



NGTG12N60TF1G

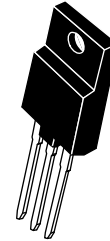
N-Channel IGBT 600V, 12A, $V_{CE(sat)}$;1.4V TO-3PF-3L

ON Semiconductor®

<http://onsemi.com>

Features

- $V_{CE(sat)}$ =1.4V typ. (I_C =12A, V_{GE} =15V)
- Low switching loss in higher frequency applications
- Enhancement type
- 5 μ s short circuit capability
- Adoption of full isolation type package



TO-3PF-3L

Applications

- Power factor correction of white goods appliance
- General purpose inverter

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$, Unless otherwise specified

| Parameter | Symbol | Conditions | Ratings | Unit | |
|------------------------------|------------|--|------------------------------|------------------|---|
| Collector to Emitter Voltage | V_{CES} | | 600 | V | |
| Gate to Emitter Voltage | V_{GES} | | ± 20 | V | |
| Collector Current (DC) | I_C^{*1} | Limited by T_{jmax} | @ $T_c=25^\circ\text{C}$ *2 | 24 | A |
| | | | @ $T_c=100^\circ\text{C}$ *2 | 12 | A |
| Collector Current (Pulse) | I_{CP} | Pulse width Limited by T_{jmax} (Ref:ASO graph) | 88 | A | |
| Allowable Power Dissipation | P_D | $T_c=25^\circ\text{C}$ (Our ideal heat dissipation condition) *2 | 54 | W | |
| Junction Temperature | T_j | | 150 | $^\circ\text{C}$ | |
| Storage Temperature | T_{stg} | | - 55 to +150 | $^\circ\text{C}$ | |

Note : *1 Collector Current is calculated from the following formula.

$$I_C(T_c) = \frac{T_{jmax} - T_c}{R_{th(j-c)} \times V_{CE(sat)} \max(T_{jmax}, I_C(T_c))}$$

*2 Our condition is radiation from backside.

The method is applying silicone grease to the backside of the device and attaching the device to water-cooled radiator made of aluminium.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Electrical Characteristics at $T_a = 25^\circ\text{C}$, Unless otherwise specified

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---------------|--|-------------------------|------|-----------|---------------|
| | | | min | typ | max | |
| Collector to Emitter Breakdown Voltage | $V_{(BR)CES}$ | $I_C=500\mu\text{A}$, $V_{GE}=0\text{V}$ | 600 | | | V |
| Collector to Emitter Cut off Current | I_{CES} | $V_{CE}=600\text{V}$, $V_{GE}=0\text{V}$ | $T_c=25^\circ\text{C}$ | | 10 | μA |
| | | | $T_c=125^\circ\text{C}$ | | 1 | mA |
| Gate to Emitter Leakage Current | I_{GES} | $V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$ | | | ± 100 | nA |
| Gate to Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{CE}=20\text{V}$, $I_C=250\mu\text{A}$ | 4.5 | | 6.5 | V |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15\text{V}$, $I_C=12\text{A}$ | $T_c=25^\circ\text{C}$ | 1.4 | 1.6 | V |
| | | | $T_c=125^\circ\text{C}$ | 1.6 | | V |
| Input Capacitance | C_{ies} | | | 2000 | | pF |
| Output Capacitance | C_{oes} | $V_{CE}=20\text{V}$, $f=1\text{MHz}$ | | 60 | | pF |
| Reverse Transfer Capacitance | C_{res} | | | 50 | | pF |

Continued on next page.

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

NGTG12N60TF1G

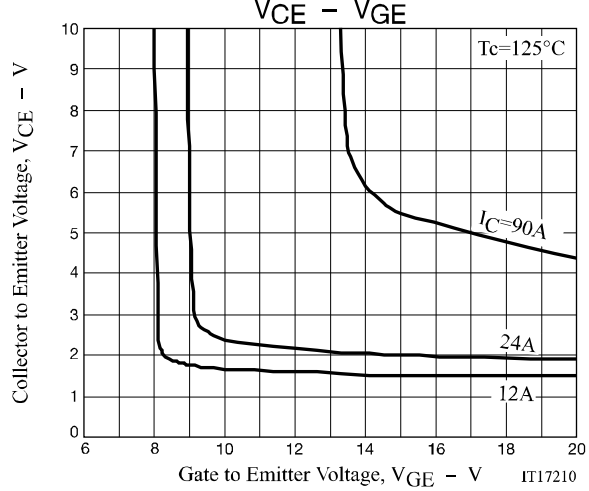
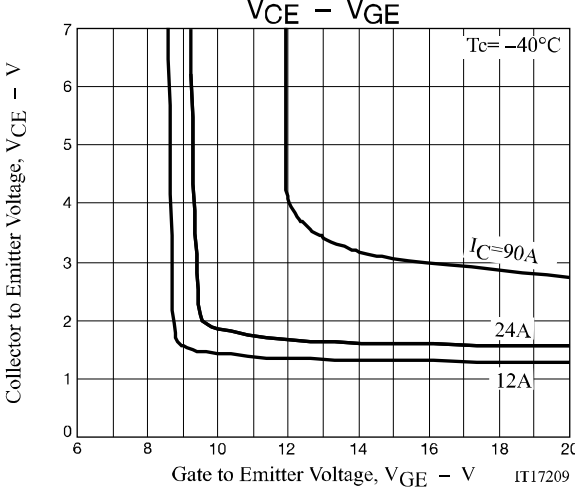
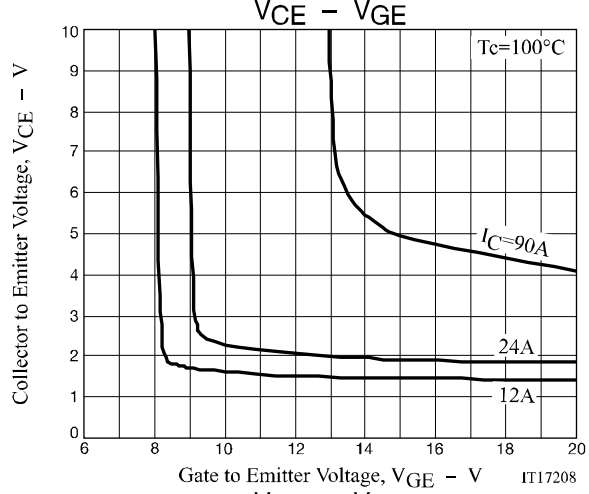
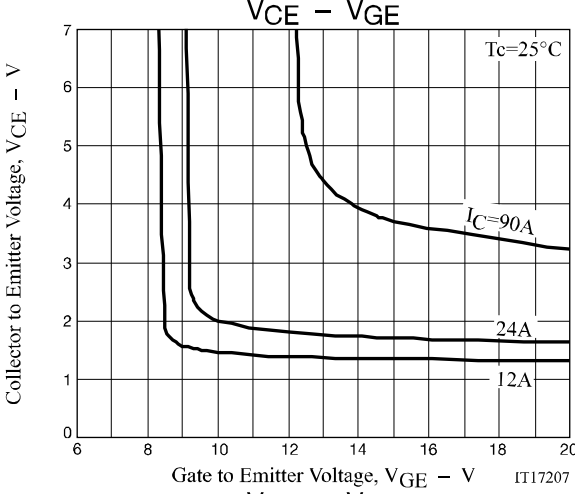
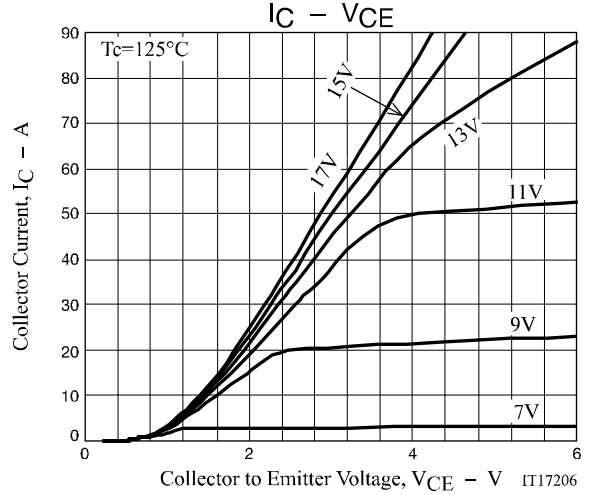
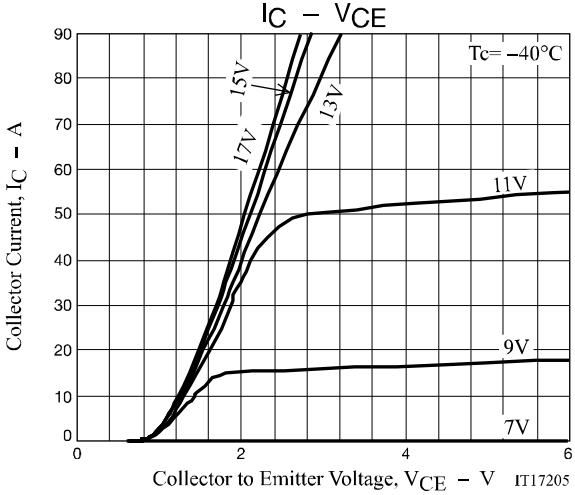
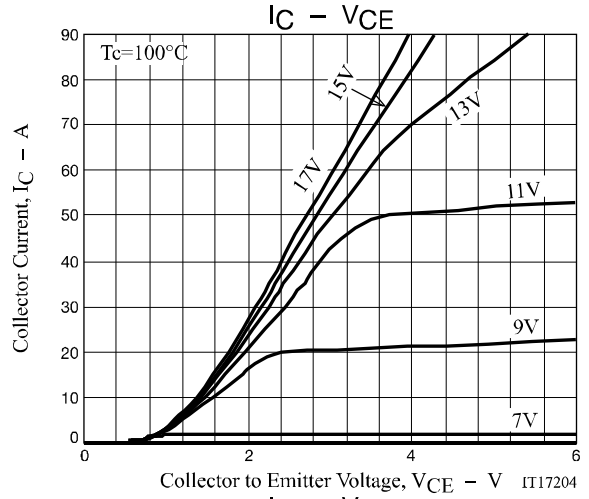
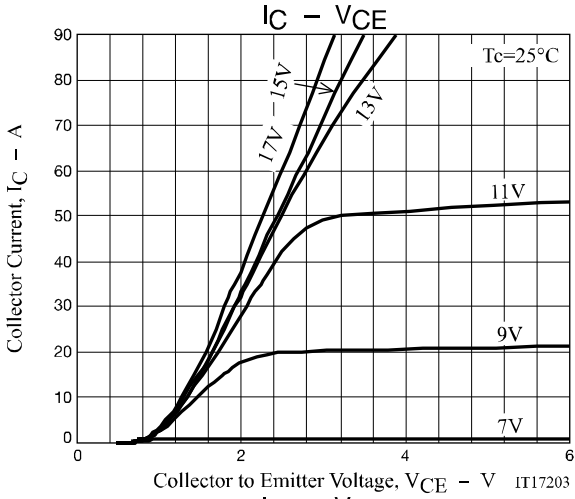
Continued from preceding page.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|-----------------------------------|--------------|---|---------|-----|-----|------|
| | | | min | typ | max | |
| Turn-ON Delay Time | $t_{d(on)}$ | $V_{CC}=300V, I_C=15A$ $R_G=30\Omega, L=200\mu H$ $V_{GE}=0V/15V$ $V_{clamp}=400V$ See Fig.1, See Fig.2 | | 55 | | ns |
| Rise Time | t_r | | | 30 | | ns |
| Turn-ON Time | t_{on} | | | 330 | | ns |
| Turn-OFF Delay Time | $t_{d(off)}$ | | | 200 | | ns |
| Fall Time | t_f | | | 110 | | ns |
| Turn-OFF Time | t_{off} | | | 350 | | ns |
| Total Gate Charge | Q_g | $V_{CE} =300V, V_{GE}=15V, I_C=15A$ | | 84 | | nC |
| Gate to Emitter Charge | Q_{ge} | | | 16 | | nC |
| Gate to Collector "Miller" Charge | Q_{gc} | | | 37 | | nC |

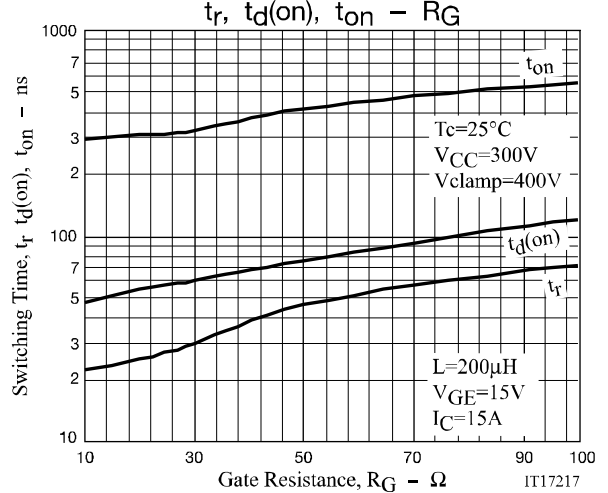
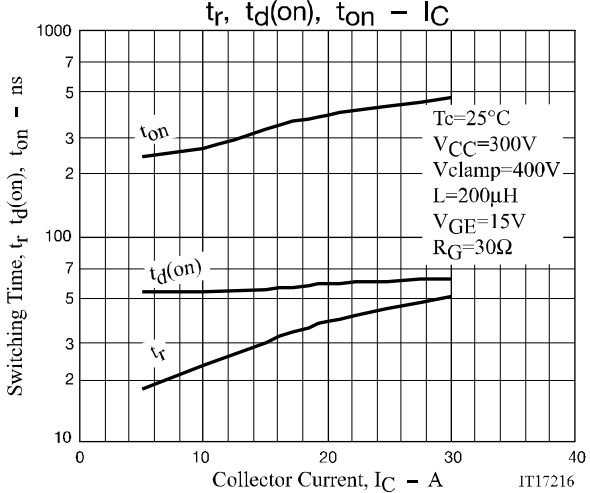
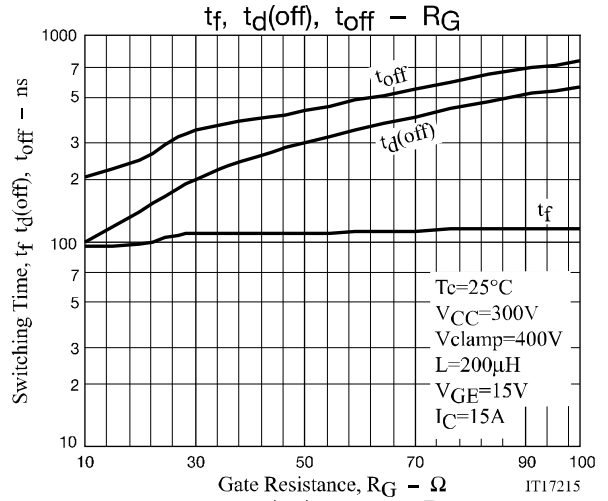
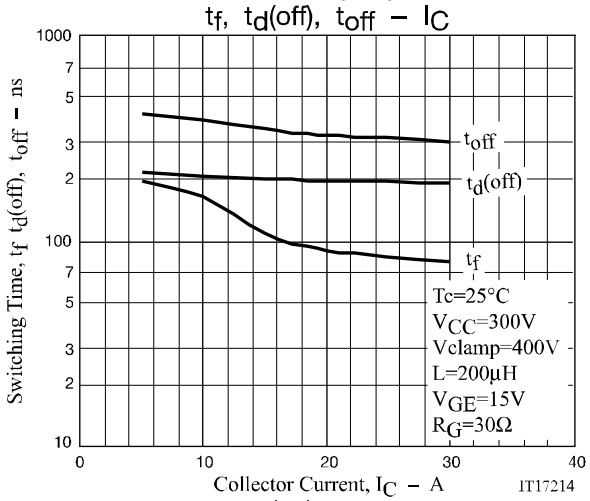
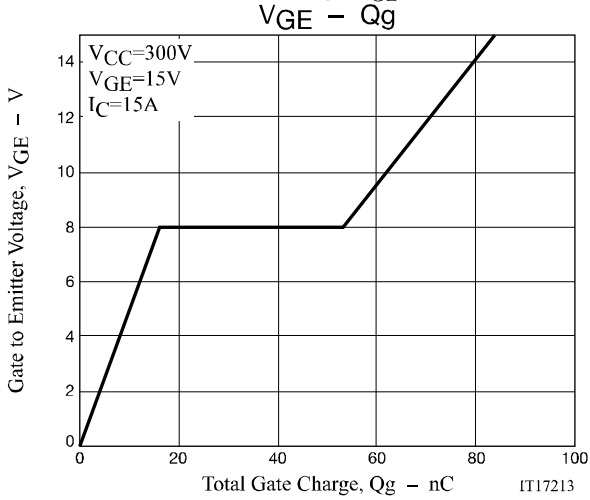
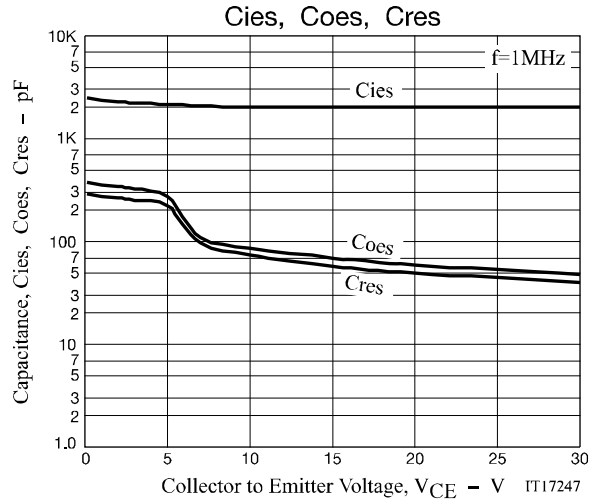
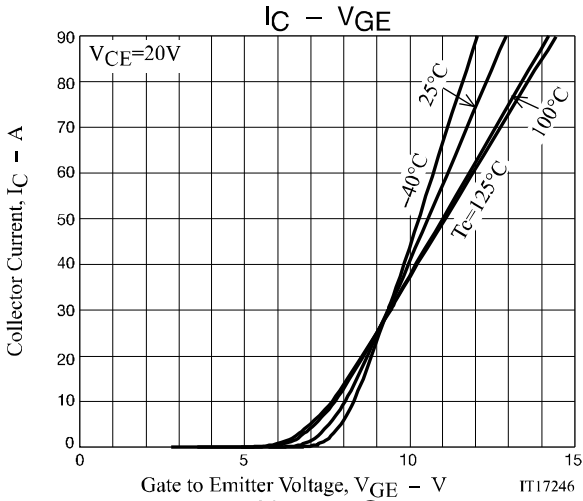
Thermal Characteristics at $T_a = 25^\circ C$, Unless otherwise specified

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---------------|---|---------|----------------|
| Thermal Resistance (junction- Case) | $R_{th(j-c)}$ | $T_c=25^\circ C$ (our ideal heat dissipation condition)*2 | 2.33 | $^\circ C / W$ |
| Thermal Resistance (junction- atmosphere) | $R_{th(j-a)}$ | | 47.5 | $^\circ C / W$ |

NGTG12N60TF1G

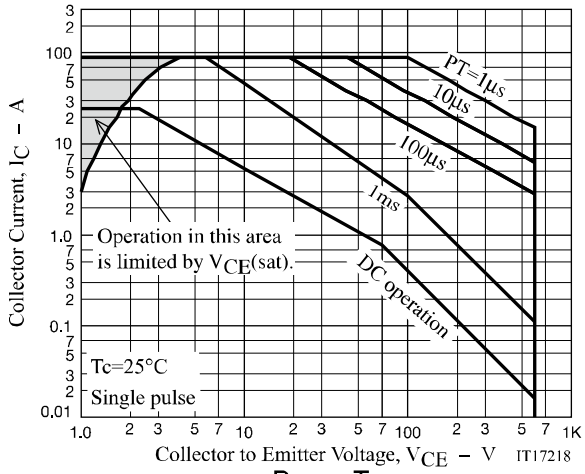


NGTG12N60TF1G

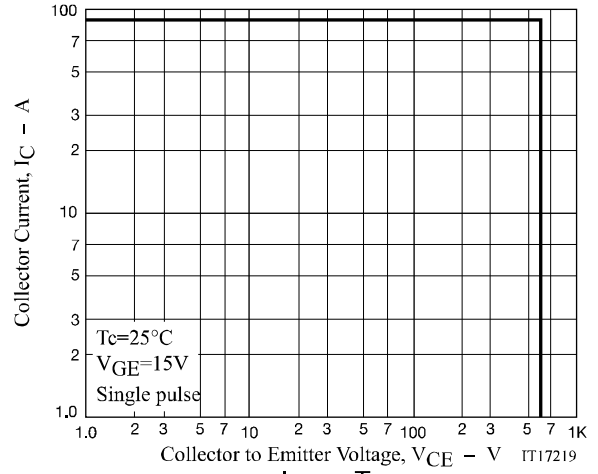


NGTG12N60TF1G

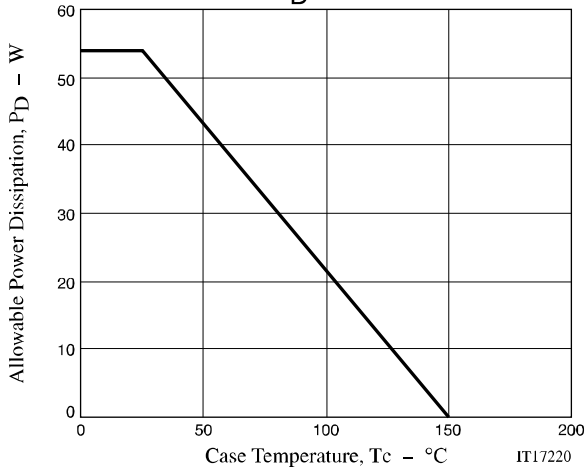
Forward Bias A S O



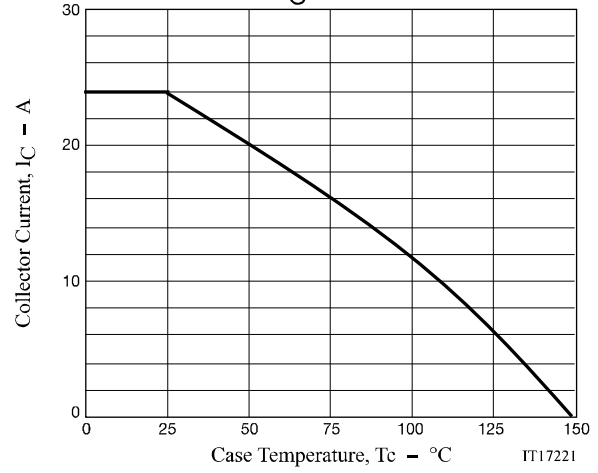
Reverse Bias A S O



$P_D - T_c$



$I_C - T_c$



NGTG12N60TF1G

Package Dimensions

NGTG12N60TF1G

TO-3PF-3L

CASE 340AH

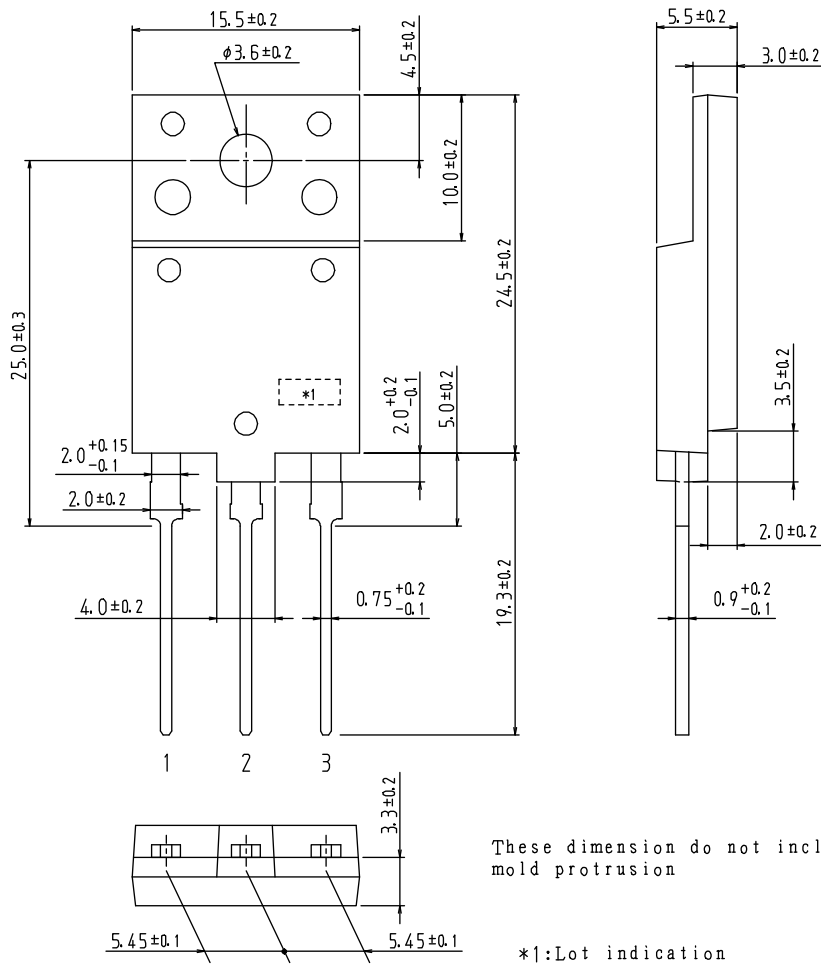
ISSUE 0

Unit : mm

1: Gate

2: Collector

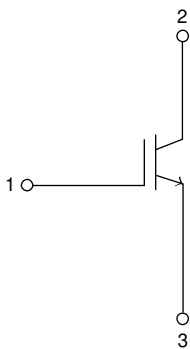
3: Emitter



These dimension do not include mold protrusion

*1: Lot indication

Electrical Connection



NGTG12N60TF1G

Ordering & Package Information

| Device | Package | Shipping | note |
|---------------|--------------------|-------------------|---------|
| NGTG12N60TF1G | TO-3PF-3L SC-94 | 30 pcs. / tube | Pb-Free |

Marking

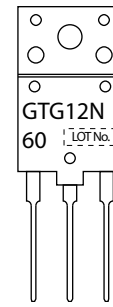


Fig.1 Switching Time Test Circuit

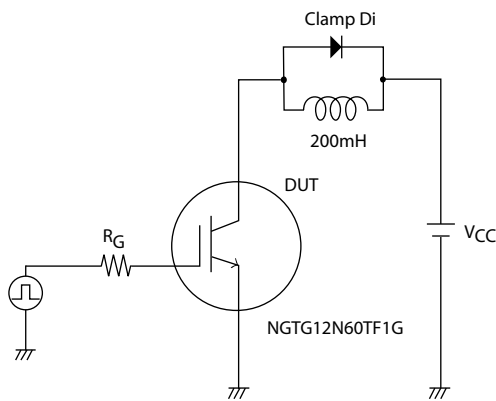
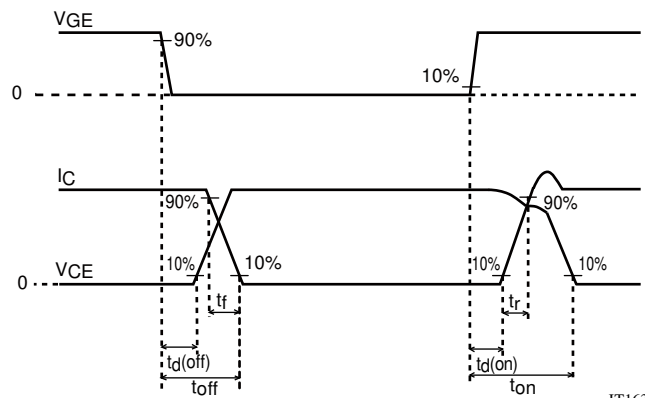


Fig.2 Timing Chart



IT16383

ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.