Ordering number : ENA2283A

NGTB10N60FG

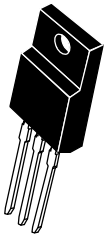
N-Channel IGBT
600V, 10A, V_{CE}(sat);1.5V, TO-220F-3FS

ON Semiconductor®

http://onsemi.com

Features

- IGBT V_{CE} (sat)=1.5V typ. (I_C=10A, V_{GE}=15V)
- IGBT I_C=20A (Tc=25°C)
- Adaption of full isolation type package
- 5μs short circuit capability
- Diode V_F=1.3V typ.(I_F=10A)
- Diode t_{rr}=70ns typ.
- Enhansment type



TO-220F-3FS

Applications

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

Specifications

Absolute Maximum Ratings at Ta = 25°C, Unless otherwise specified

Parameter	Symbol	Conditions		Value	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 Tjmax	@ Tc=25°C *2	20	A
			@ Tc=100°C *2	10	A
Collector Current (Pulse)	I_{CP}	Pulse width Limited by Tjmax		72	A
Diode Average Output Current	I_O			10	A
Allowable Power Dissipation	P_D	Tc=25°C (Our ideal heat dissipation condition) *2		40	W
Junction Temperature	Tj			150	°C
Storage Temperature	Tstg			- 55 to +150	°C

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

$$I_C(Tc)= \frac{Tjmax - Tc}{R_{th}(j\text{-}c)\times V_{CE}(sat)\ (I_C(Tc))}$$

*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 those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Electrical Characteristics at Ta = 25°C, Unless otherwise specified

Parameter	Symbol	Conditions		Value			Unit
				min	typ	max	
Collector to Emitter Breakdown Voltage	$V_{(BR)CES}$	I_C=500μA, V_{GE}=0V		600			V
Collector to Emitter Cut off Current	I_{CES}	V_{CE}=600V, V_{GE}=0V	Tc=25°C			10	μA
			Tc=125°C			1	mA
Gate to Emitter Leakage Current	I_{GES}	V_{GE}=±20V, V_{CE} =0V				±100	nA
Gate to Emitter Threshold Voltage	V_{GE}(off)	V_{CE} =20V, I_C=250μA		4.5		6.5	V
Collector to Emitter Saturation Voltage	V_{CE}(sat)	V_{GE}=15V, I_C=10A	Tc=25°C		1.5	1.7	V
			Tc=125°C		1.7		V
Diode Forward Voltage	V_F	I_F=10A			1.3		V
Input Capacitance	Cies	V_{CE} =20V,f=1MHz			1440		pF
Output Capacitance	Coes				60		pF
Reverse Transfer Capacitance	Cres				30		pF

Continued on next page.

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

Continued from preceding page.

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Turn-ON Delay Time	t_{d}(on)	V_{CC}=300V,I_C=10A R_G=30Ω,L=200μH V_{GE}=0V/15V Vclamp=400V See Fig.1, See Fig.2		40		ns
Rise Time	t_r			23		ns
Turn-ON Time	ton			110		ns
Turn-OFF Delay Time	t_{d}(off)			145		ns
Fall Time	t_f			90		ns
Turn-OFF Time	toff			240		ns
Total Gate Charge	Qg	V_{CE} =300V, V_{GE}=15V, I_C=10A		55		nC
Gate to Emitter Charge	Qge			20		nC
Gate to Collector “Miller” Charge	Qgc			10		nC
Diode Reverse Recovery Time	t_{rr}	I_F=10A, di/dt=100A/μs, V_{CC}=50V, See Fig.3		70		ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Thermal Characteristics at Ta = 25°C, Unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Thermal Resistance IGBT (junction- Case)	Rth(j-c) (IGBT)	Tc=25°C (Our ideal heat dissipation condition)*2	3.09	°C /W
Thermal Resistance Diode (junction- Case)	Rth(j-c) (Diode)	Tc=25°C (Our ideal heat dissipation condition)*2	4	°C /W
Thermal Resistance (junction- ambient)	Rth(j-a)		59.5	°C /W

Fig.1 Switching Time Test Circuit

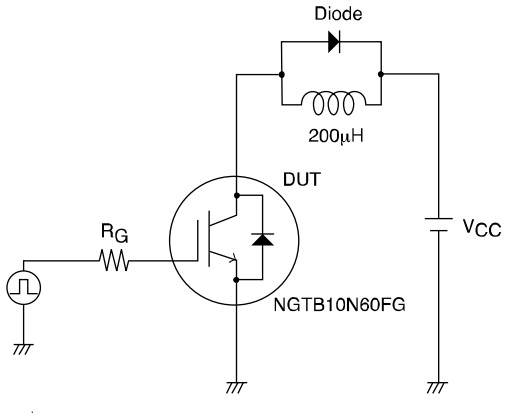


Fig.2 Timing Chart

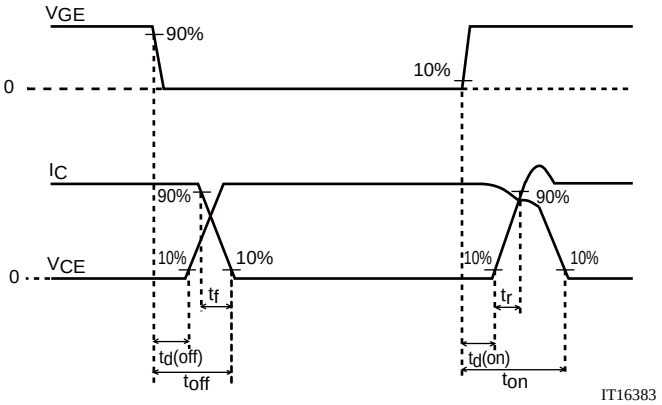
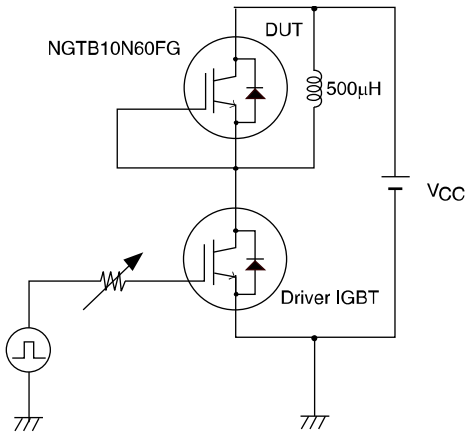
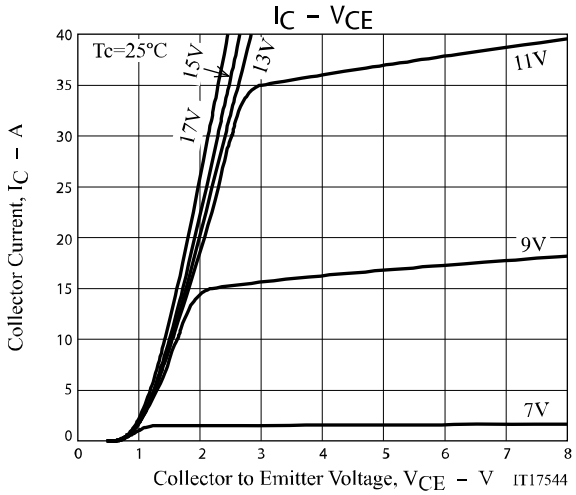
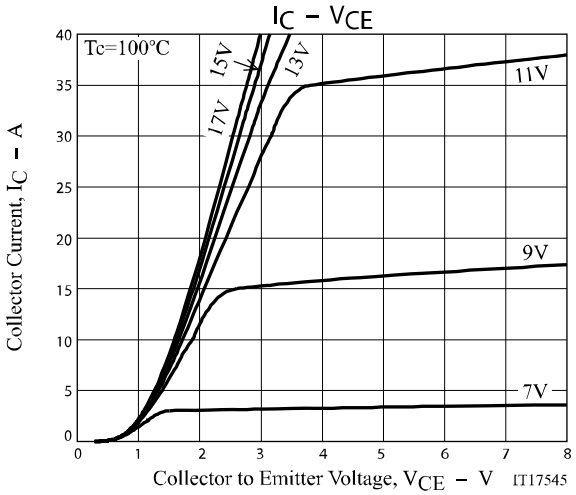
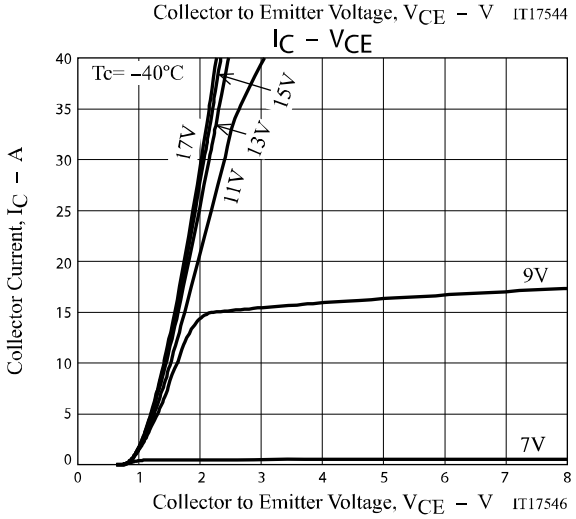


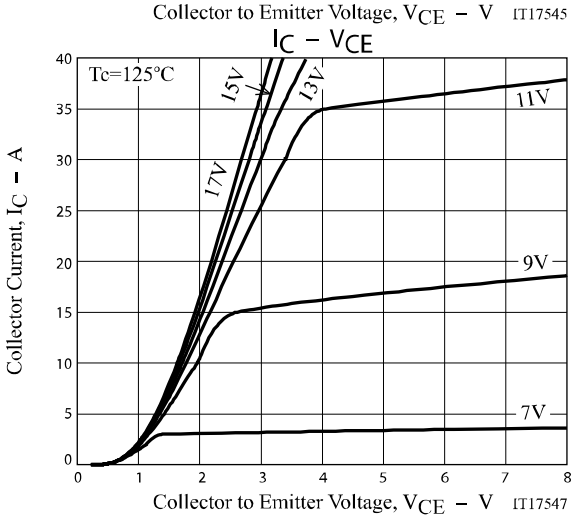
Fig.3 Reverse Recovery Time Test Circuit

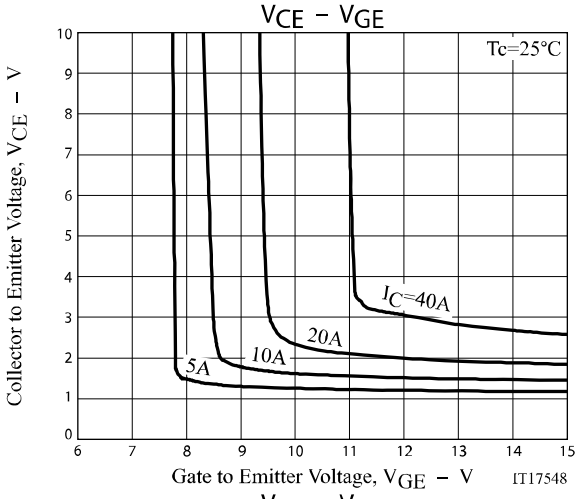


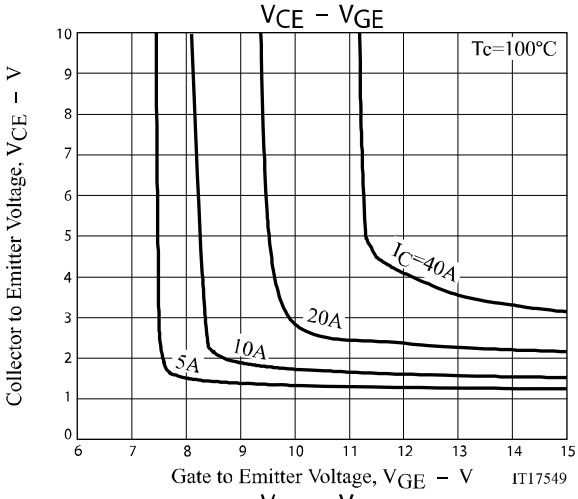

IC – VCE
Tc=25°C
15V
13V
17V
11V
9V
7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17544

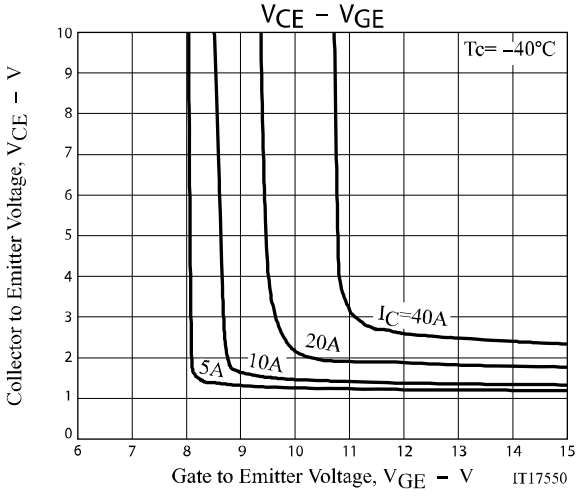

IC – VCE
Tc=100°C
15V
13V
17V
11V
9V
7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17545

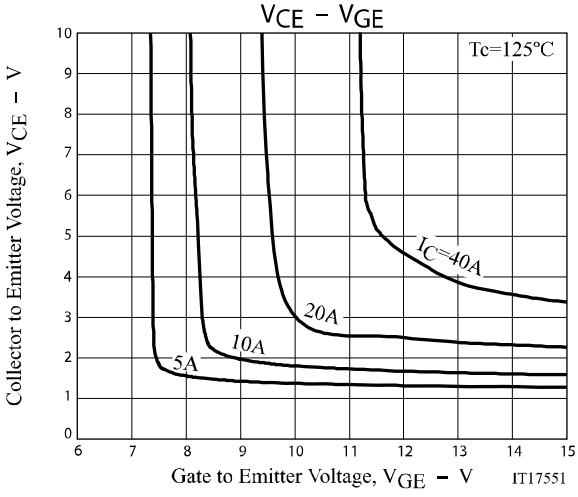

IC – VCE
Tc= –40°C
15V
13V
17V
11V
9V
7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17546

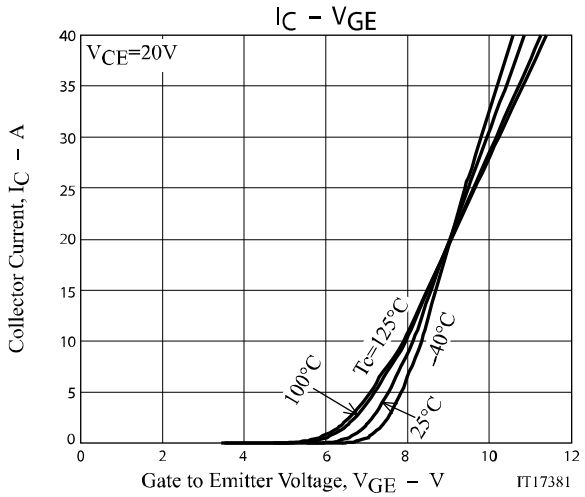

IC – VCE
Tc=125°C
15V
13V
17V
11V
9V
7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17547

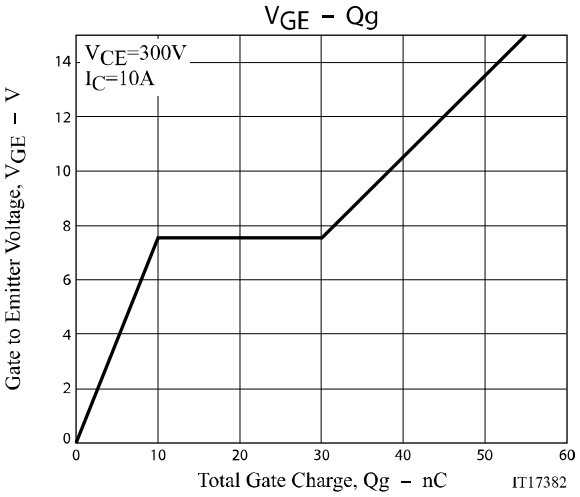

VCE – VGE
Tc=25°C
IC=40A
20A
10A
5A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17548

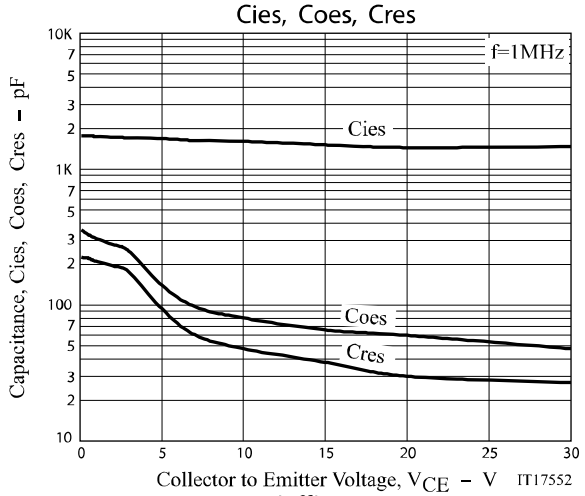

VCE – VGE
Tc=100°C
IC=40A
20A
10A
5A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17549

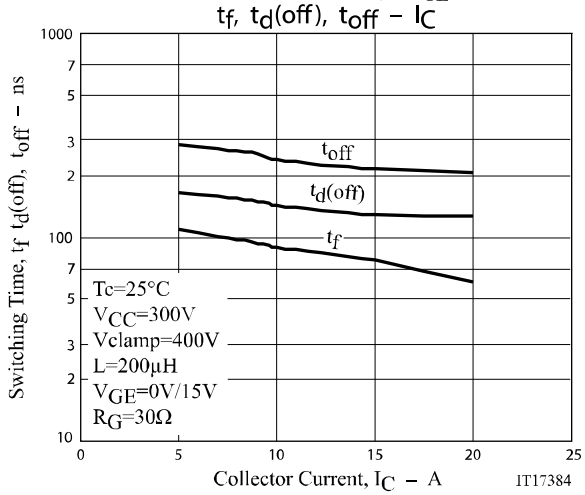

VCE – VGE
Tc= –40°C
IC=40A
20A
10A
5A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17550

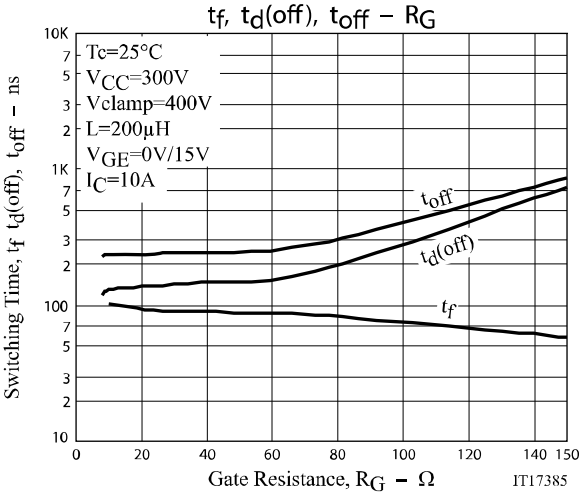

VCE – VGE
Tc=125°C
IC=40A
20A
10A
5A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17551

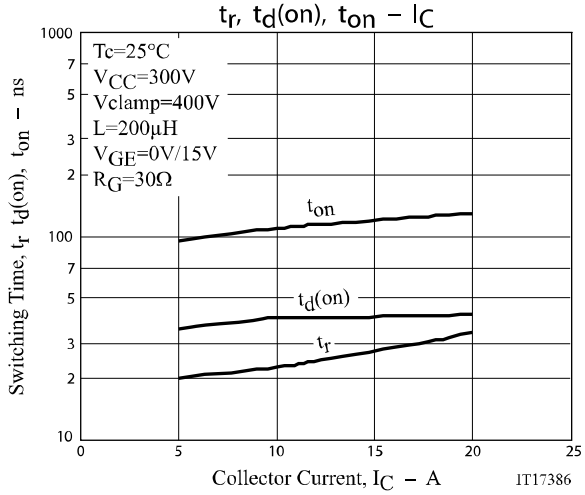

IC – VGE
VCE=20V
Collector Current, IC – A
Gate to Emitter Voltage, VGE – V
100°C
Tc=125°C
–40°C
25°C
IT17381

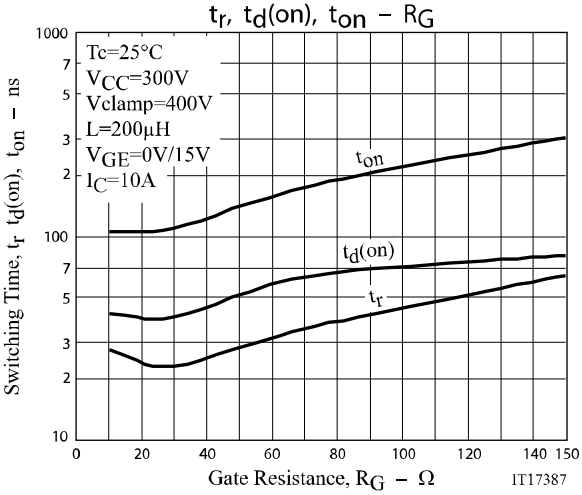

VGE – Qg
VCE=300V
IC=10A
Gate to Emitter Voltage, VGE – V
Total Gate Charge, Qg – nC
IT17382


Cies, Coes, Cres
f=1MHz
Cies
Coes
Cres
Capacitance, Cies, Coes, Cres – pF
Collector to Emitter Voltage, VCE – V
IT17552

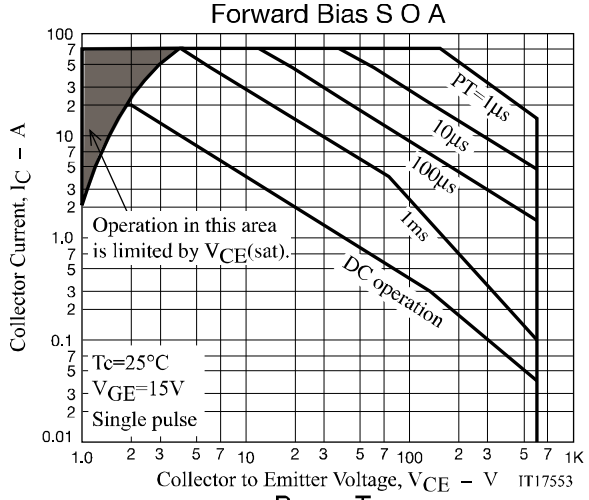

tf, td(off), toff – IC
toff
td(off)
tf
Tc=25°C
VCC=300V
Vclamp=400V
L=200µH
VGE=0V/15V
RG=30Ω
Switching Time, tf, td(off), toff – ns
Collector Current, IC – A
IT17384


tf, td(off), toff – RG
Tc=25°C
VCC=300V
Vclamp=400V
L=200µH
VGE=0V/15V
IC=10A
toff
td(off)
tf
Switching Time, tf, td(off), toff – ns
Gate Resistance, RG – Ω
IT17385

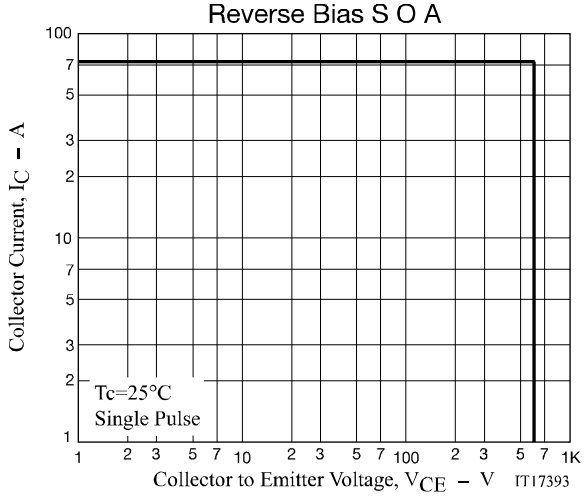

tr, td(on), ton – IC
Tc=25°C
VCC=300V
Vclamp=400V
L=200µH
VGE=0V/15V
RG=30Ω
ton
td(on)
tr
Switching Time, tr, td(on), ton – ns
Collector Current, IC – A
IT17386


tr, td(on), ton – RG
Tc=25°C
VCC=300V
Vclamp=400V
L=200µH
VGE=0V/15V
IC=10A
ton
td(on)
tr
Switching Time, tr, td(on), ton – ns
Gate Resistance, RG – Ω
IT17387

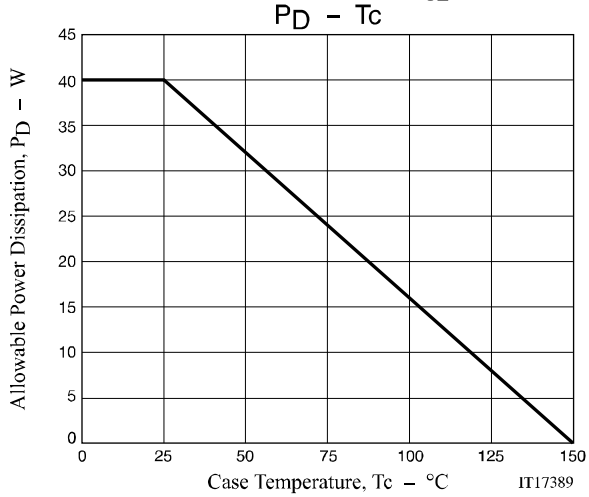
Forward Bias S O A



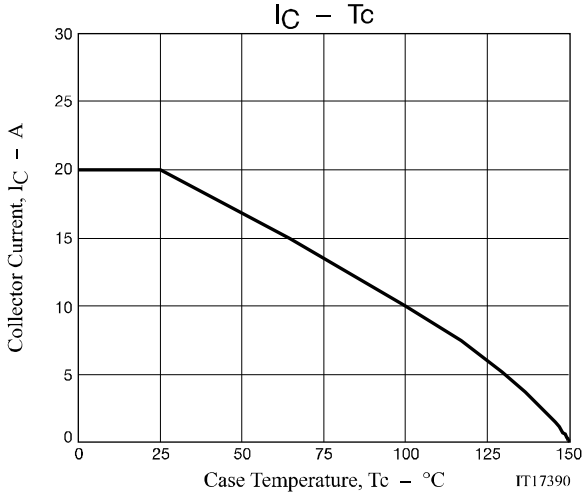
Reverse Bias S O A



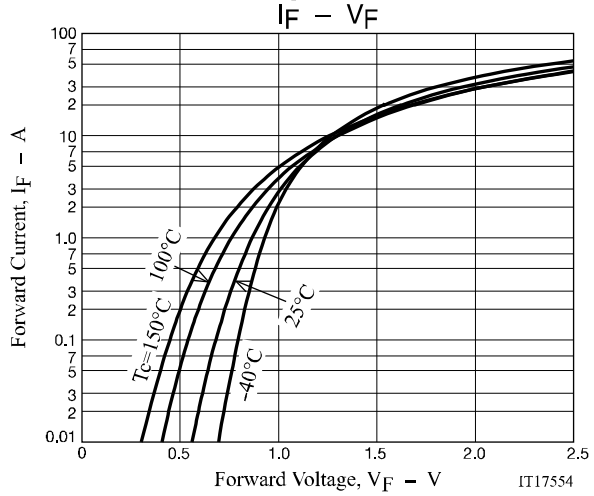
P_D – Tc



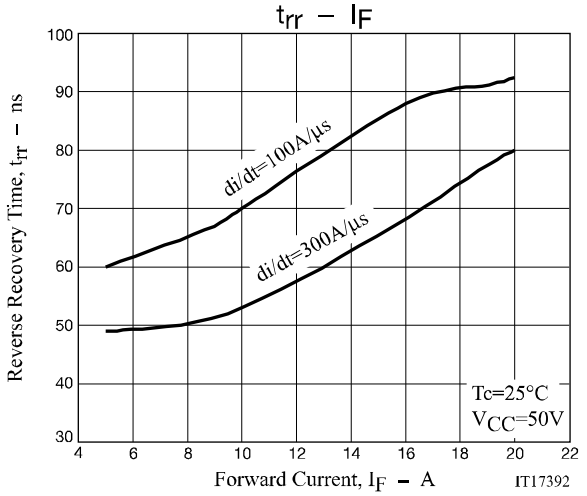
I_C – Tc



I_F – V_F



t_{rr} – I_F



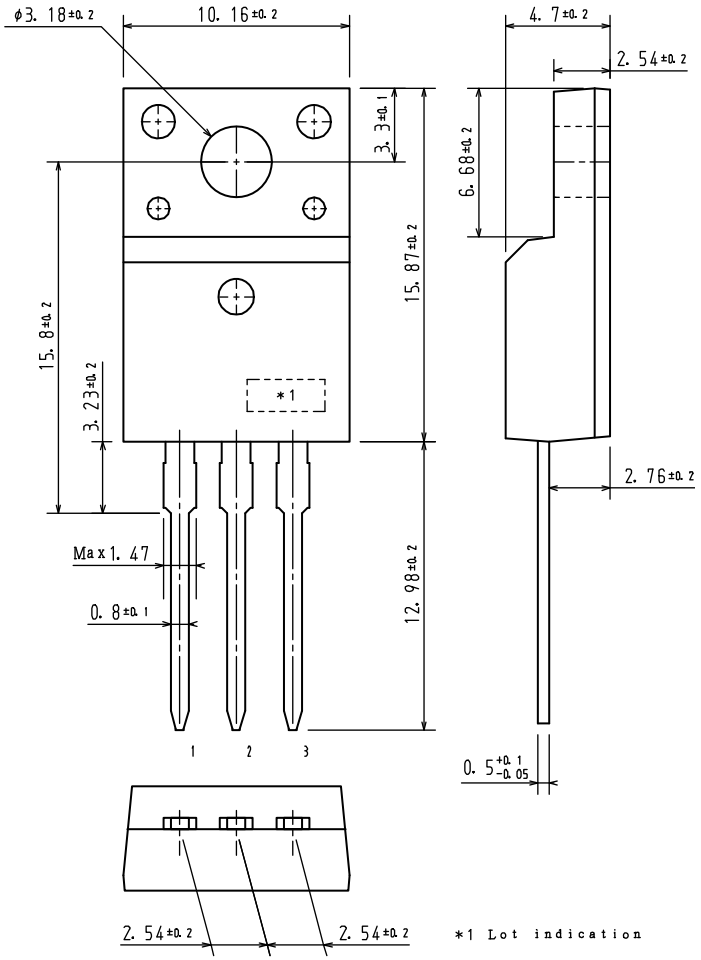
Package Dimensions

NGTB10N60FG

TO-220F-3FS

CASE 221AM
ISSUE O
Unit : mm

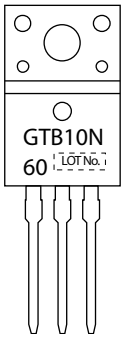
1: Gate
2: Collector
3: Emitter



Ordering & Package Information

Device	Package	Shipping	note
NGTB10N60FG	TO-220F-3FS SC-67	50 pcs. / tube	Pb-Free

Marking



Electrical Connection