NGTB15N60R2FG

IGBT
600V, 14A, N-Channel

ON Semiconductor®

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Features

- Reverse Conducting Ⅱ IGBT
- IGBT V_{CE}(sat)=1.85V typ. (I_C=15A, V_{GE}=15V)
- IGBT t_f=75ns typ.
- Diode V_F=1.7V typ. (I_F=15A)
- Diode t_{rr}=95ns typ.
- 10μs Short Circuit Capability

Applications

- General Purpose Inverter

Specifications

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

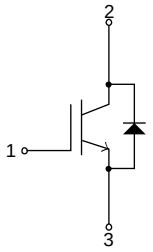
Parameter		Symbol	Value	Unit
Collector to Emitter Voltage		V_{CES}	600	V
Gate to Emitter Voltage		V_{GES}	±20	V
Collector Current (DC)	@Tc=25°C *2	I_C *1	24	A
Limited by Tjmax	@Tc=100°C *2		14	A
Collector Current (Peak) Pulse width Limited by Tjmax		I_{CP}	60	A
Diode Average Output Current		I_O	15	A
Power Dissipation Tc=25°C (Our ideal heat dissipation condition) *2		P_D	54	W
Junction Temperature		Tj	175	°C
Storage Temperature		Tstg	−55 to +175	°C

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

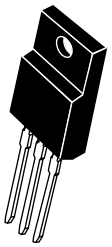
$$I_C(Tc)= \frac{Tjmax - Tc}{R_{th}(j\text{-}c)\times V_{CE}(sat)\ (I_C(Tc))}$$

*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 aluminum.

Electrical Connection
N-Channel

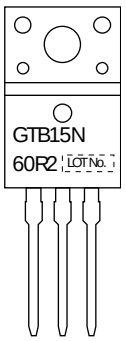


1:Gate
2:Collector
3:Emitter



TO-220F-3FS

Marking



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.

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

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

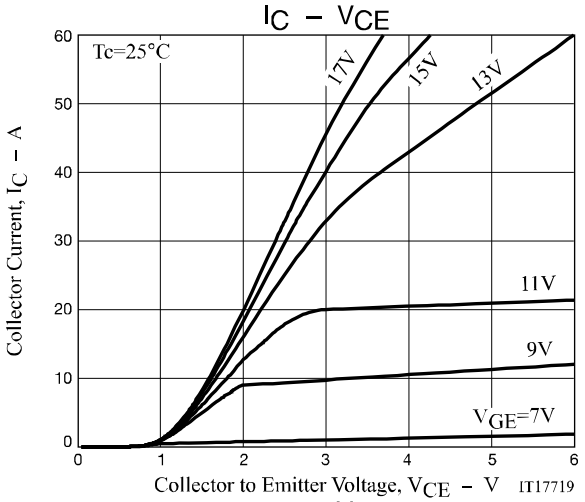
Parameter	Symbol	Conditions		Value min	Value typ	Value max	Unit
Collector to Emitter Breakdown Voltage	$V_{(BR)CES}$	I_C=500μA, V_{GE}=0V		600			V
Collector to Emitter Cut off Current	I_{CES}	V_{CE}=600V, V_{GE}=0V	Tc=25°C			10	μA
			Tc=125°C			1	mA
Gate to Emitter Leakage Current	I_{GES}	V_{GE}=±20V, V_{CE}=0V				±100	nA
Gate to Emitter Threshold Voltage	V_{GE}(th)	V_{CE}=20V, I_C=250μA		4.5		7.0	V
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=15A	Tc=25°C		1.85	2.1	V
		V_{GE}=15V, I_C=14A	Tc=100°C		2.0	2.3	V
Forward Diode Voltage	V_F	I_F=15A			1.7	2.1	V
Input Capacitance	Cies	V_{CE}=20V, f=1MHz			2000		pF
Output Capacitance	Coes				65		pF
Reverse Transfer Capacitance	Cres				50		pF
Turn-ON Delay Time	$t_{d(on)}$	V_{CC}=300V, I_C=15A R_G=30Ω, L=500μH V_{GE}=0V/15V Vclamp=400V Tc=25°C See Fig.1, See Fig.2			70		ns
Rise Time	t_r				40		ns
Turn-ON Time	ton				200		ns
Turn-OFF Delay Time	$t_{d(off)}$				190		ns
Fall Time	t_f				75		ns
Turn-OFF Time	toff				290		ns
Turn-ON Energy	Eon				550		μJ
Turn-OFF Energy	Eoff				220		μJ
Total Gate Charge	Qg	V_{CE}=300V, V_{GE}=15V, I_C=15A			80		nC
Gate to Emitter Charge	Qge				16		nC
Gate to Collector “Miller” Charge	Qgc				38		nC
Diode Reverse Recovery Time	t_{rr}	I_F=15A,di/dt=300A/μs, V_{CC}=300V, See Fig.3			95		ns

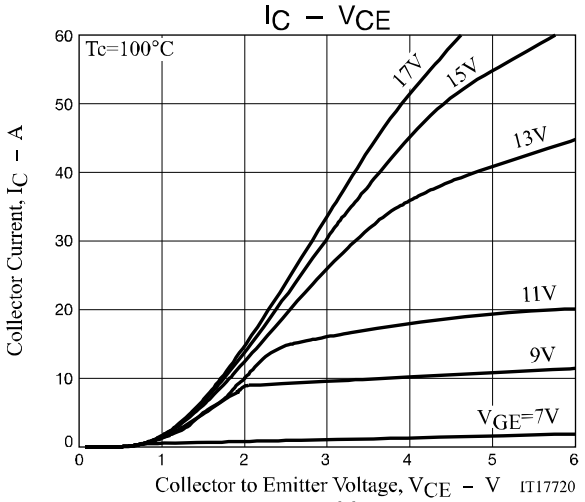
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

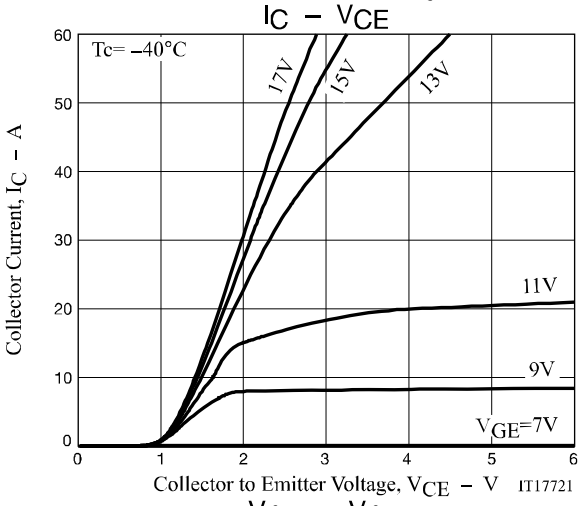
Thermal Characteristics at Ta = 25°C, Unless otherwise specified

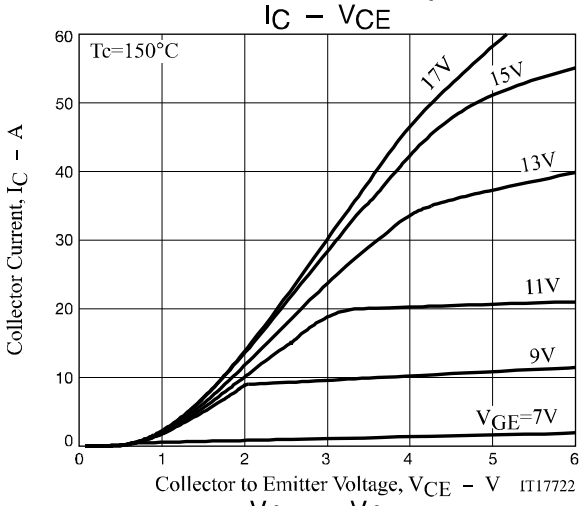
Parameter	Symbol	Conditions	Value	Unit
Thermal Resistance IGBT (Junction to Case)	Rth(j-c) (IGBT)	Tc=25°C (Our ideal heat dissipation condition) *2	2.78	°C/W
Thermal Resistance (Junction to Ambient)	Rth(j-a)		69	°C/W

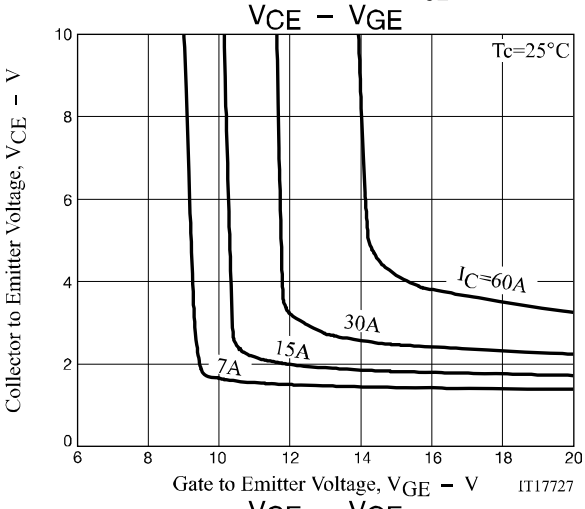
Note : *2 Our condition is radiation from backside.
The method is applying silicone grease to the backside of the device and attaching the device to water-cooled radiator made of aluminum.

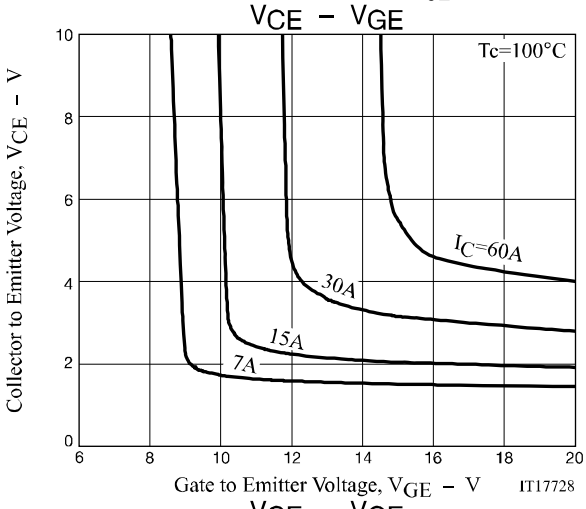

IC – VCE
Tc=25°C
17V
15V
13V
11V
9V
VGE=7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17719

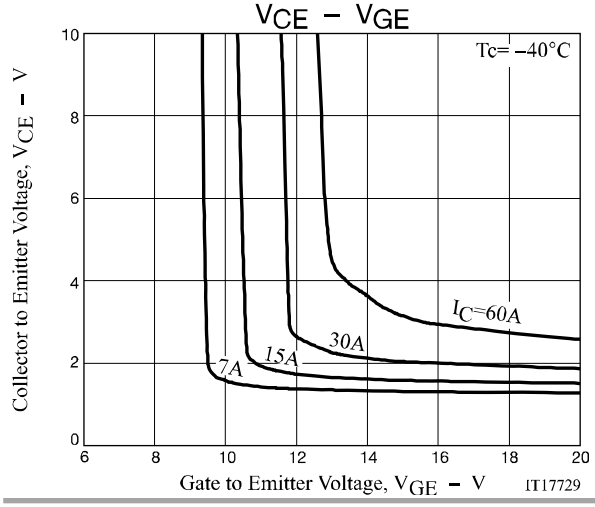

IC – VCE
Tc=100°C
17V
15V
13V
11V
9V
VGE=7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17720

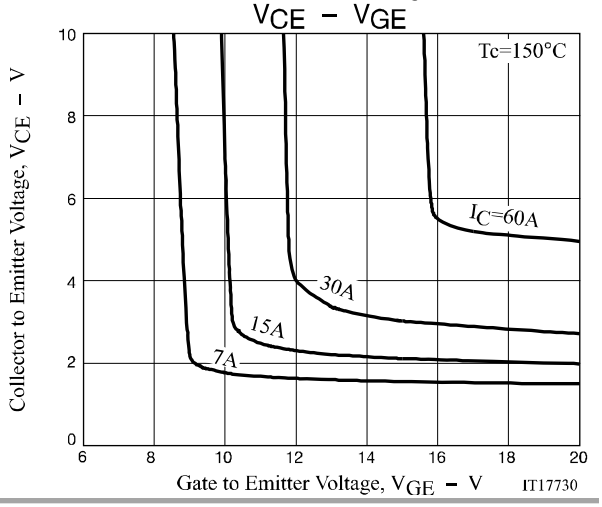

IC – VCE
Tc= –40°C
17V
15V
13V
11V
9V
VGE=7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17721

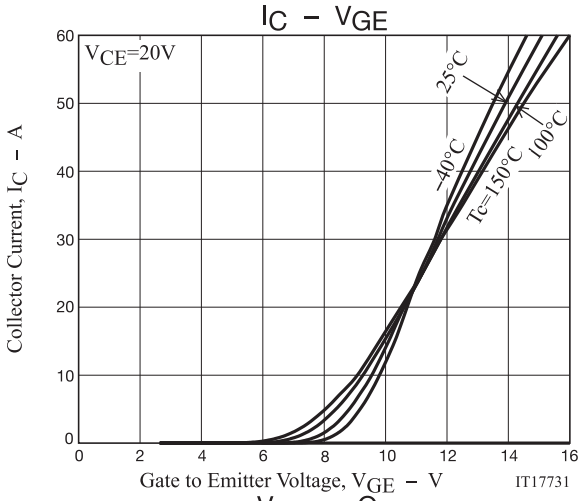

IC – VCE
Tc=150°C
17V
15V
13V
11V
9V
VGE=7V
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17722

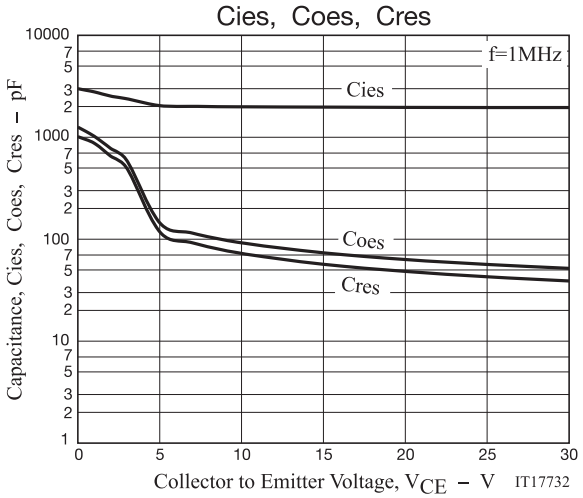

VCE – VGE
Tc=25°C
IC=60A
30A
15A
7A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17727

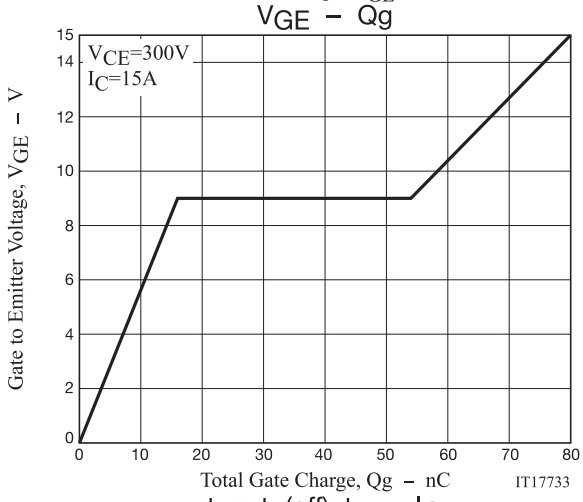

VCE – VGE
Tc=100°C
IC=60A
30A
15A
7A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17728

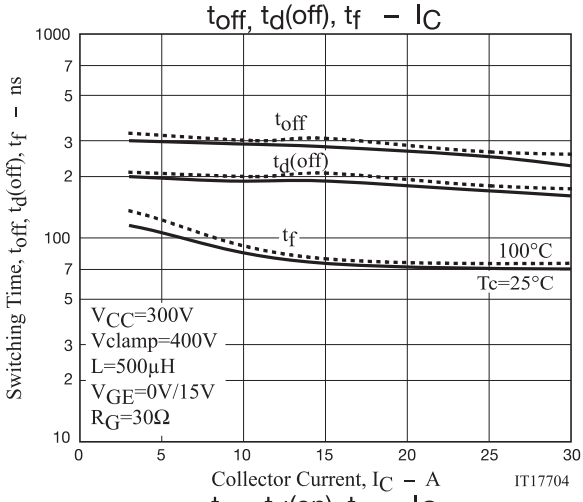

VCE – VGE
Tc= –40°C
IC=60A
30A
15A
7A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17729

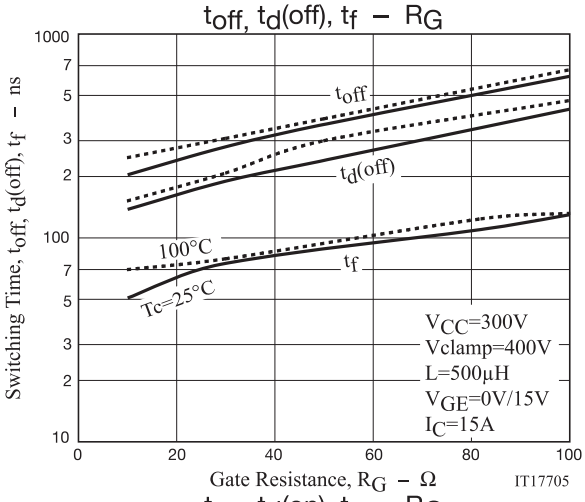

VCE – VGE
Tc=150°C
IC=60A
30A
15A
7A
Collector to Emitter Voltage, VCE – V
Gate to Emitter Voltage, VGE – V
IT17730

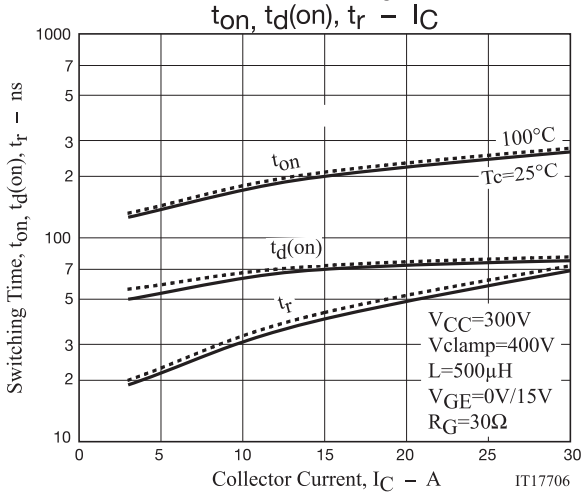

I_C – V_{GE}
V_{CE}=20V
25°C
40°C
Tc=150°C
100°C
Collector Current, I_C – A
Gate to Emitter Voltage, V_{GE} – V
IT17731

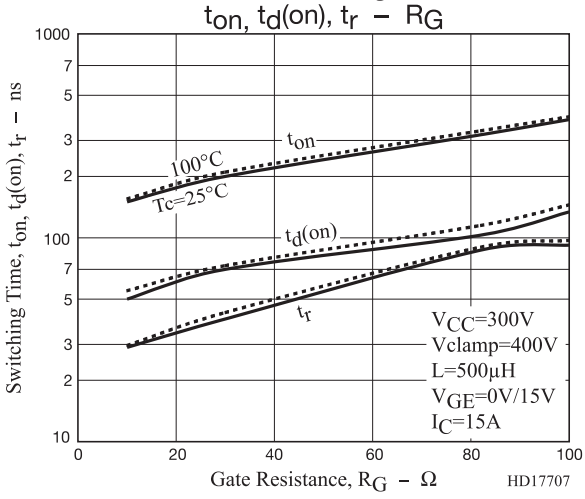

Cies, Coes, Cres
f=1MHz
Cies
Coes
Cres
Capacitance, Cies, Coes, Cres – pF
Collector to Emitter Voltage, V_{CE} – V
IT17732

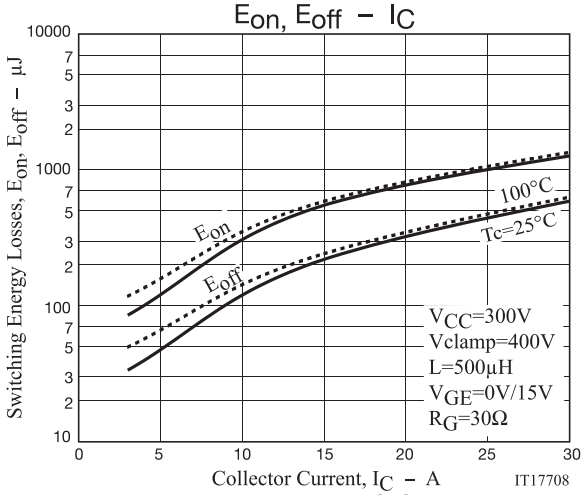

V_{GE} – Qg
V_{CE}=300V
I_C=15A
Gate to Emitter Voltage, V_{GE} – V
Total Gate Charge, Qg – nC
IT17733

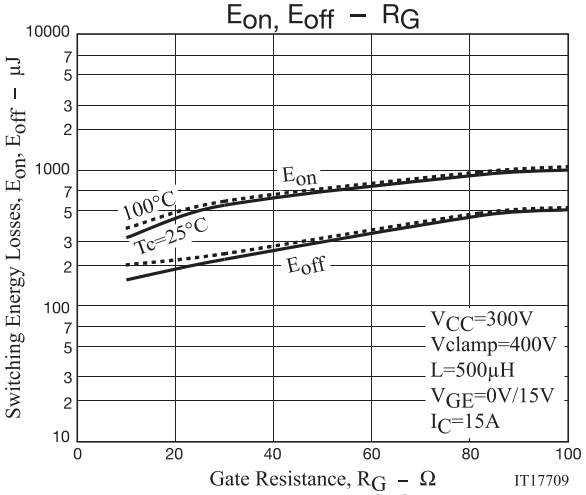

t_{off}, $t_{d(off)}$, t_f – I_C
t_{off}
$t_{d(off)}$
t_f
100°C
Tc=25°C
V_{CC}=300V
Vclamp=400V
L=500µH
V_{GE}=0V/15V
R_G=30Ω
Switching Time, t_{off}, $t_{d(off)}$, t_f – ns
Collector Current, I_C – A
IT17704

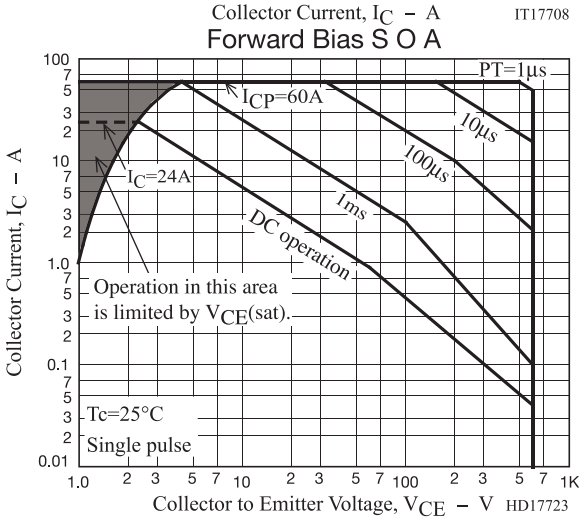

t_{off}, $t_{d(off)}$, t_f – R_G
t_{off}
$t_{d(off)}$
100°C
t_f
Tc=25°C
V_{CC}=300V
Vclamp=400V
L=500µH
V_{GE}=0V/15V
I_C=15A
Switching Time, t_{off}, $t_{d(off)}$, t_f – ns
Gate Resistance, R_G – Ω
IT17705

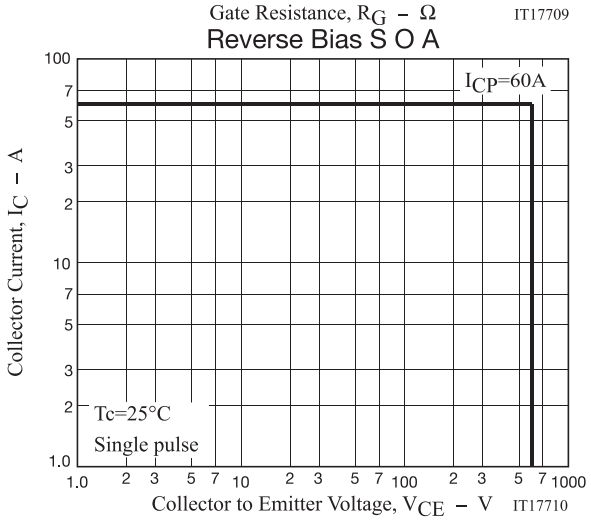

t_{on}, $t_{d(on)}$, t_r – I_C
100°C
t_{on}
Tc=25°C
$t_{d(on)}$
t_r
V_{CC}=300V
Vclamp=400V
L=500µH
V_{GE}=0V/15V
R_G=30Ω
Switching Time, t_{on}, $t_{d(on)}$, t_r – ns
Collector Current, I_C – A
IT17706

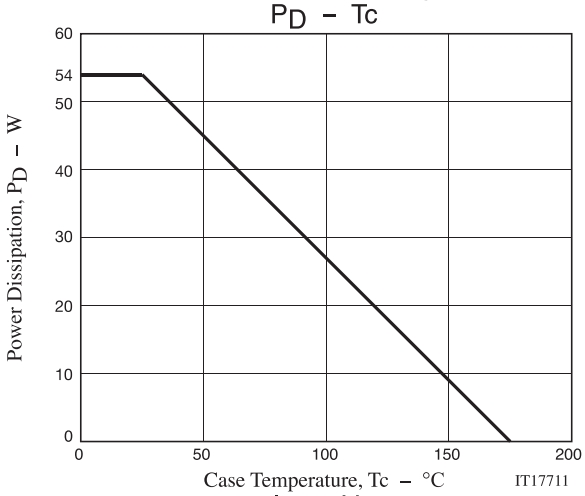

t_{on}, $t_{d(on)}$, t_r – R_G
t_{on}
100°C
Tc=25°C
$t_{d(on)}$
t_r
V_{CC}=300V
Vclamp=400V
L=500µH
V_{GE}=0V/15V
I_C=15A
Switching Time, t_{on}, $t_{d(on)}$, t_r – ns
Gate Resistance, R_G – Ω
HD17707

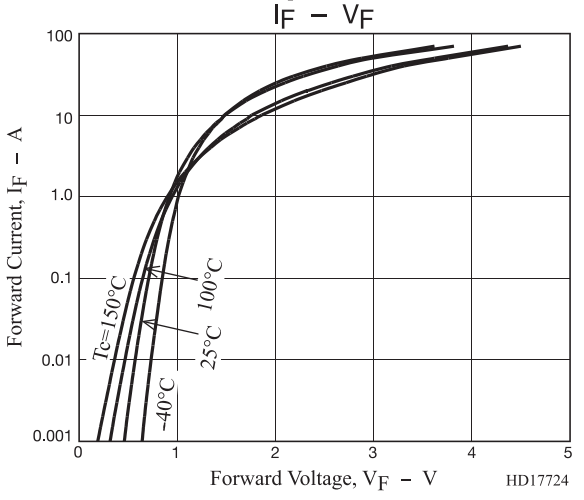

Eon, Eoff – IC
Switching Energy Losses, Eon, Eoff – μJ
Collector Current, IC – A
IT17708
Eon
Eoff
100°C
Tc=25°C
VCC=300V
Vclamp=400V
L=500μH
VGE=0V/15V
RG=30Ω

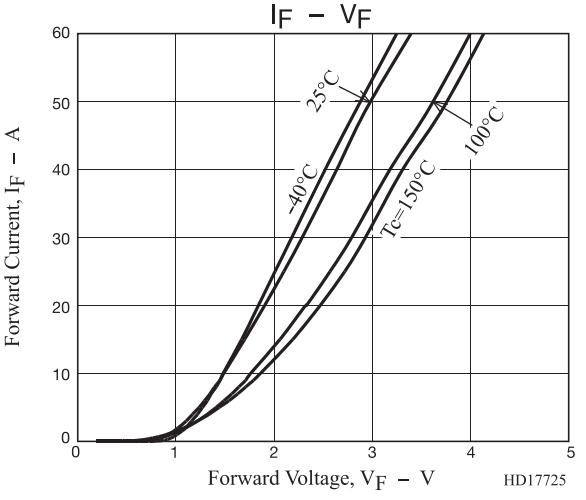

Eon, Eoff – RG
Switching Energy Losses, Eon, Eoff – μJ
Gate Resistance, RG – Ω
IT17709
Eon
Eoff
100°C
Tc=25°C
VCC=300V
Vclamp=400V
L=500μH
VGE=0V/15V
IC=15A

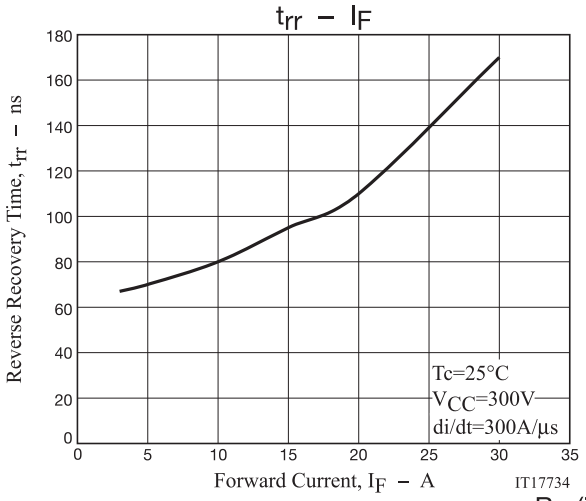

Forward Bias S O A
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
HD17723
PT=1μs
ICP=60A
IC=24A
10μs
100μs
1ms
DC operation
Operation in this area
is limited by VCE(sat).
Tc=25°C
Single pulse


Reverse Bias S O A
Collector Current, IC – A
Collector to Emitter Voltage, VCE – V
IT17710
ICP=60A
Tc=25°C
Single pulse


PD – Tc
Power Dissipation, PD – W
Case Temperature, Tc – °C
IT17711


IF – VF
Forward Current, IF – A
Forward Voltage, VF – V
HD17724
Tc=150°C
100°C
25°C
–40°C


IF – VF
Forward Current, IF – A
Forward Voltage, VF – V
HD17725
25°C
–40°C
Tc=150°C
100°C



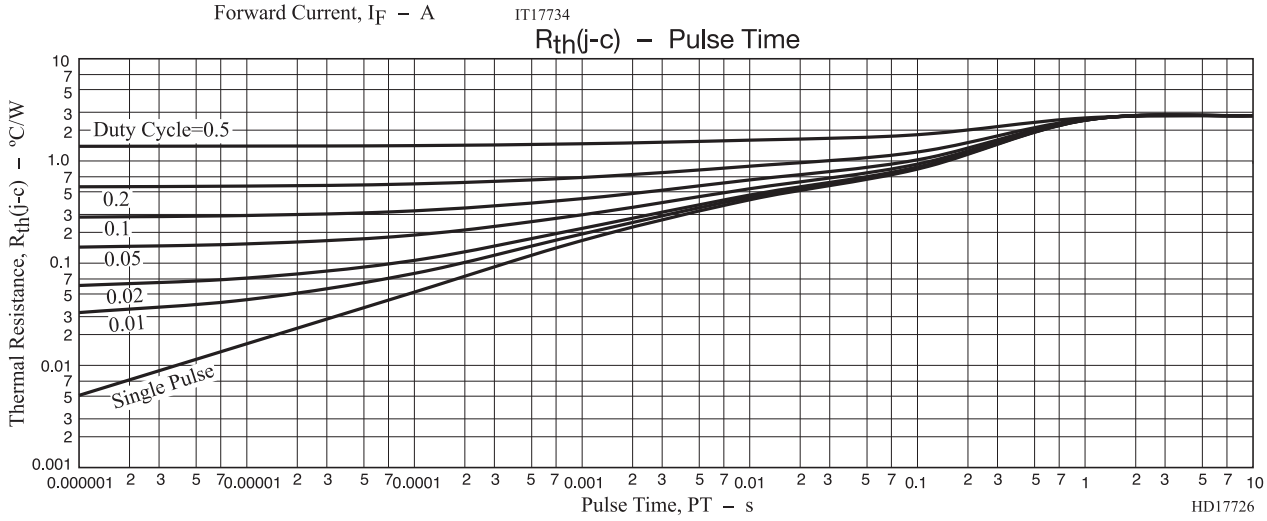


Fig.1 Switching Time Test Circuit

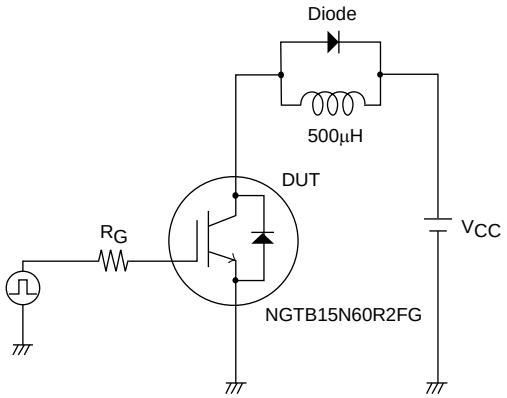


Fig.2 Timing Chart

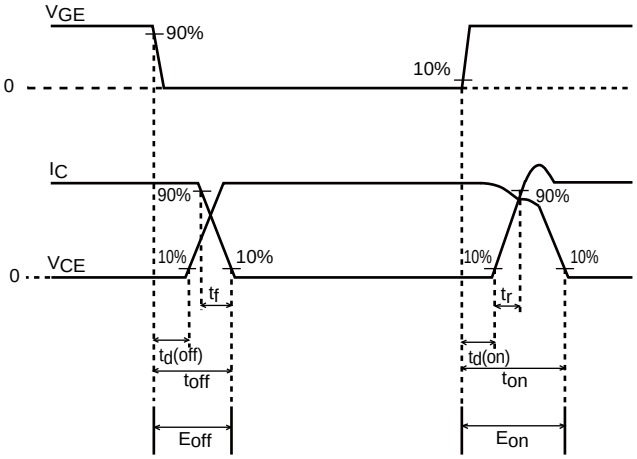
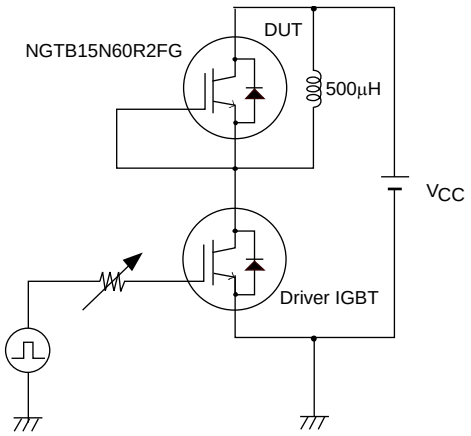


Fig.3 Reverse Recovery Time Test Circuit



Package Dimensions

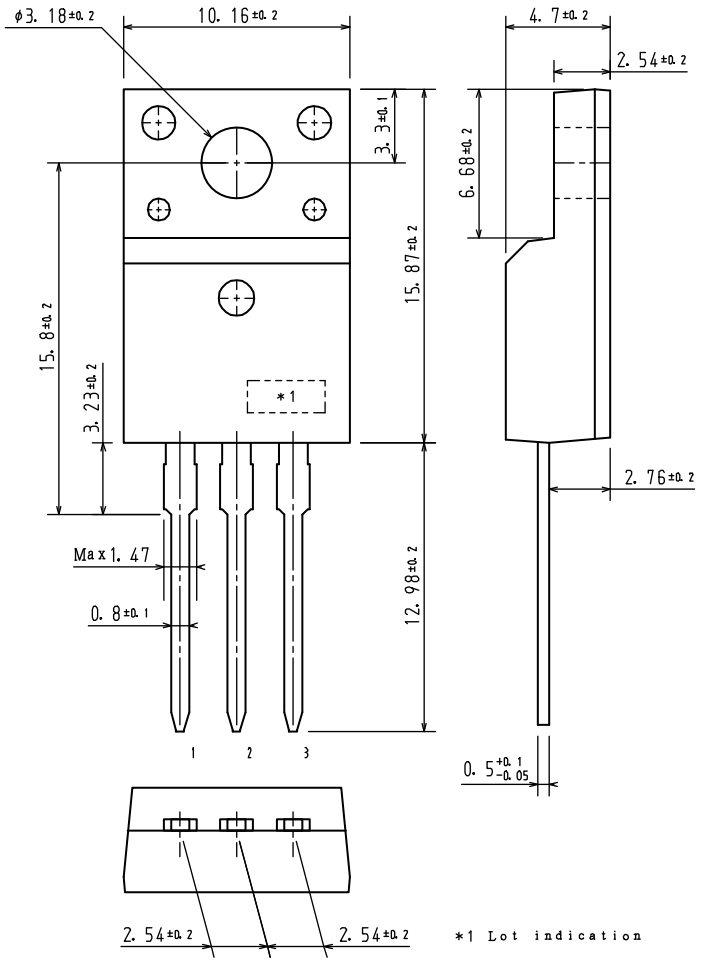
NGTB15N60R2FG

TO-220F-3FS

CASE 221AM
ISSUE O

unit : mm

1:Gate
2:Collector
3:Emitter



ORDERING INFORMATION

Device	Package	Shipping	note
NGTB15N60R2FG	TO-220F-3FS	50 pcs. / tube	Pb-Free and Halogen Free

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

ON Semiconductor:

NGTB15N60R2FG