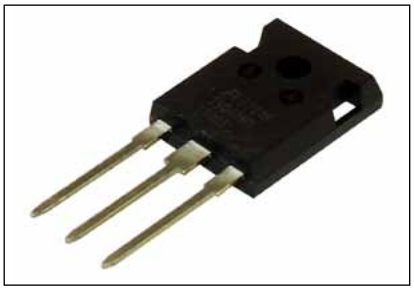
# FGW15N120VD

Discrete IGBT

## Discrete IGBT (High-Speed V series)
## 1200V / 15A

### Features
Low power loss
Low switching surge and noise
High reliability, high ruggedness (RBSOA, SCSOA etc.)

### Applications
Inverter for Motor drive
AC and DC Servo drive amplifier
Uninterruptible power supply



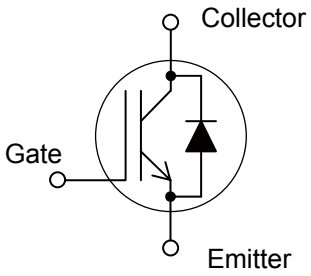
### Maximum Ratings and Characteristics

● **Absolute Maximum Ratings (at $T_c$=25°C unless otherwise specified)**

| Items | Symbols | Characteristics | Units | Remarks |
|---|---|---|---|---|
| Collector-Emitter voltage | $V_{CES}$ | 1200 | V | |
| Gate-Emitter voltage | $V_{GES}$ | ±20 | V | |
| DC Collector Current | $I_{C@25}$ | 28 | A | $T_C$=25°C, $T_j$=150°C |
| | $I_{C@100}$ | 15 | A | $T_C$=100°C, $T_j$=150°C |
| Pulsed Collector Current | $I_{CP}$ | 30 | A | Note *1 |
| Turn-Off Safe Operating Area | - | 30 | A | $V_{CE}$≤1200V, $T_j$≤175°C |
| Diode Forward Current | $I_{F@25}$ | 26 | A | |
| | $I_{F@100}$ | 15 | A | |
| Diode Pulsed Current | $I_{FP}$ | 30 | A | Note *1 |
| Short Circuit Withstand Time | $t_{SC}$ | 10 | μs | $V_{CC}$≤640V, $V_{GE}$=15V<br>$T_j$≤150°C |
| IGBT Max. Power Dissipation | $P_{D\_IGBT}$ | 155 | W | $T_C$=25°C |
| FWD Max. Power Dissipation | $P_{D\_FWD}$ | 95 | | $T_C$=25°C |
| Operating Junction Temperature | $T_j$ | -40~+175 | °C | |
| Storage Temperature | $T_{stg}$ | -55~+175 | °C | |

Note *1 : Pulse width limited by Tjmax.

### Equivalent circuit




● **Electrical characteristics (at $T_j$= 25°C unless otherwise specified)**

| Items | Symbols | Conditions | | Characteristics min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| Collector-Emitter Breakdown Voltage | $V_{(BR)CES}$ | $I_C$ = 50μA, $V_{GE}$ = 0V | | 1200 | - | - | V |
| Zero Gate Voltage Collector Current | $I_{CES}$ | $V_{CE}$ = 1200V, $V_{GE}$ = 0V | $T_j$=25°C | - | - | 250 | μA |
| | | | $T_j$=175°C | - | - | 2 | mA |
| Gate-Emitter Leakage Current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | - | - | 200 | nA |
| Gate-Emitter Threshold Voltage | $V_{GE\ (th)}$ | $V_{CE}$ = +20V, $I_C$ = 15mA | | 6.0 | 6.5 | 7.0 | V |
| Collector-Emitter Saturation Voltage | $V_{CE\ (sat)}$ | $V_{GE}$ = +15V, $I_C$ = 15A | $T_j$=25°C | - | 1.85 | 2.4 | V |
| | | | $T_j$=175°C | - | 2.4 | - | |
| Input Capacitance | $C_{ies}$ | $V_{CE}$=25V | | - | 1015 | - | pF |
| Output Capacitance | $C_{oes}$ | $V_{GE}$=0V | | - | 58 | - | |
| Reverse Transfer Capacitance | $C_{res}$ | f=1MHz | | - | 47 | - | |
| Gate Charge | $Q_G$ | $V_{CC}$ = 600V<br>$I_C$ = 15A<br>$V_{GE}$ = 15V | | - | 150 | - | nC |
| Turn-On Delay Time | $t_{d(on)}$ | $T_j$ = 25°C | | - | 27 | - | ns |
| Rise Time | $t_r$ | $V_{CC}$ = 600V | | - | 20 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | $I_C$ = 15A | | - | 180 | - | |
| Fall Time | $t_f$ | $V_{GE}$ = 15V | | - | 45 | - | |
| Turn-On Energy | $E_{on}$ | $R_G$ = 10Ω | | - | 1.1 | - | mJ |
| Turn-Off Energy | $E_{off}$ | L = 500μH<br>Energy loss include “tail” and FWD reverse recovery. | | - | 0.8 | - | |
| Turn-On Delay Time | $t_{d(on)}$ | $T_j$ = 175°C | | - | 28 | - | ns |
| Rise Time | $t_r$ | $V_{CC}$ = 600V | | - | 22 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | $I_C$ = 15A | | - | 245 | - | |
| Fall Time | $t_f$ | $V_{GE}$ = 15V | | - | 75 | - | |
| Turn-On Energy | $E_{on}$ | $R_G$ = 10Ω | | - | 1.7 | - | mJ |
| Turn-Off Energy | $E_{off}$ | L = 500μH<br>Energy loss include “tail” and FWD reverse recovery. | | - | 1.4 | - | |
| Forward Voltage Drop | $V_F$ | $I_F$=15A | $T_j$=25°C | - | 1.7 | 2.21 | V |
| | | | $T_j$=175°C | - | 1.8 | - | V |
| Diode Reverse Recovery Time | $t_{rr1}$ | $V_{CC}$=30V<br>$I_F$ = 1.5A<br>-di/dt=200A/μs | | - | 56 | 73 | ns |
| Diode Reverse Recovery Time | $t_{rr2}$ | $V_{CC}$=600V<br>$I_F$=15A | | - | 0.26 | - | μs |
| Diode Reverse Recovery Charge | $Q_{rr}$ | -$di_F$/dt=200A/μs<br>$T_j$=25°C | | - | 0.85 | - | μC |

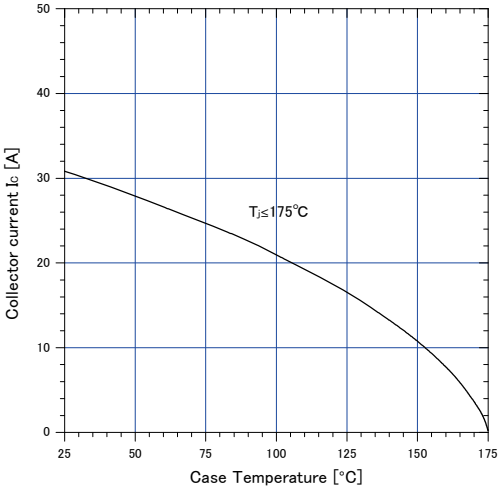
| Items | Symbols | Conditions | Characteristics | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Diode Reverse Recovery Time** | $t_{rr2}$ | $V_{CC}$=600V<br>$I_F$=15A | - | 0.65 | - | µs |
| **Diode Reverse Recovery Charge** | $Q_{rr}$ | -$di_F/dt$=200A/µs<br>$T_j$=175°C | - | 2.2 | - | µC |

● **Thermal resistance**

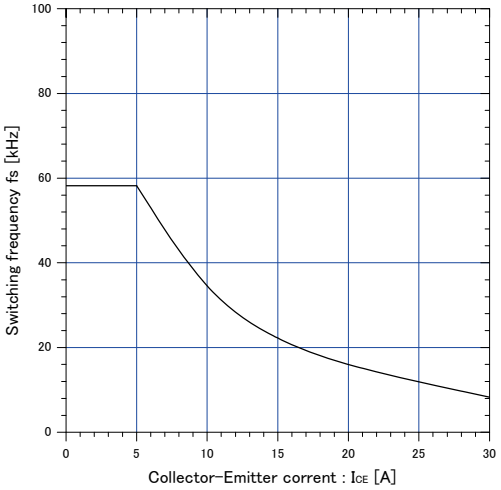
| Items | Symbols | Characteristics | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Thermal Resistance, Junction-Ambient** | $R_{th(j-a)}$ | - | - | 50 | °C/W |
| **Thermal Resistance, IGBT Junction to Case** | $R_{th(j-c)\_IGBT}$ | - | - | 0.962 | |
| **Thermal Resistance, FWD Junction to Case** | $R_{th(j-c)\_FWD}$ | - | - | 1.563 | |

## ■ Characteristics (Representative)

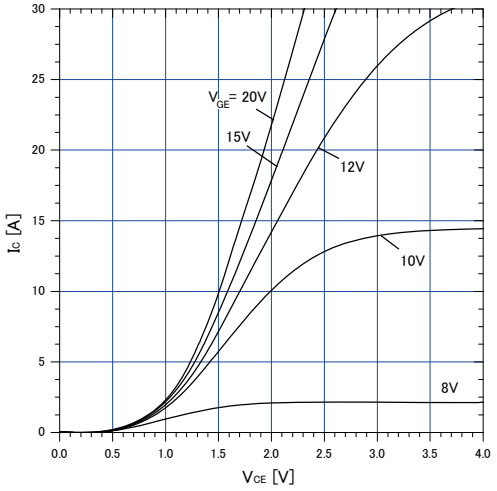
Graph.1
DC Collector Current vs $T_C$
$V_{GE}$≥+15V, $T_j$≤175°C



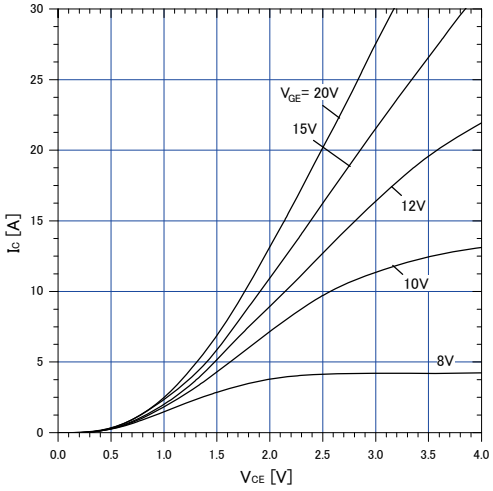

Graph.2
Collector Current vs. switching frequency
$V_{GE}$=+15V, $T_C$≤175°C, $V_{CC}$=600V, D=0.5,
$R_G$=10Ω, $T_C$=100°C



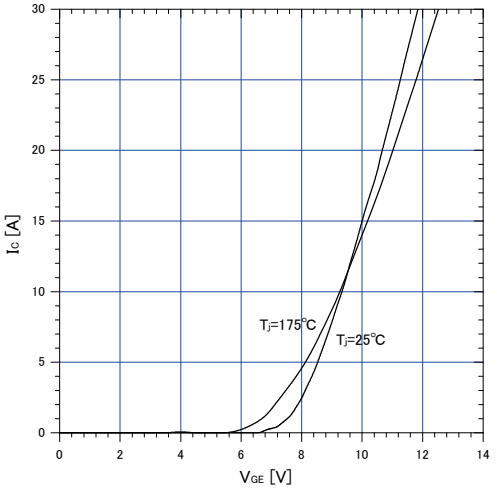

Graph.3
Typical Output Characteristics ($V_{CE}$-$I_C$)
$T_j$=25°C



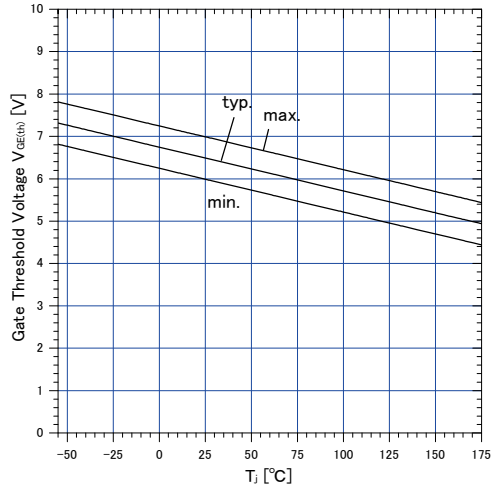

Graph.4
Typical Output Characteristics ($V_{CE}$-$I_C$)
$T_j$=175°C



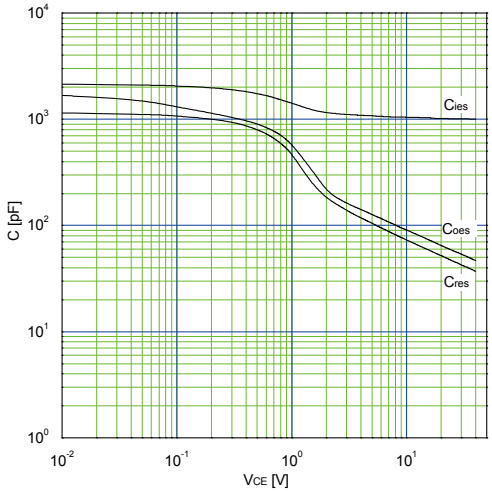

Graph.5
Typical Transfer Characteristics
$V_{GE}$=+15V



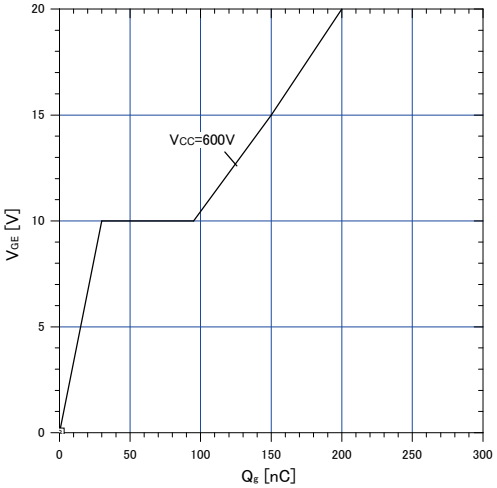

Graph.6
Gate Threshold Voltage vs. $T_j$
$I_C$=15mA, $V_{CE}$=20V



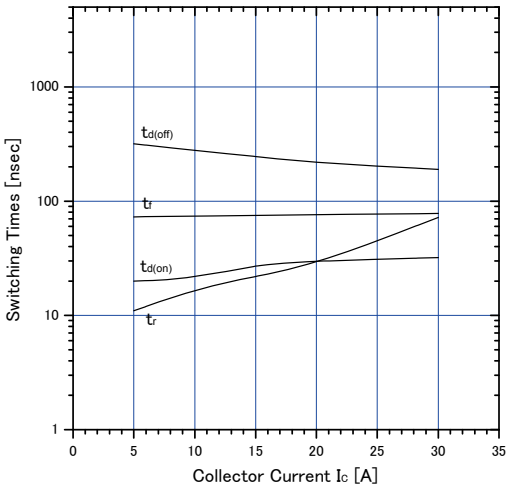
Graph.7
Typical Capacitance
$V_{GE}$=0V, f=1MHz, $T_j$=25°C



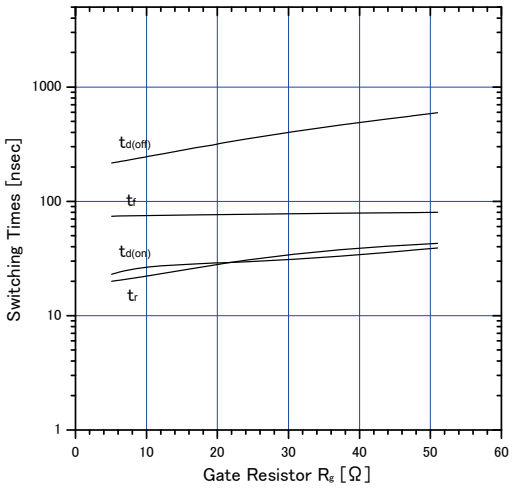

Graph.8
Typical Gate Charge
$V_{CC}$=600V, $I_C$=15A, $T_j$=25°C



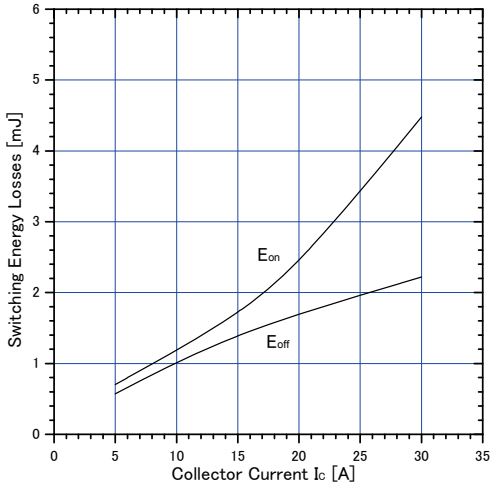

Graph.9
Typical switching time vs. $I_C$
$T_j$=175°C, $V_{CC}$=600V, L=500µH
$V_{GE}$=15V,$R_G$=10Ω



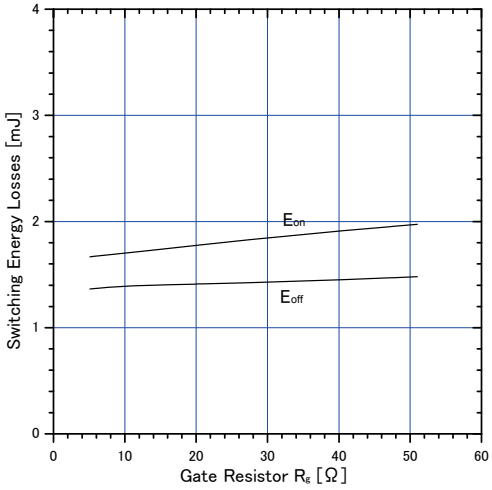

Graph.10
Typical switching time vs. $R_G$
$T_j$=175°C, $V_{CC}$=600V, $I_C$=15A, L=500µH
$V_{GE}$=15V



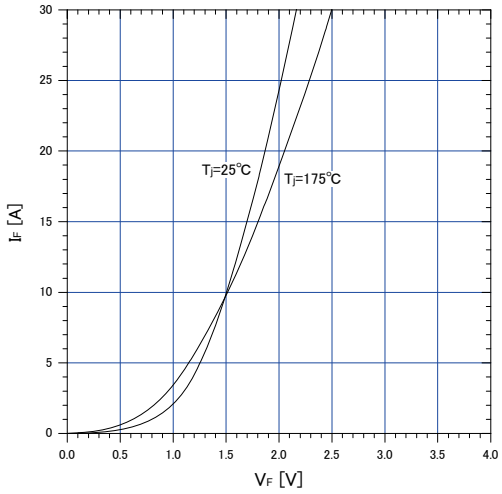

Graph.11
Typical switching losses vs. $I_C$
$T_j$=175°C, $V_{CC}$=600V, L=500µH
$V_{GE}$=15V, $R_G$=10Ω



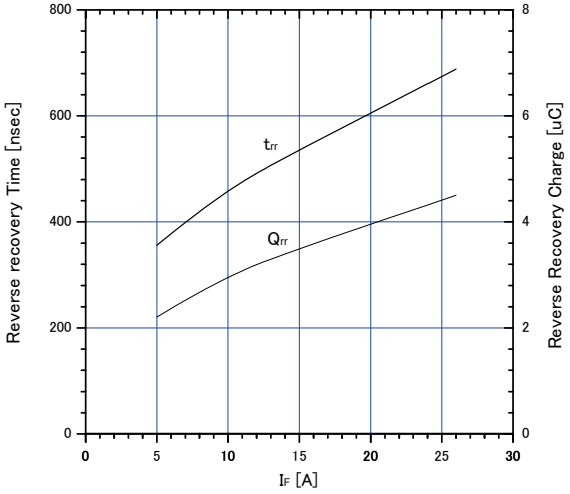

Graph.12
Typical switching losses vs. $R_G$
$T_j$=175°C, $V_{CC}$=600V, $I_C$=15A, L=500µH
$V_{GE}$=15V



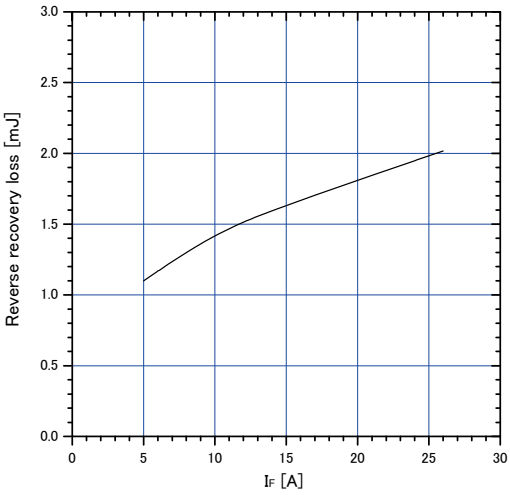
Graph.13
FWD Forward voltage drop ($V_F$-$I_F$)



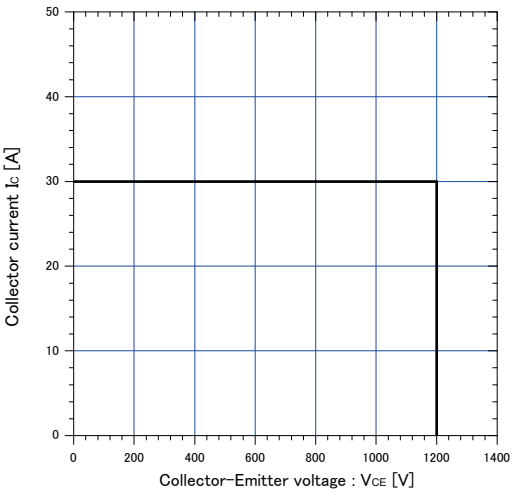

Graph.14
Typical reverse recovery characteristics vs. $I_F$
$T_J$=175°C, $V_{CC}$=600V, L=500µH,
$V_{GE}$=15V,$R_G$=10Ω



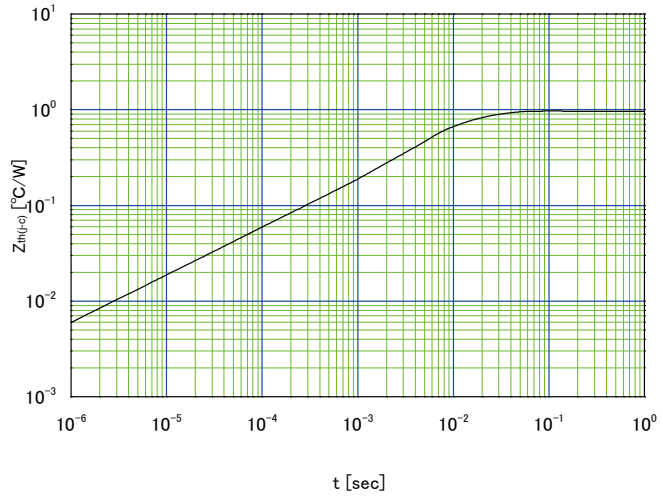

Graph.15
Typical reverse recovery loss vs. $I_F$
$T_J$=175°C,$V_{CC}$=600V,L=500µH
$V_{GE}$=15V,$R_G$=10Ω



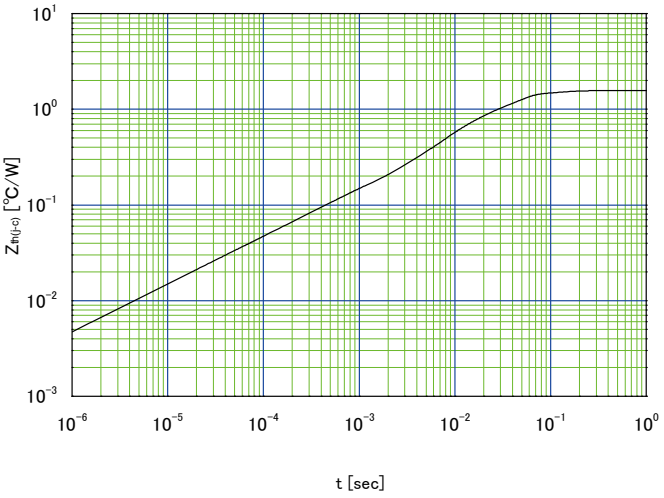

Graph.16
Reverse biased Safe Operating Area
$T_J$≦175°C,$V_{GE}$=+15V/0V,$R_G$=10Ω



Graph.17
Transient thermal resistance of IGBT

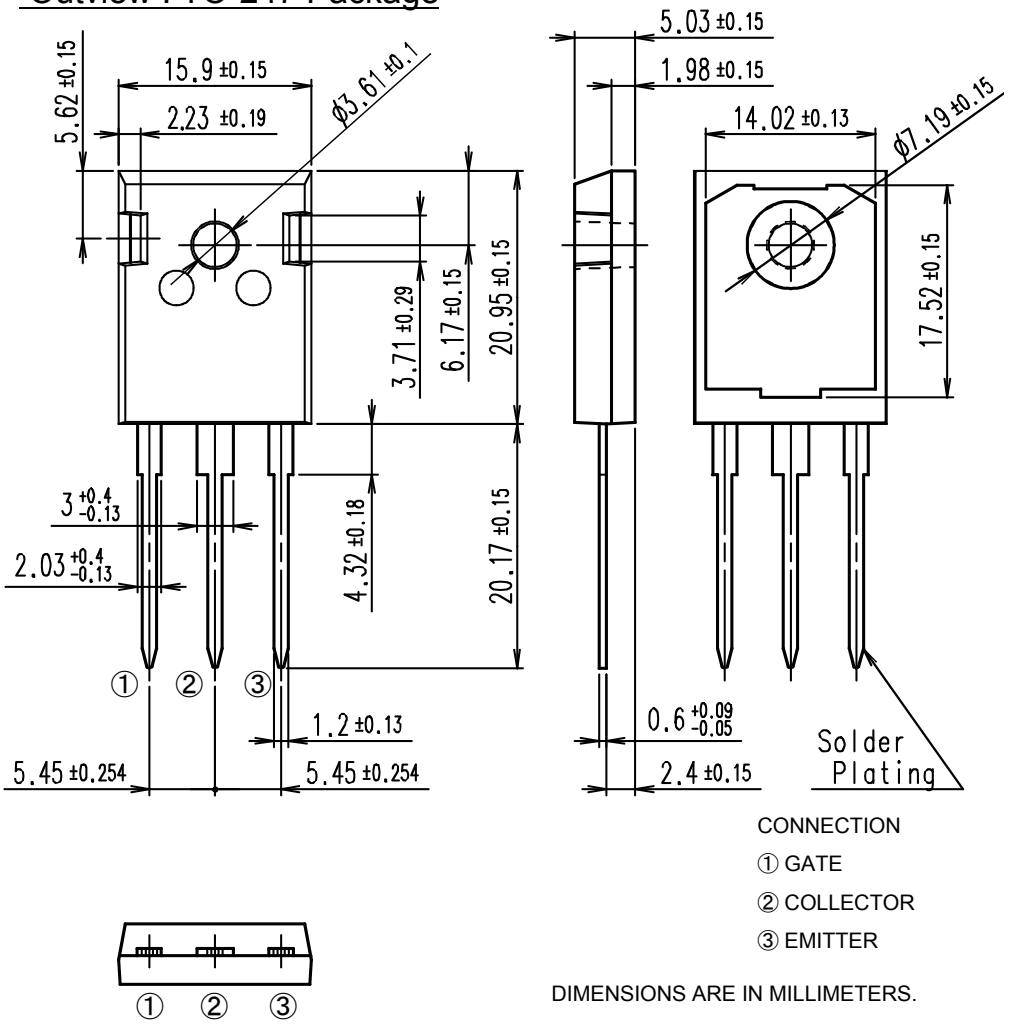



Graph.18
Transient thermal resistance of FWD



## ■ Outline Drawings, mm

Outview : TO-247 Package







CONNECTION
① GATE
② COLLECTOR
③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

## WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of May 2011.
The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sur to obtain the latest specifications.

2. All applications described in this Catalog exemplify the use of Fuji's products for your reference only. No right or license, either express or implied, under any patent, copyright, trade secret or other intellectual property right owned by Fuji Electric Co., Ltd. is (or shall be deemed) granted. Fuji Electric Co., Ltd. makes no representation or warranty, whether express or implied, relating to the infringement or alleged infringement of other's intellectual property rights which may arise from the use of the applications described herein.

3. Although Fuji Electric Co., Ltd. is enhancing product quality and reliability, a small percentage of semiconductor products may become faulty. When using Fuji Electric semiconductor products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing a physical injury, fire, or other problem if any of the products become faulty. It is recommended to make your design failsafe, flame retardant, and free of malfunction.

4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
- Computers
- OA equipment
- Communications equipment (terminal devices)
- Measurement equipment
- Machine tools
- Audiovisual equipment
- Electrical home appliances
- Personal equipment
- Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
- Transportation equipment (mounted on cars and ships)
- Trunk communications equipment
- Traffic-signal control equipment
- Gas leakage detectors with an auto-shut-off feature
- Emergency equipment for responding to disasters and anti-burglary devices
- Safety devices
- Medical equipment

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
- Space equipment
- Aeronautic equipment
- Nuclear control equipment
- Submarine repeater equipment



8. If you have any question about any portion in this Catalog, ask Fuji Electric Co., Ltd. or its sales agents before using the product.
Neither Fuji Electric Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** fuji ***manufacturer:***

Other Similar products are found below :

BZ6WL30CU BZ6WR30CAU BZ6WL30CAU EW100AAG-3P100B EW50AAG-2P015B FMN-60 5V AH165-EG33 AH165-J3C33A AH165-SGLW11E3 AH165-TGL5W11E3 AHX511-L AHX662-A DR30D0L-E3A AR22E0L-10E4G AR22F0L-02H4R AR22G3R-01B AR22G4L-10E3W AR22G4L-11E3A AR22JCR-3A14DC AR22M0R-01B AR22PR-711B AR22S2R-22W AR22VGE-11R AR30E0L-10E3W AR30E0R-11G AR9T511-H EG52F/40-30MA BU-ECA2005L BW9BTAA-L3 BW9BTAA-S2 BW9FWCA-15A BZ6KL10CU 1TR0AK RT11-DC24V SA103RCUL/60 SA103RCUL/75 SA203CUL/125 SA203CUL/200 SA203RCUL/125 SA53RCUL/3 SC-E1-220VAC SC-E5-200V 2NC2F-CK SG103CUL/40-CO SK12LR-E01W AC09-CX0/11L1 EW125JAG-4P030K EW250JAGU-3P200K EW250JAGU-3P225K EW50RAGU-3P003K