



# NGTG12N60TF1G

## N-Channel IGBT

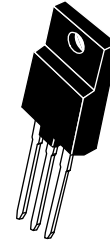
600V, 12A,  $V_{CE(sat)}$ ;1.4V TO-3PF-3L

ON Semiconductor®

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### Features

- $V_{CE(sat)}$ =1.4V typ. ( $I_C$ =12A,  $V_{GE}$ =15V)
- Low switching loss in higher frequency applications
- Enhancement type
- 5 $\mu$ 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	$V_{GES}$		$\pm 20$	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	$\mu\text{A}$
			$T_c=125^\circ\text{C}$		1	mA
Gate to Emitter Leakage Current	$I_{GES}$	$V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$			$\pm 100$	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

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### ORDERING INFORMATION

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

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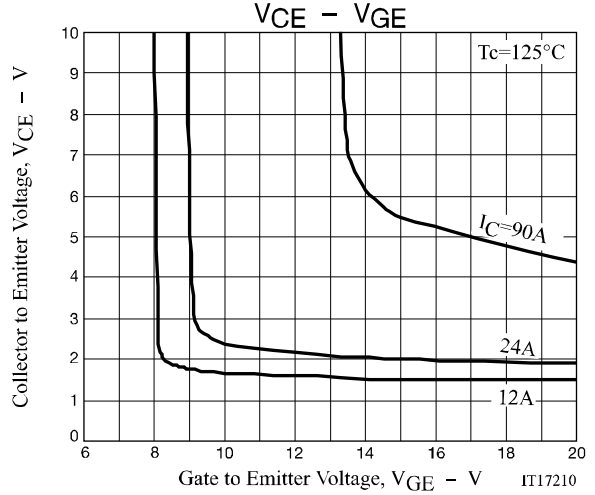
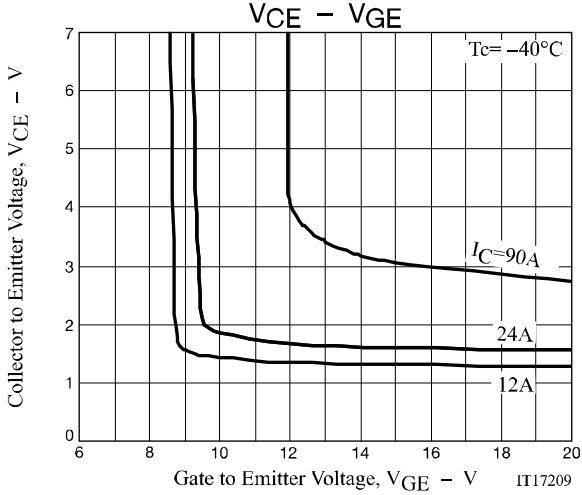
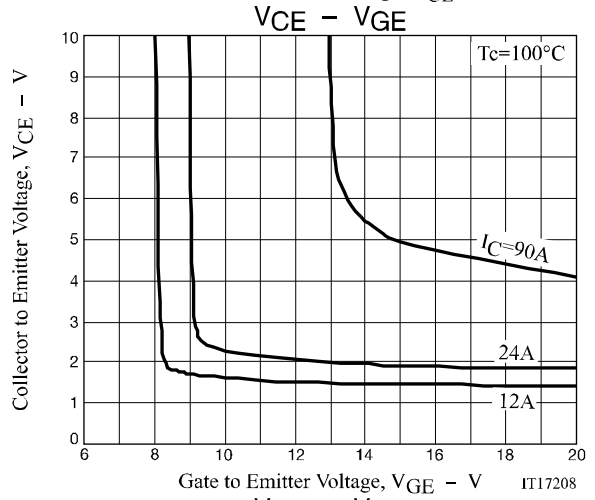
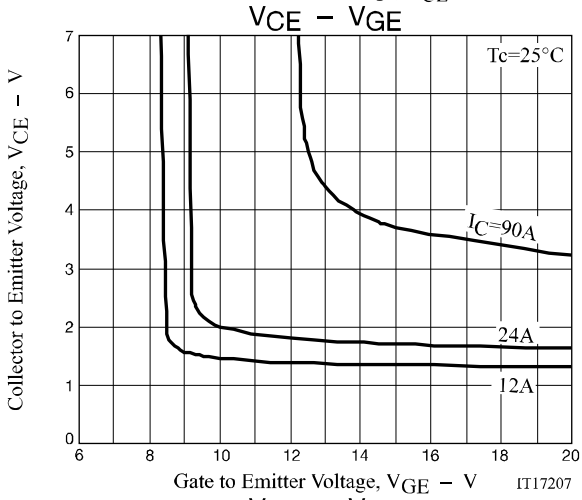
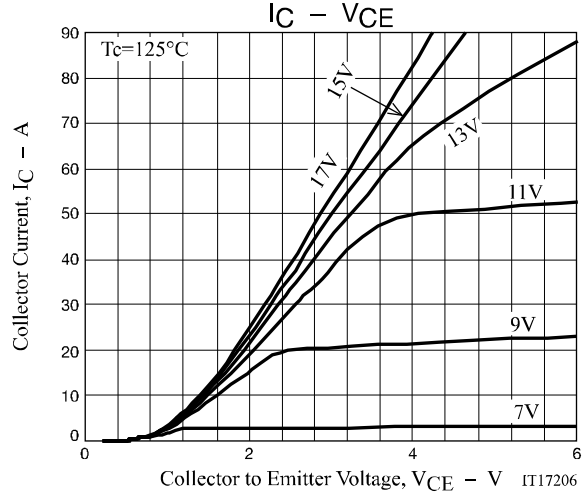
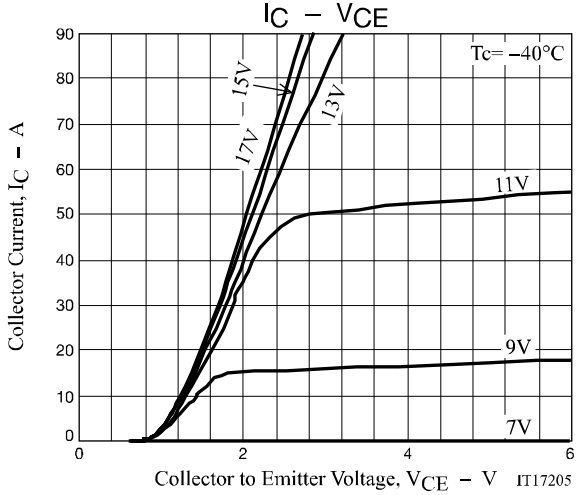
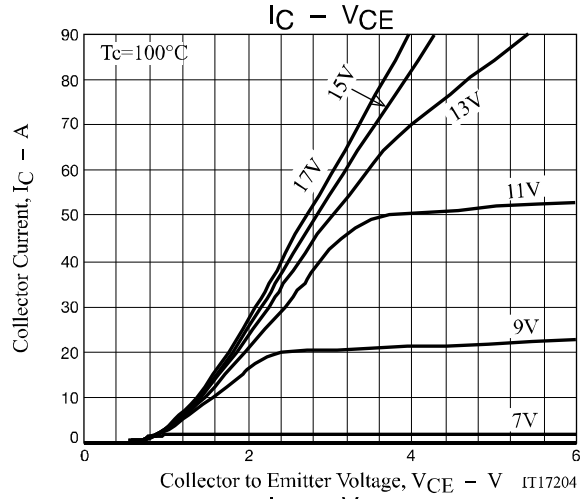
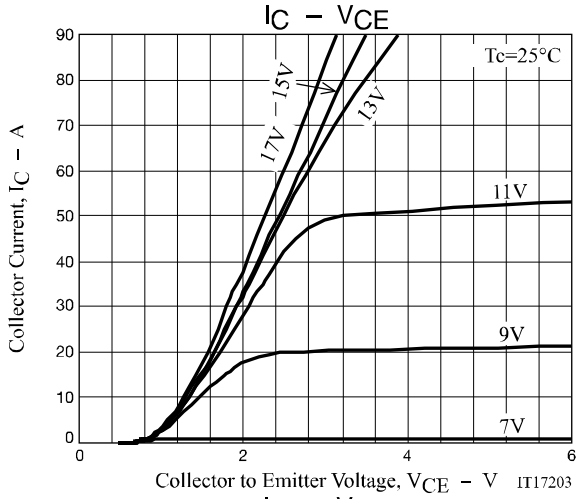
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Turn-ON Delay Time	$t_{d(on)}$	$V_{CC}=300V, I_C=15A$ $R_G=30\Omega, L=200\mu H$ $V_{GE}=0V/15V$ $V_{clamp}=400V$ See Fig.1, See Fig.2		55		ns
Rise Time	$t_r$			30		ns
Turn-ON Time	$t_{on}$			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

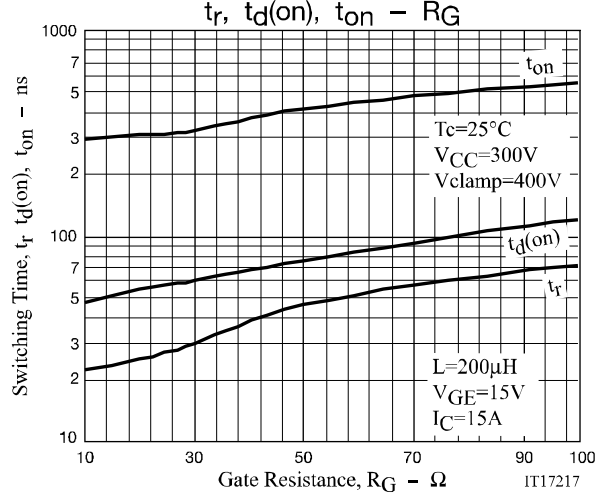
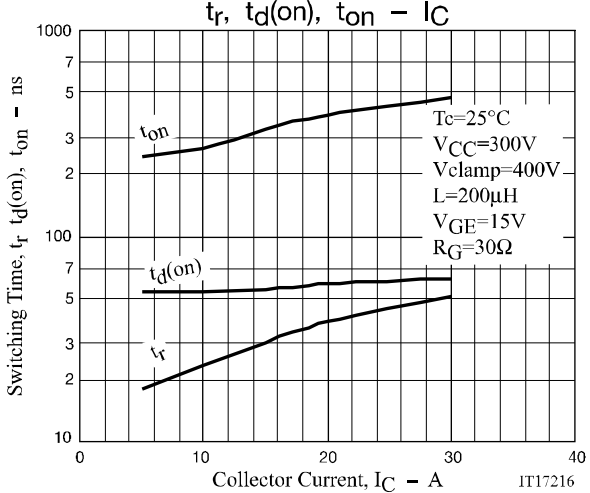
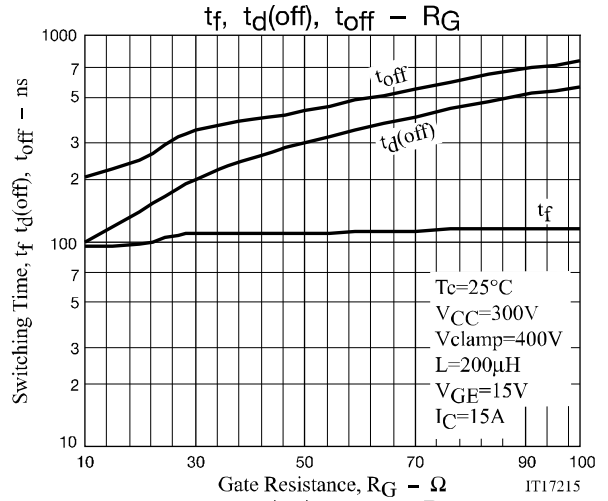
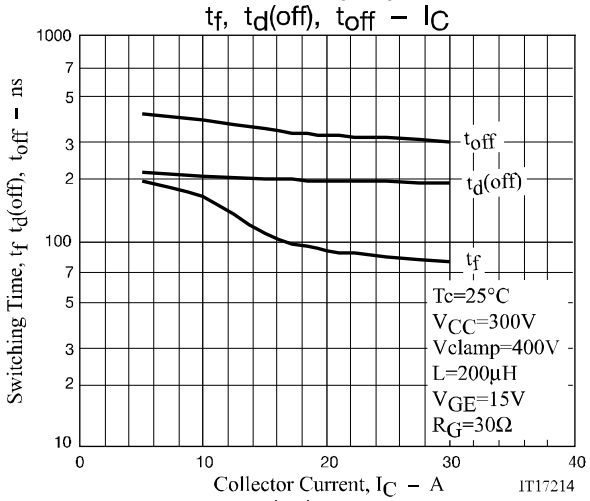
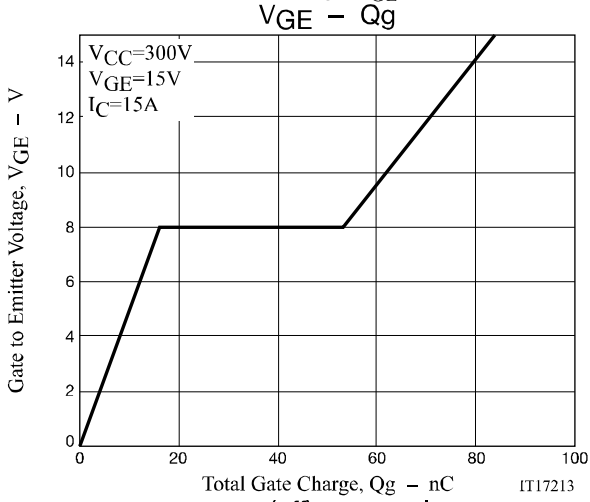
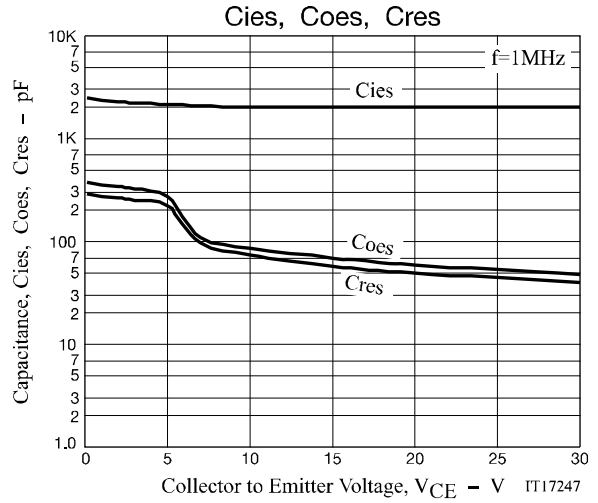
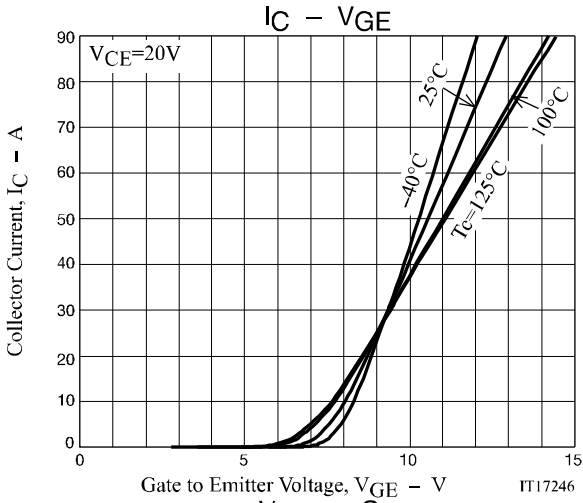
## Thermal Characteristics at $T_a = 25^\circ C$ , Unless otherwise specified

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	$^\circ C / W$

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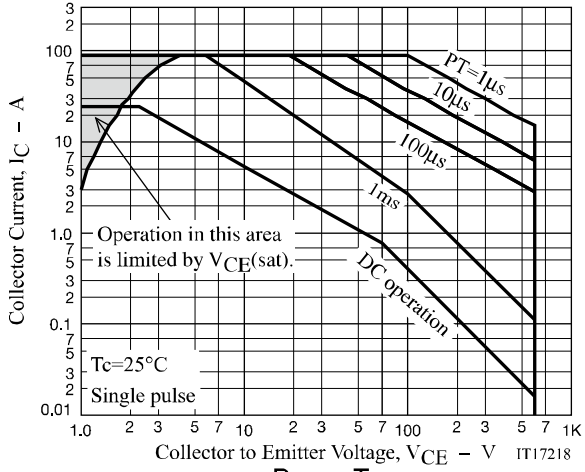


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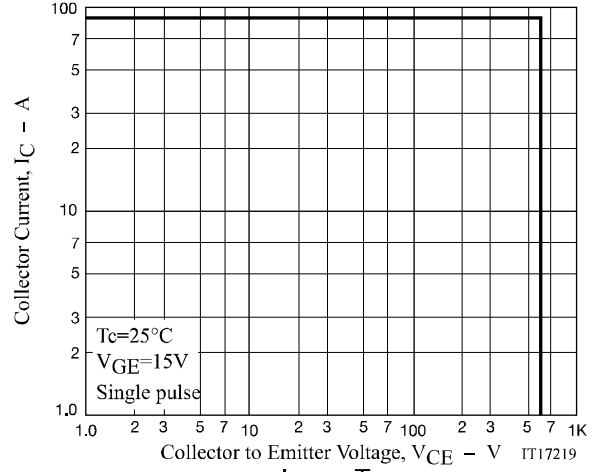


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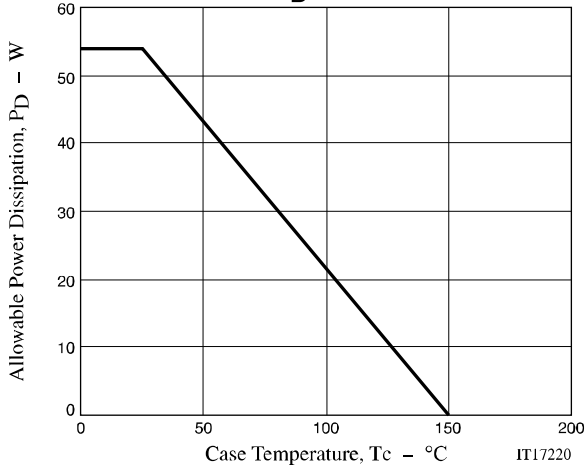
Forward Bias A S O



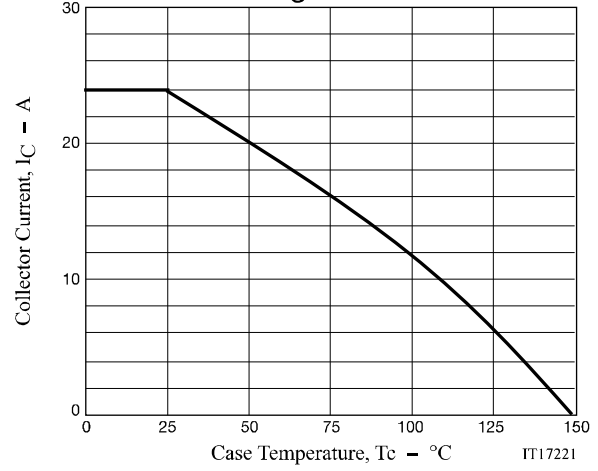
Reverse Bias A S O



$P_D - T_c$



$I_C - T_c$



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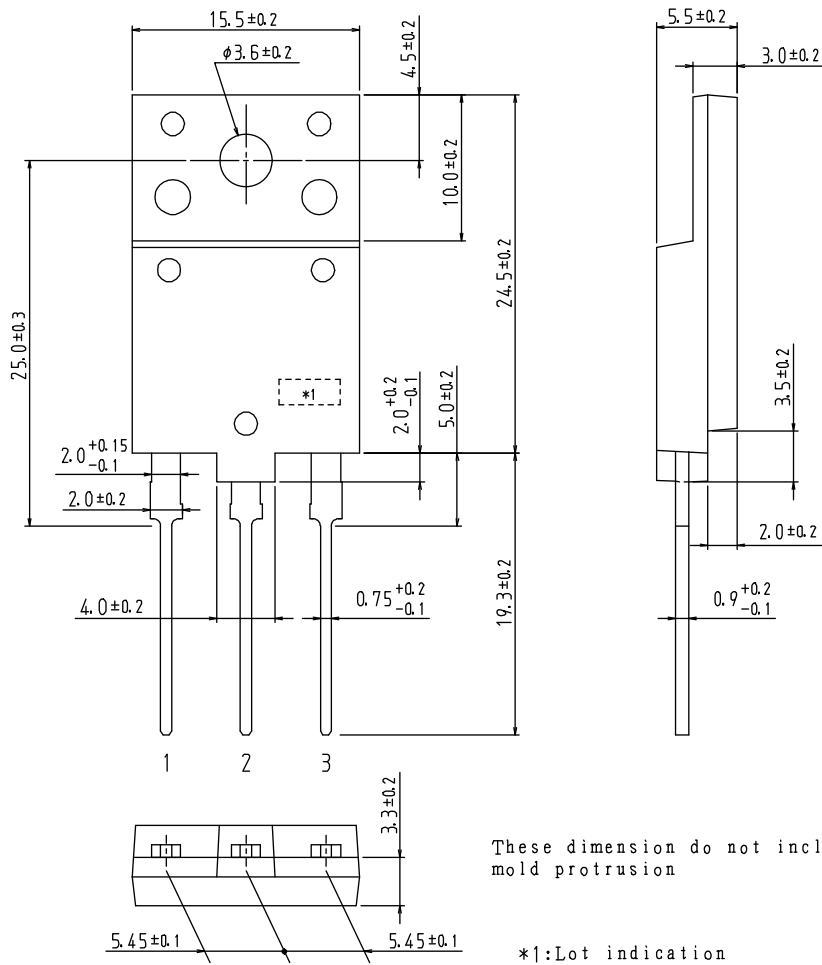
## Package Dimensions

NGTG12N60TF1G

**TO-3PF-3L**  
CASE 340AH  
ISSUE 0

Unit : mm

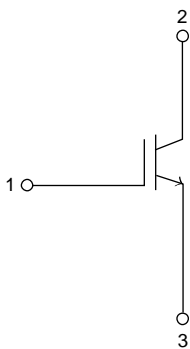
- 1: Gate
- 2: Collector
- 3: Emitter



These dimension do not include mold protrusion

\*1: Lot indication

## Electrical Connection

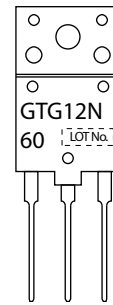


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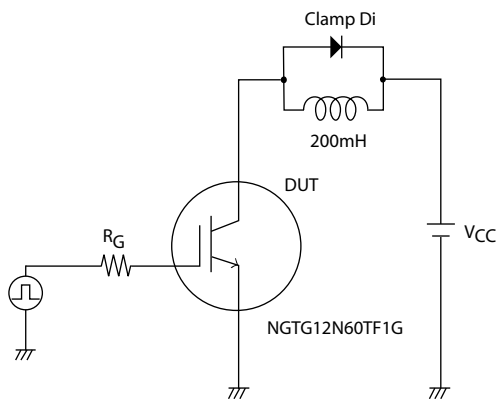
## Ordering & Package Information

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

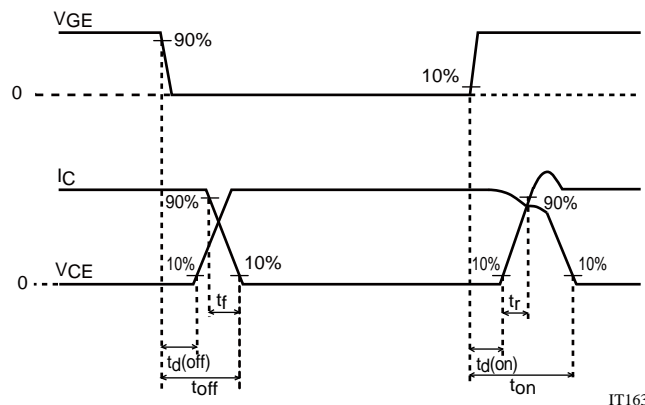
## Marking



**Fig.1 Switching Time Test Circuit**



**Fig.2 Timing Chart**



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