           |      | 2.8  | V     |
|       | Forward Voltage of FWD                | $V_F$         | $-I_C=50\text{A}$                          |      | 3.0  | V     |
| DB    | Collector Current At Off Signal Input | $I_{CES}$     | $V_{CE}=600\text{V}$ , Input Terminal Open |      | 1.0  | mA    |
|       | Collector-Emitter Saturation Voltage  | $V_{CE(Sat)}$ | $I_C=30\text{A}$                           |      | 2.8  | V     |
|       | Forward Voltage of FWD                | $V_F$         | $-I_C=30\text{A}$                          |      | 3.3  | V     |

#### Electrical Characteristics of Control Circuit ( at $T_f=25^\circ\text{C}$ , $V_{CC}=15\text{V}$ )

| Items                                       | Symbols      | Conditions  | Min. | Typ. | Max. | Units            |
|---|--------------|---|------|------|------|------------------|
| Current of P-Line Side Driver (One Unit)    | $I_{CCP}$    | $f_{SW}=0\sim 15\text{kHz}$ , $T_C=-20\sim 100^\circ\text{C}$ | 3    |      | 18   | mA               |
| Current of N-Line Side Driver (Three Units) | $I_{CCN}$    | $f_{SW}=0\sim 15\text{kHz}$ , $T_C=-20\sim 100^\circ\text{C}$ | 10   |      | 65   |                  |
| Input Signal Threshold Voltage              | $V_{IN(th)}$ | On  | 1.00 | 1.35 | 1.70 | V                |
|   |              | Off   | 1.25 | 1.60 | 1.95 |                  |
| Input Zener Voltage                         | $V_Z$        | $R_{IN}=20\text{k}\Omega$                                     |      | 8.0  |      |                  |
| Over Heating Protection Temperature Level   | $T_{COH}$    | $V_{DC}=0\text{V}$ , $I_C=0\text{A}$ , Case Temp.             | 110  |      | 125  | $^\circ\text{C}$ |
| Hysteresis                                  | $T_{CH}$     |   |      | 20   |      |                  |
| IGBT Chips Over Heating Protec. Temp. Level | $T_{JOH}$    | Surface Of IGBT Chip  | 150  |      |      |                  |
| Hysteresis                                  | $T_{JH}$     |   |      | 20   |      |                  |
| Inverter Collector Current Protection Level | $I_{OC}$     | $T_f=125^\circ\text{C}$                                       | 75   |      |      | A                |
| DB Collector Current Protection Level       | $I_{OC}$     | $T_f=125^\circ\text{C}$                                       | 45   |      |      |                  |
| Over Current Detecting Time                 | $t_{DOC}$    | $T_f=25^\circ\text{C}$  |      | 10   |      | $\mu\text{s}$    |
| Alarm Signal Hold Time                      | $t_{ALM}$    |   | 1.5  | 2    |      | ms               |
| Limiting Resistor for Alarm                 | $R_{ALM}$    |   | 1425 | 1500 | 1575 | $\Omega$         |
| Under Voltage Protection Level              | $V_{UV}$     |   | 11.0 |      | 12.5 | V                |
| Hysteresis                                  | $V_H$        |   | 0.2  |      |      |                  |

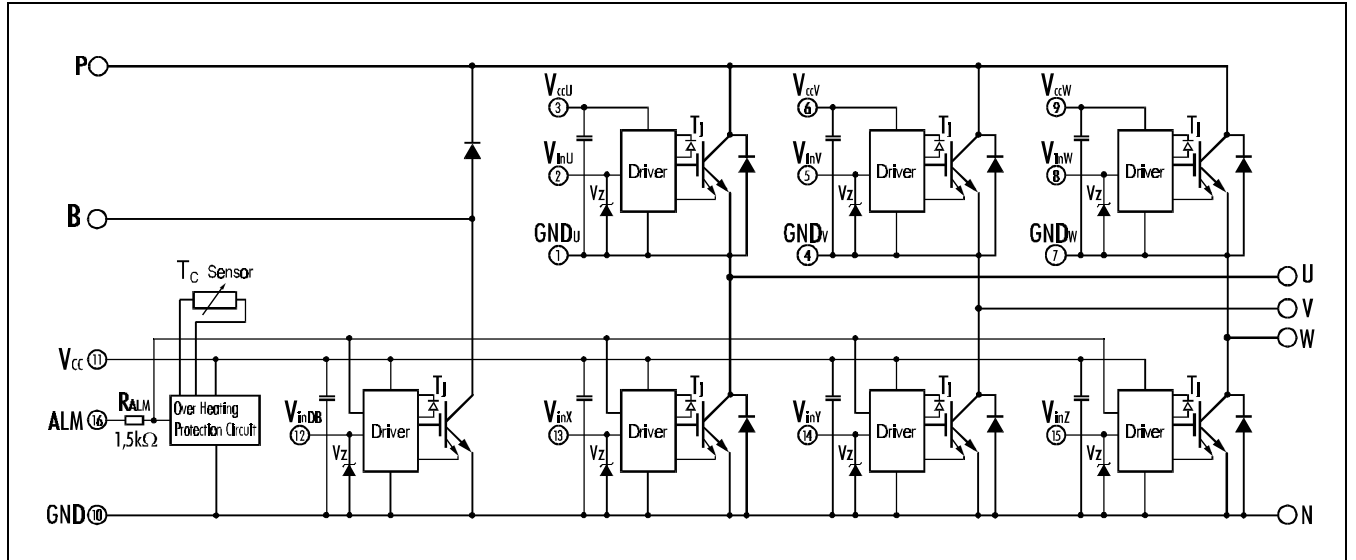
#### Dynamic Characteristics ( at $T_C=T_f=125^\circ\text{C}$ , $V_{CC}=15\text{V}$ )

| Items          | Symbols   | Conditions                              | Min. | Typ. | Max. | Units         |
|----------------|-----------|---|------|------|------|---------------|
| Switching Time | $t_{ON}$  | $I_C=50\text{A}$ , $V_{DC}=300\text{V}$ | 0.3  |      |      | $\mu\text{s}$ |
|                | $t_{OFF}$ |   |      |      | 3.6  |               |
|                | $t_{RR}$  | $I_F=50\text{A}$ , $V_{DC}=300\text{V}$ |      |      | 0.4  |               |

• Thermal Characteristics

| Items              | Symbols       | Conditions            | Min. | Typ. | Max. | Units |
|--------------------|---------------|-----------------------|------|------|------|-------|
| Thermal Resistance | $R_{th(i-c)}$ | Inverter IGBT         |      |      | 0.63 | °C/W  |
|                    | $R_{th(i-c)}$ | Diode                 |      |      | 1.33 |       |
|                    | $R_{th(i-c)}$ | DB IGBT               |      |      | 1.04 |       |
|                    | $R_{th(c-f)}$ | With Thermal Compound |      | 0.05 |      |       |

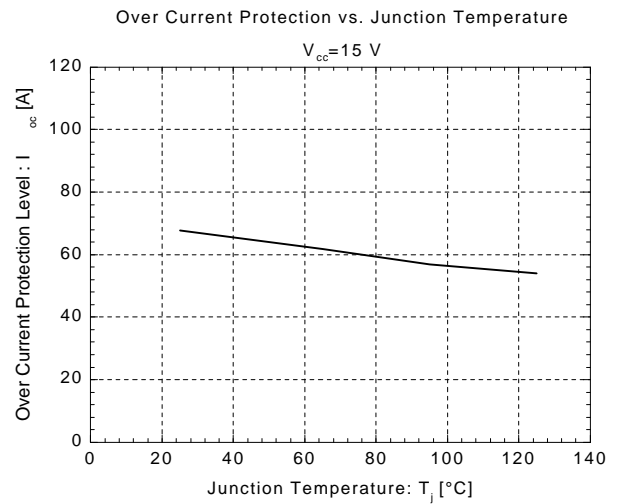
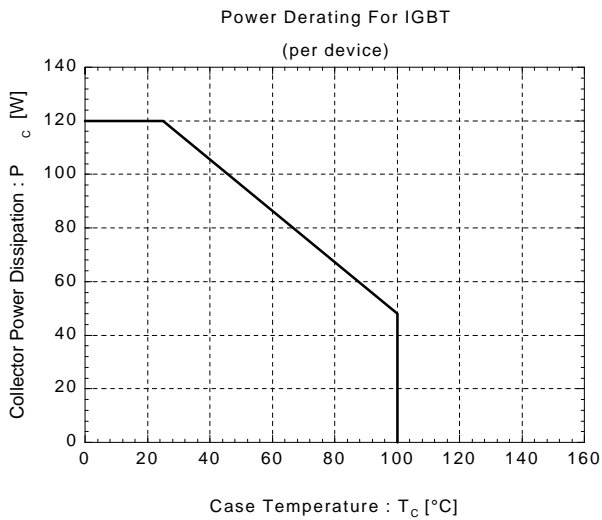
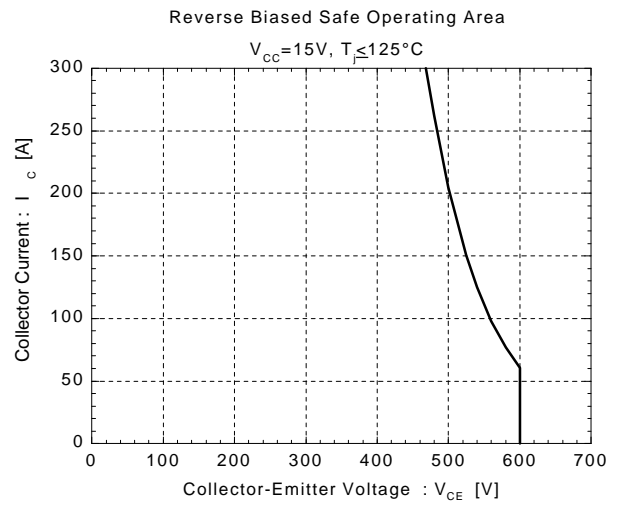
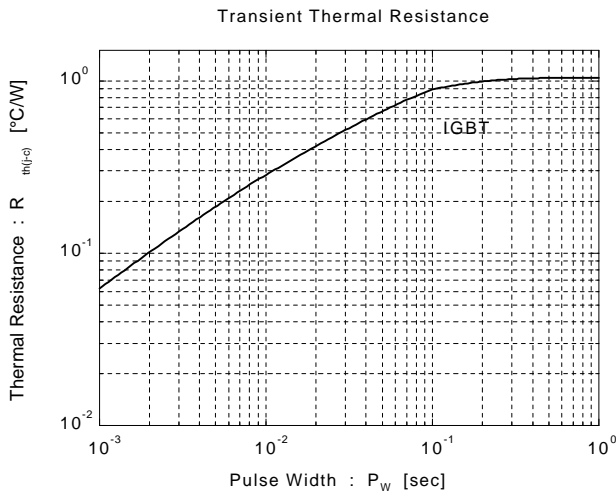
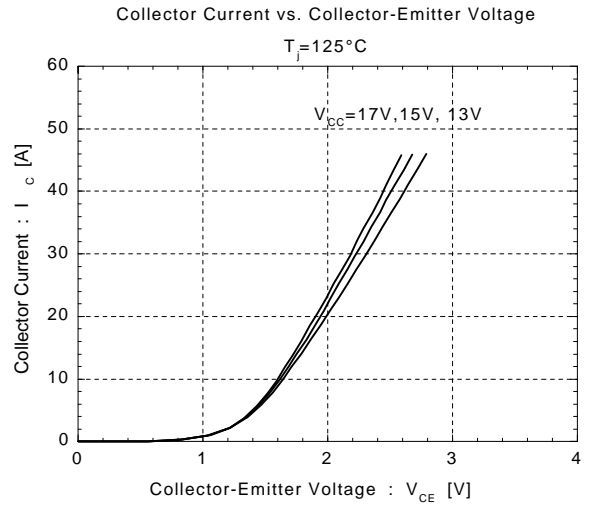
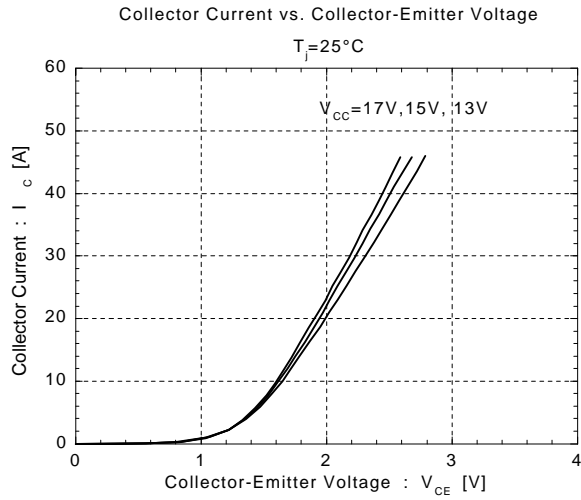
■ Equivalent Circuit



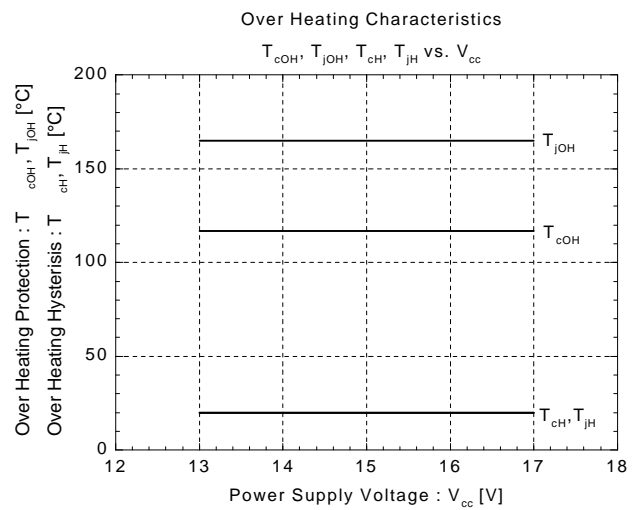
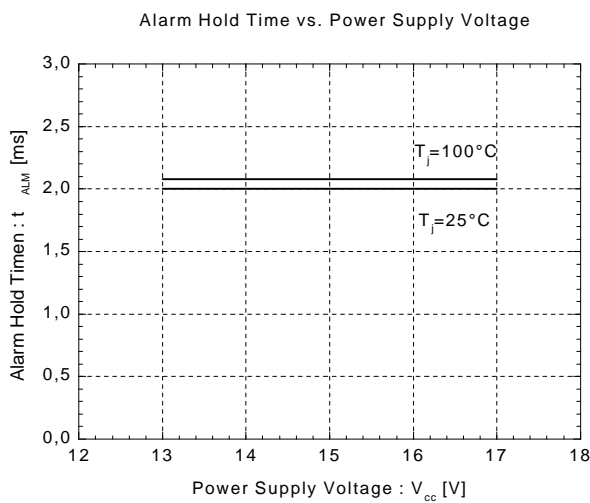
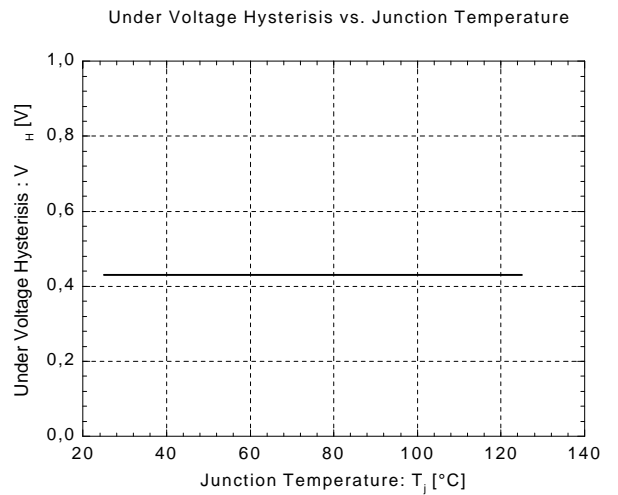
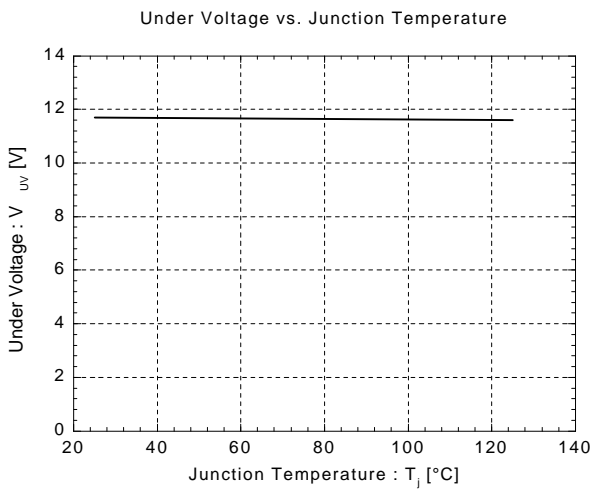
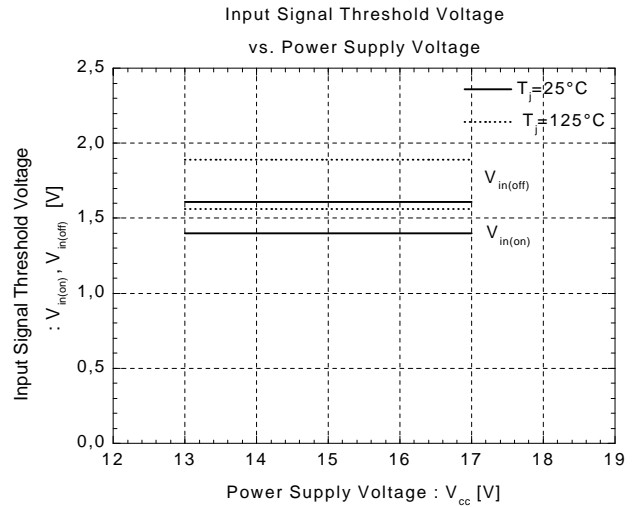
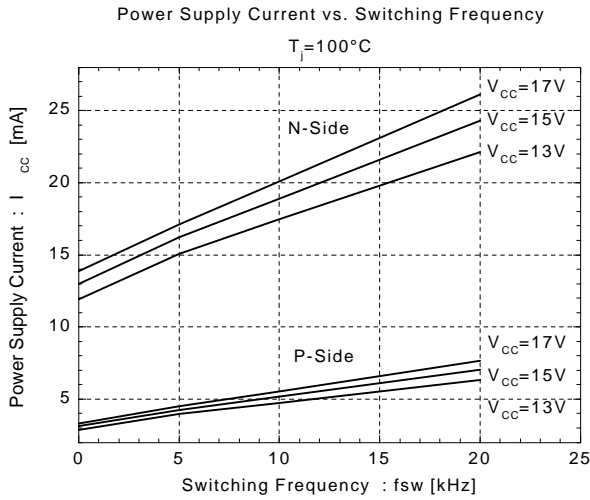
Drivers include following functions

- Short circuit protection circuit
- Amplifier for driver
- Undervoltage protection circuit
- Overcurrent protection circuit
- IGBT Chip overheating protection

## Dynamic Brake

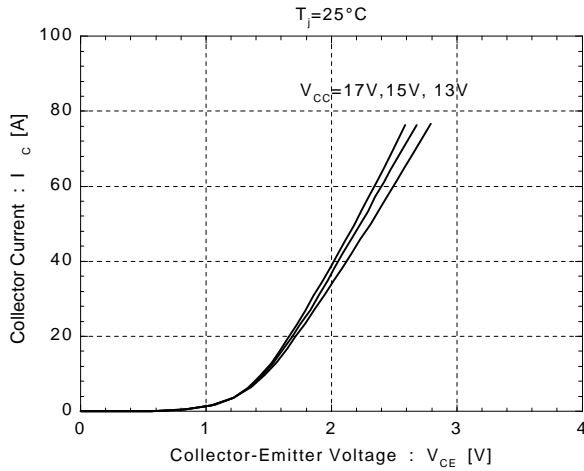


## Control Circuit

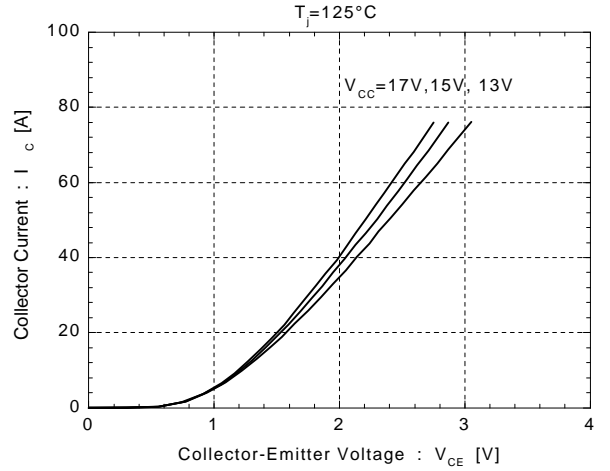


## ■ Inverter

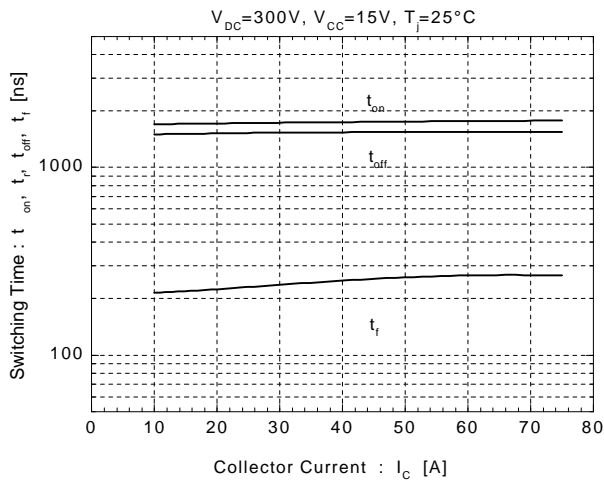
Collector Current vs. Collector-Emitter Voltage



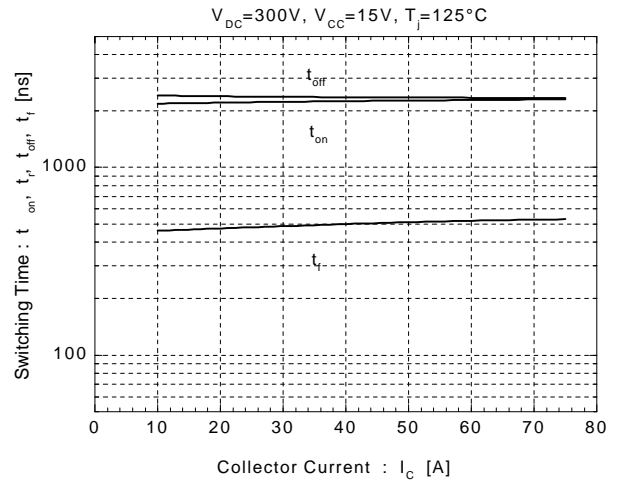
Collector Current vs. Collector-Emitter Voltage



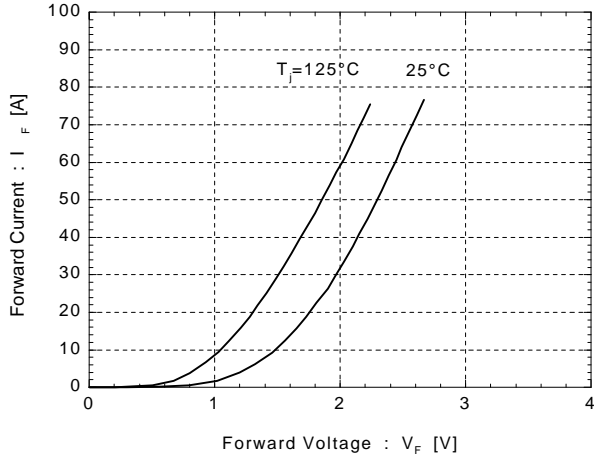
Switching Time vs. Collector Current



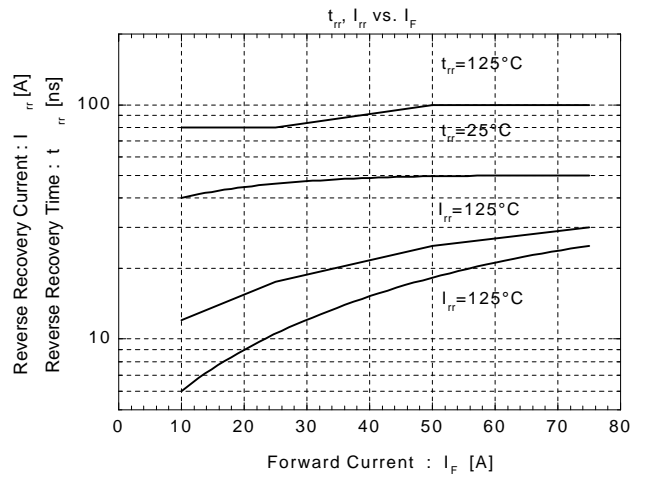
Switching Time vs. Collector Current

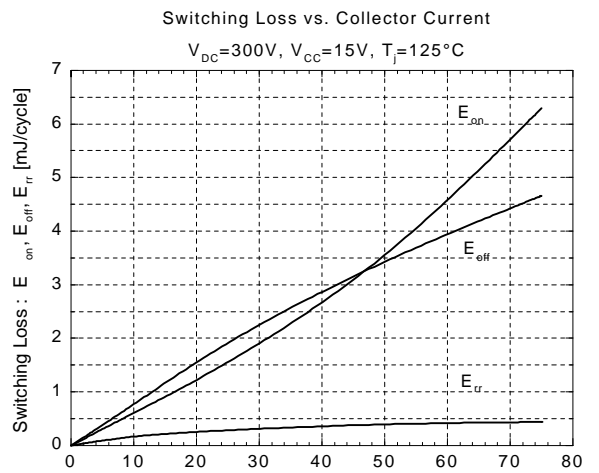
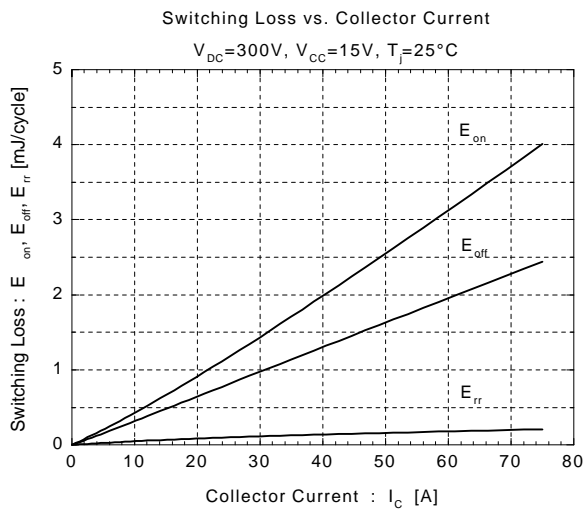
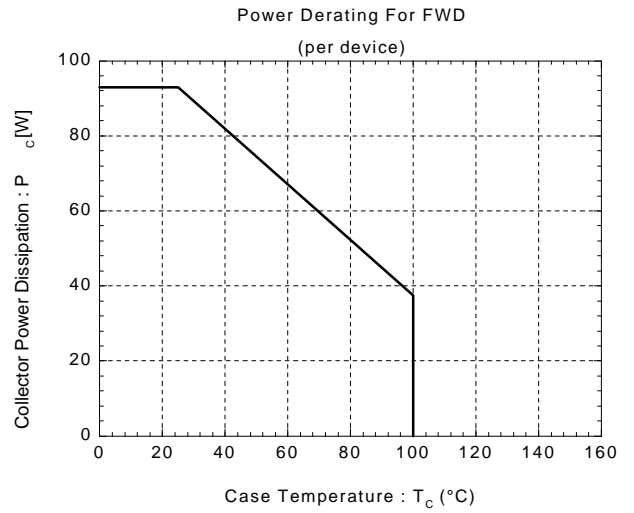
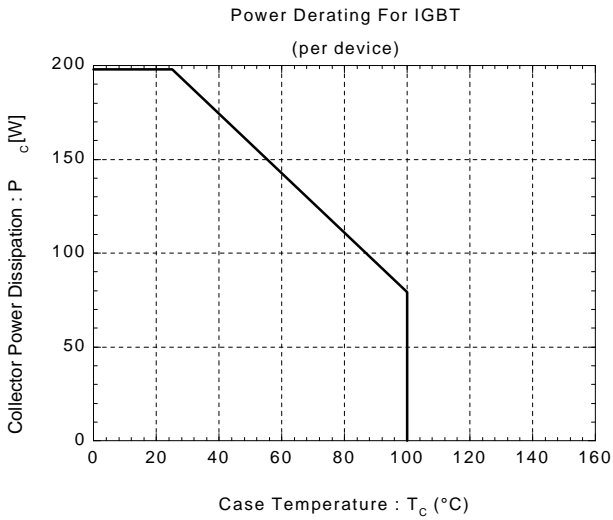
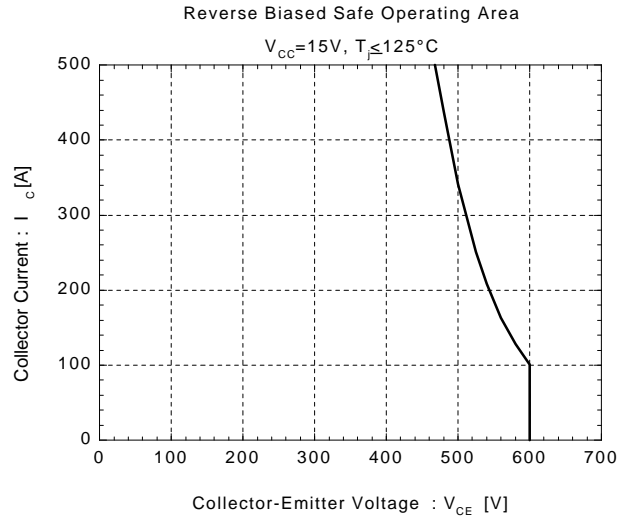
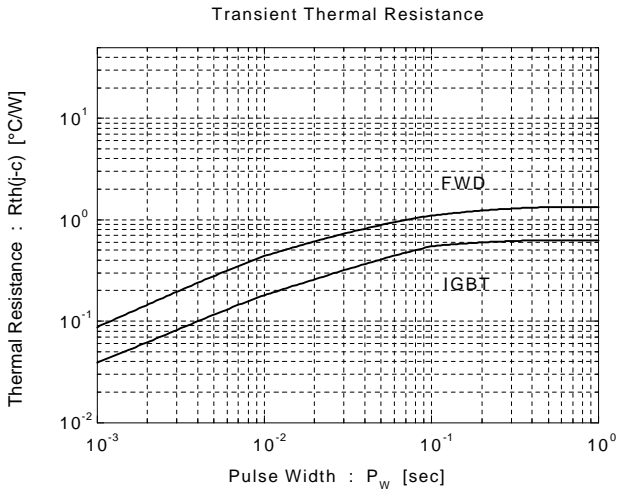


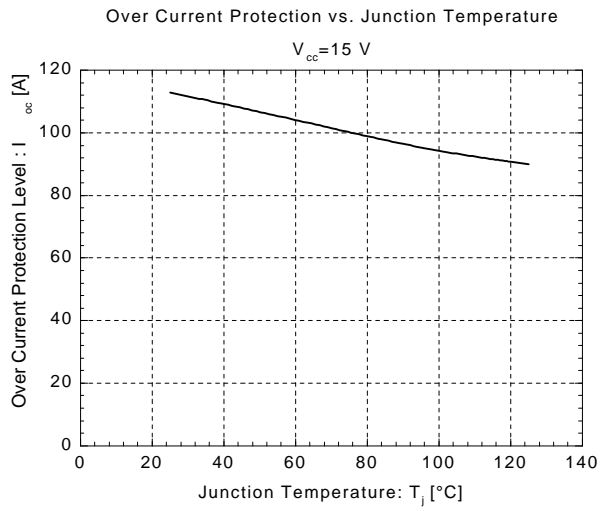
Forward Voltage vs. Forward Current



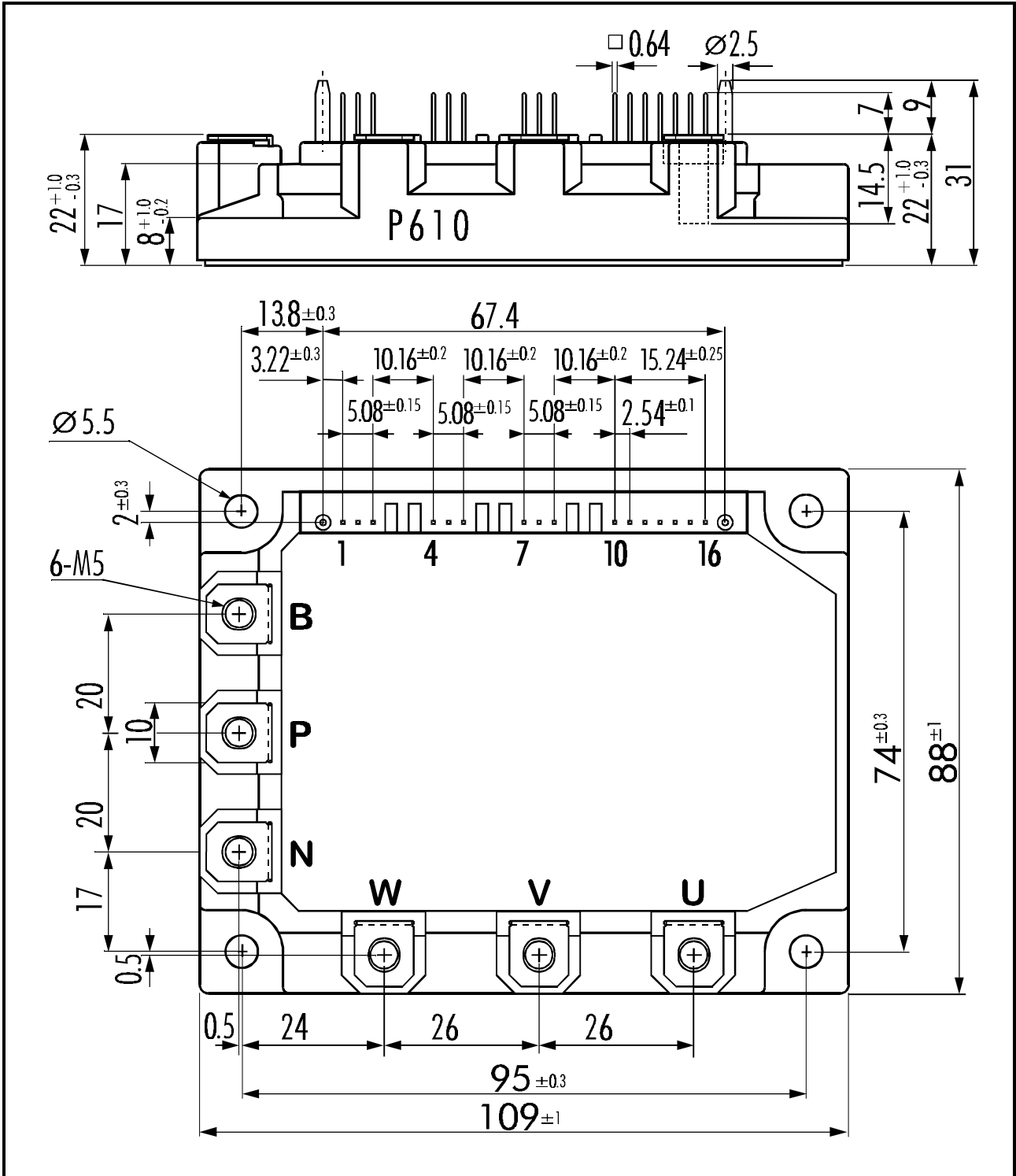
Reverse Recovery Characteristics







■ Outline Drawing



**Weight: 440g**



For more information, contact:

**Collmer Semiconductor, Inc.**

P.O. Box 702708

Dallas, TX 75370

972-233-1589

972-233-0481 Fax

<http://www.collmer.com>