



NGTG12N60TF1G

N-Channel IGBT

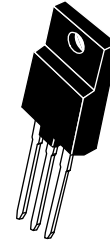
600V, 12A, $V_{CE(sat)}$;1.4V TO-3PF-3L

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 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

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ORDERING INFORMATION

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

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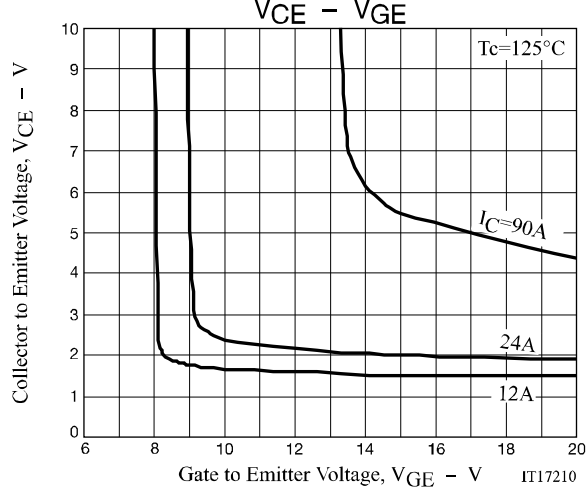
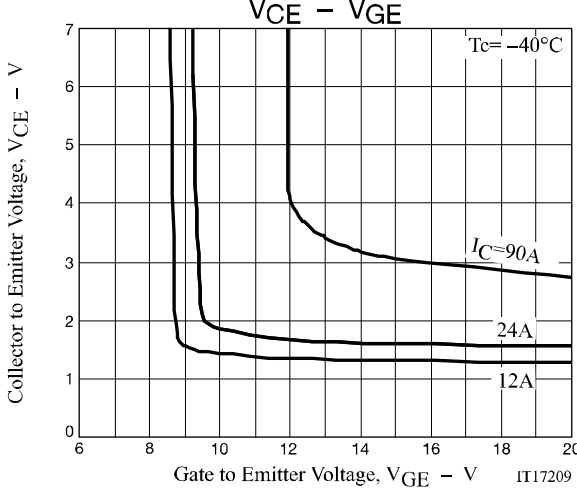
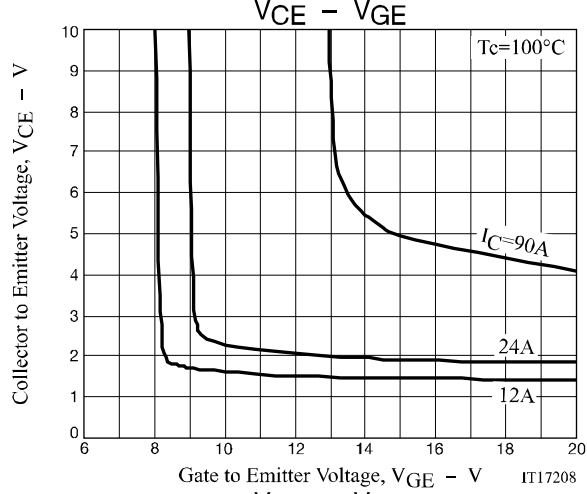
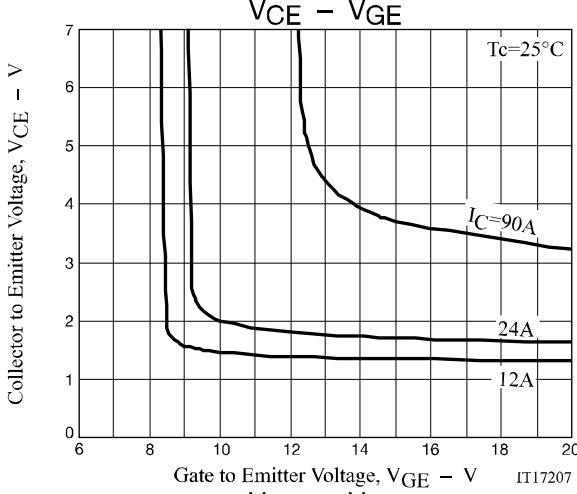
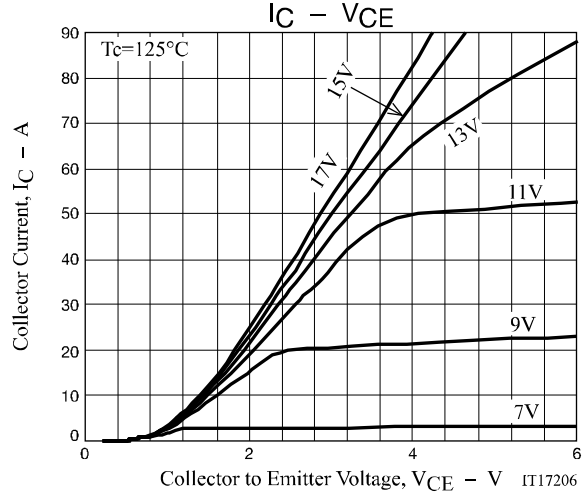
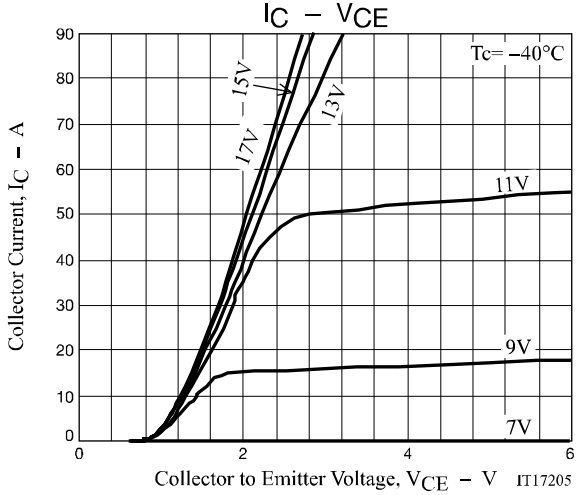
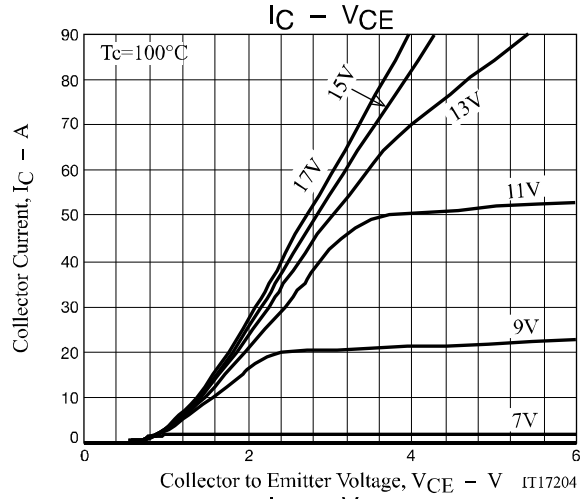
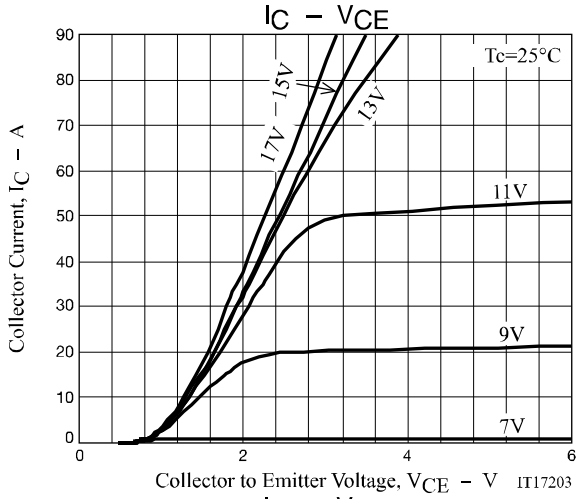
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Turn-ON Delay Time	$t_{d(on)}$	$V_{CC}=300V, I_C=15A$ $R_G=30\Omega, L=200\mu H$ $V_{GE}=0V/15V$ $V_{clamp}=400V$ See Fig.1, See Fig.2		55		ns
Rise Time	t_r			30		ns
Turn-ON Time	t_{on}			330		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

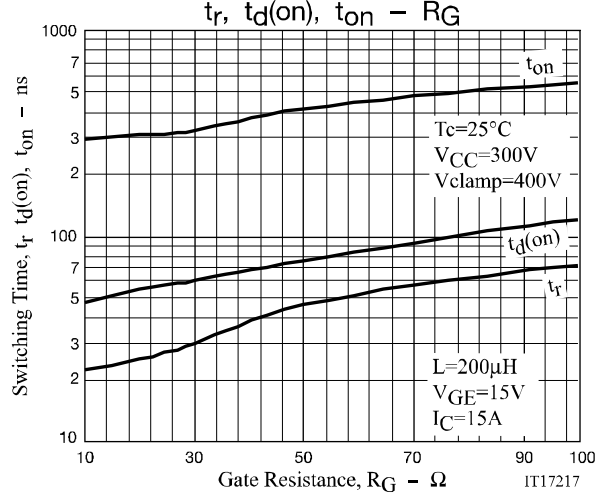
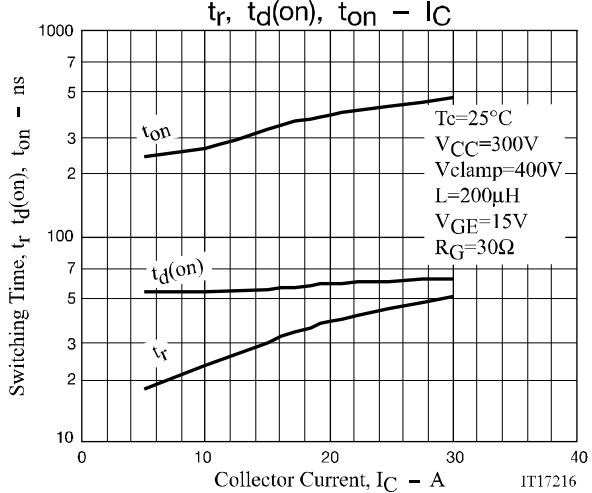
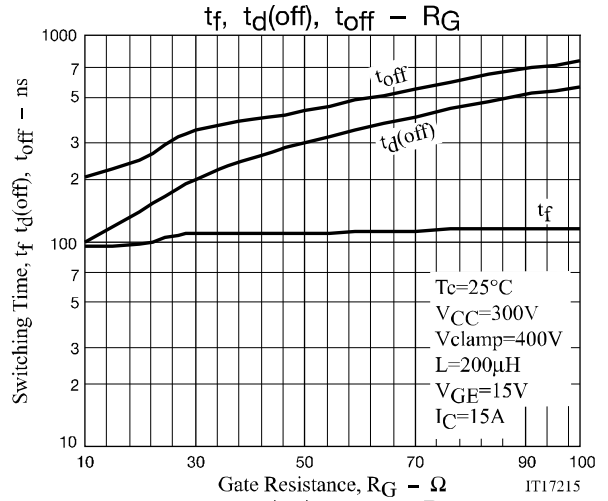
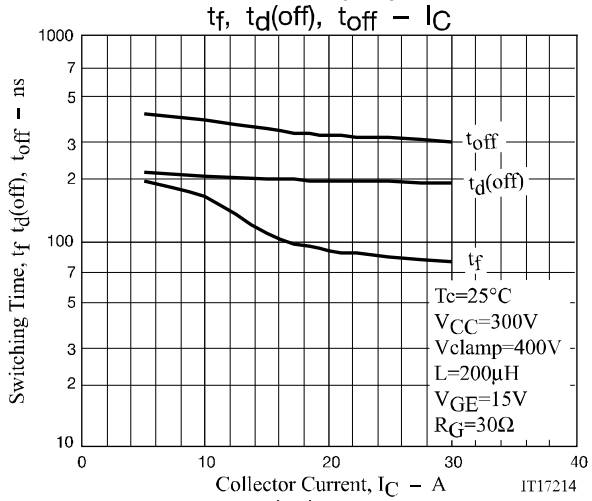
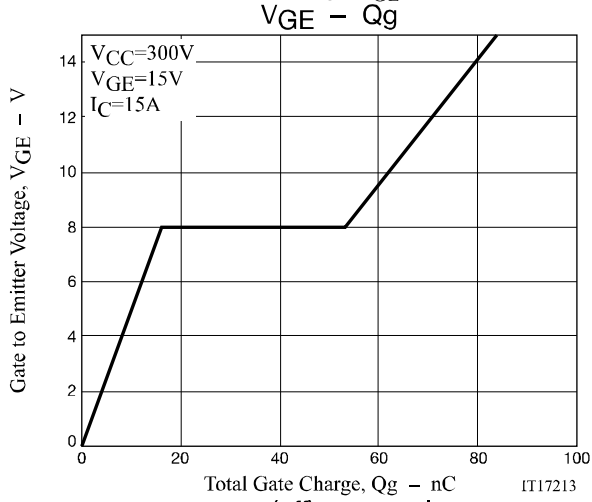
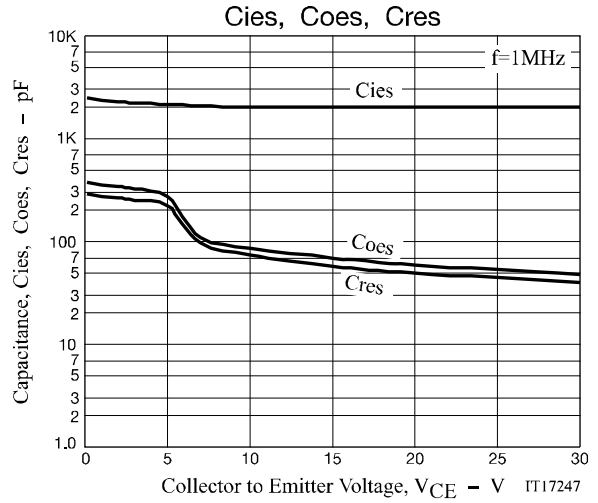
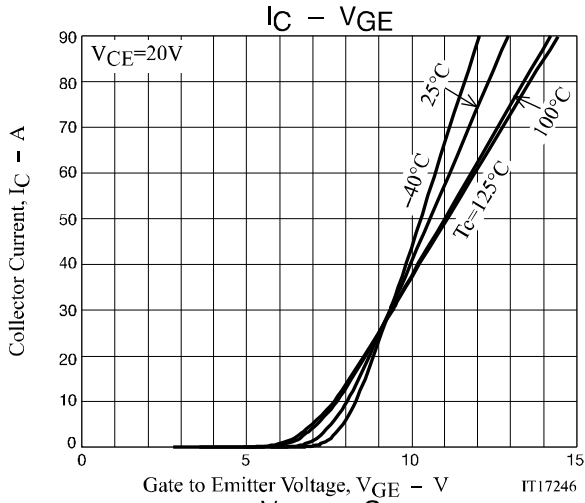
Thermal Characteristics at $T_a = 25^\circ C$, Unless otherwise specified

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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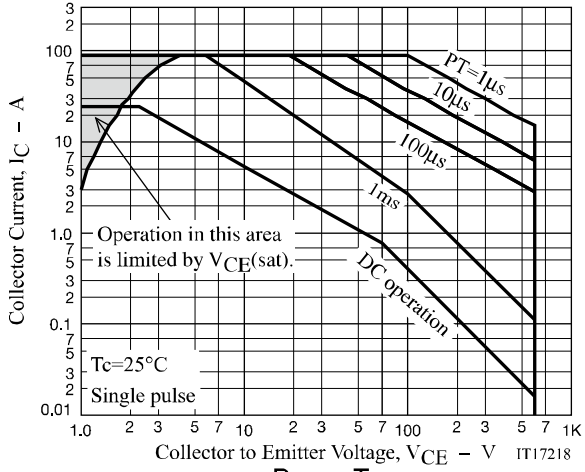


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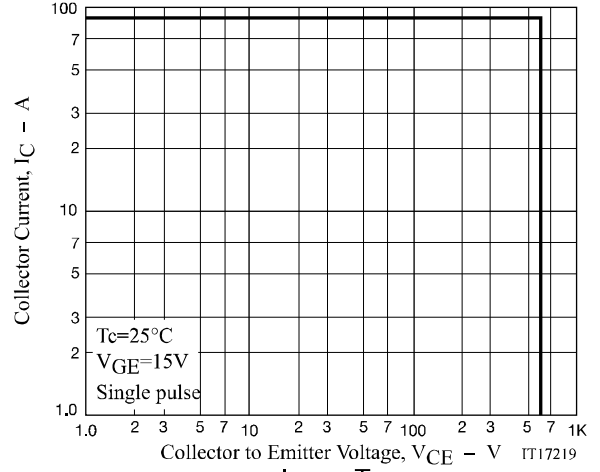


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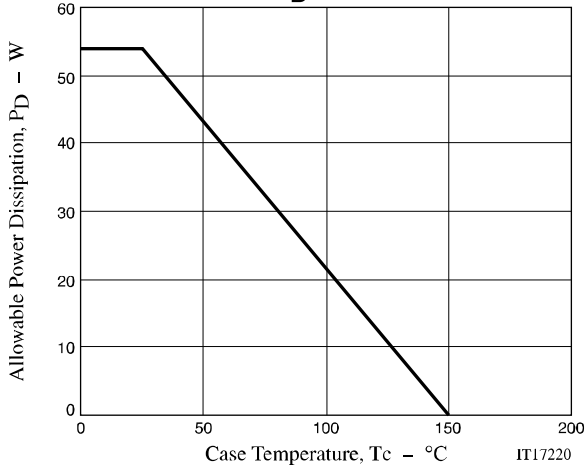
Forward Bias A S O



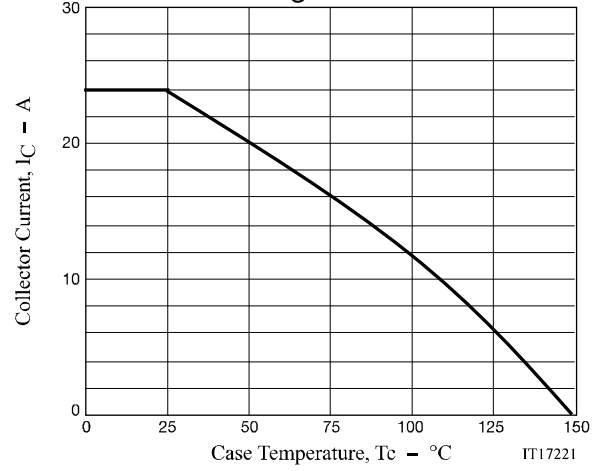
Reverse Bias A S O



$P_D - T_c$



$I_C - T_c$



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Ordering & Package Information

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

Marking

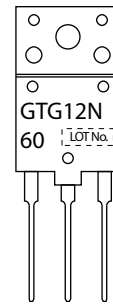


Fig.1 Switching Time Test Circuit

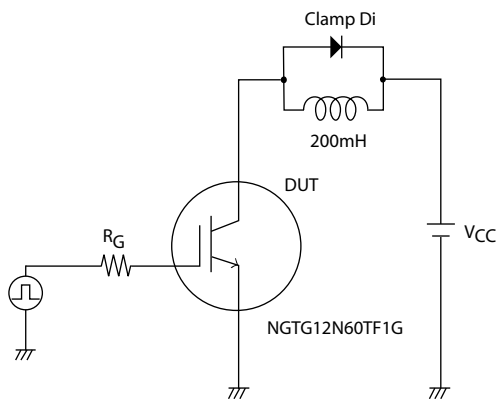
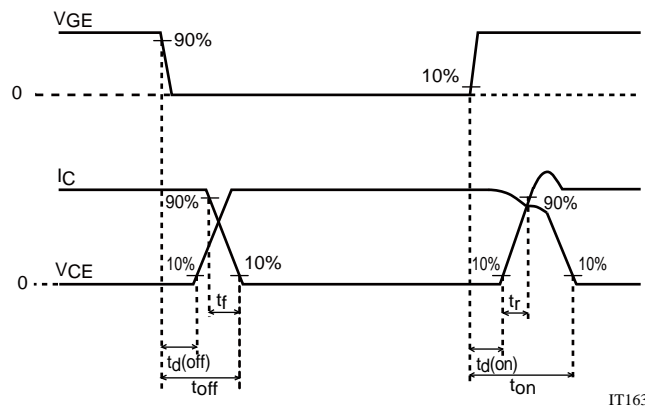


Fig.2 Timing Chart



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