



# NGTB20N60L2TF1G

## N-Channel IGBT 600V, 20A, $V_{CE(sat)}$ ;1.45V TO-3PF-3L with Low $V_F$ Switching Diode

ON Semiconductor®

<http://onsemi.com>

### Features

- IGBT  $V_{CE(sat)}$ =1.45V typ. ( $I_C$ =20A,  $V_{GE}$ =15V)
- IGBT  $t_f$ =67ns typ.
- Diode  $V_F$ =1.5V typ. ( $I_F$ =20A)
- Diode  $t_{rr}$ =70ns typ.
- Adaption of full isolation type package
- Enhancement type
- Maximum junction temperature  $T_j$ =175°C

### 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 $T_{jmax}$	@ $T_c=25^\circ\text{C} *2$	40	A
			@ $T_c=100^\circ\text{C} *2$	20	A
Collector Current (Pulse)	$I_{CP}$	Pulse width Limited by $T_{jmax}$	80	A	
Diode Average Output Current	$I_O$		20	A	
Allowable Power Dissipation	$P_D$	$T_c=25^\circ\text{C}$ (Our ideal heat dissipation condition) *2	64	W	

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

Continued on next page.

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

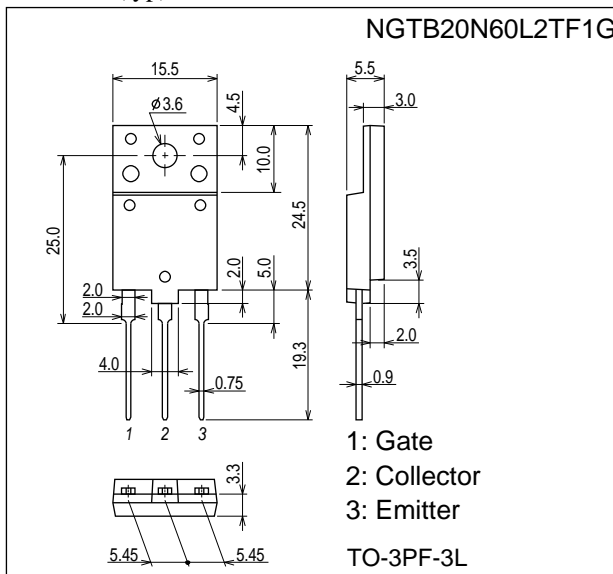
\*2 Our condition is radiation from backside.

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.

### Package Dimensions

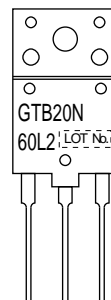
unit : mm (typ) 7538-001



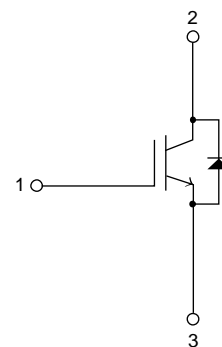
### Ordering & Package Information

Device	Package	Shipping	note
NGTB20N60L2TF1G	TO-3PF-3L SC-94	30 pcs. / tube	Pb-Free

### Marking



### Electrical Connection



# NGTB20N60L2TF1G

Continued from preceding page.

Parameter	Symbol	Conditions	Ratings	Unit
Junction Temperature	T <sub>j</sub>		175	°C
Storage Temperature	T <sub>stg</sub>		- 55 to +175	°C

## Electrical Characteristics at T<sub>a</sub> = 25°C, Unless otherwise specified

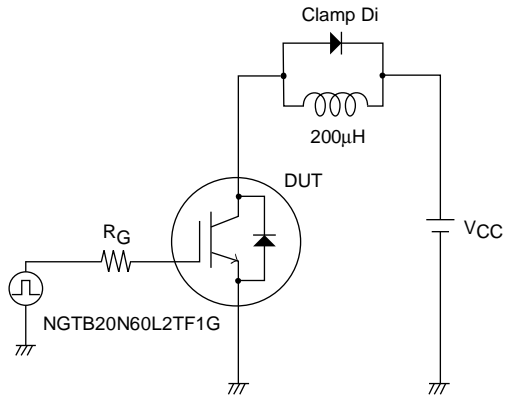
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector to Emitter Breakdown Voltage	V <sub>(BR)CES</sub>	I <sub>C</sub> =500μA, V <sub>GE</sub> =0V	600			V
Collector to Emitter Cut off Current	I <sub>CES</sub>	V <sub>CE</sub> =600V, V <sub>GE</sub> =0V T <sub>c</sub> =25°C T <sub>c</sub> =150°C			10	μA
					1	mA
Gate to Emitter Leakage Current	I <sub>GES</sub>	V <sub>GE</sub> =±20V, V <sub>CE</sub> =0V			±100	nA
Gate to Emitter Threshold Voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =20V, I <sub>C</sub> =250μA	4.5		6.5	V
Collector to Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V <sub>GE</sub> =15V, I <sub>C</sub> =20A T <sub>c</sub> =25°C T <sub>c</sub> =150°C		1.45	1.65	V
				1.8		V
Diode Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =20A		1.5		V
Input Capacitance	C <sub>ies</sub>	V <sub>CE</sub> =20V, f=1MHz		2000		pF
Output Capacitance	C <sub>oes</sub>			60		pF
Reverse Transfer Capacitance	C <sub>res</sub>			50		pF
Turn-ON Delay Time	t <sub>d(on)</sub>			60		ns
Rise Time	t <sub>r</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =20A R <sub>G</sub> =30Ω, L=200μH V <sub>GE</sub> =0V/15V, V <sub>clamp</sub> =400V See Fig.1, Fig.2		37		ns
Turn-ON Time	t <sub>on</sub>			400		ns
Turn-OFF Delay Time	t <sub>d(off)</sub>			193		ns
Fall Time	t <sub>f</sub>			67		ns
Turn-OFF Time	t <sub>off</sub>			281		ns
Total Gate Charge	Q <sub>g</sub>				84	
Gate to Emitter Charge	Q <sub>ge</sub>	V <sub>CE</sub> =300V, V <sub>GE</sub> =15V, I <sub>C</sub> =20A		16		nC
Gate to Collector "Miller" Charge	Q <sub>gc</sub>			37		nC
Diode Reverse Recovery Time	t <sub>rr</sub>		I <sub>F</sub> =10A, di/dt=100A/μs, V <sub>CC</sub> =50V See Fig.3		70	

## Thermal Characteristics at T<sub>a</sub> = 25°C, Unless otherwise specified

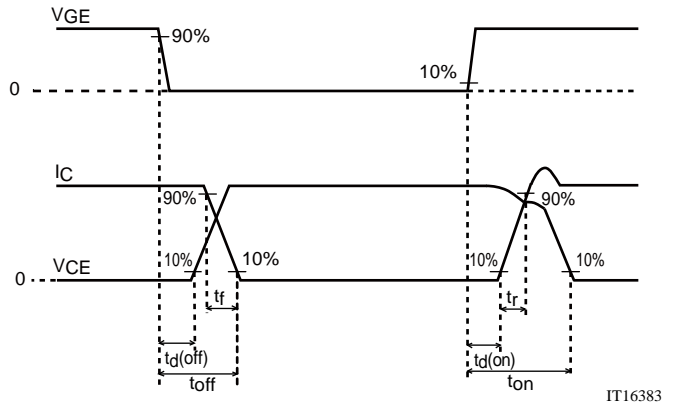
Parameter	Symbol	Conditions	Ratings	Unit
Thermal Resistance IGBT (junction- case)	R <sub>th(j-c)</sub> (IGBT)	T <sub>c</sub> =25°C (our ideal heat dissipation condition)*2	2.33	°C /W
Thermal Resistance Diode (junction- case)	R <sub>th(j-c)</sub> (Diode)	T <sub>c</sub> =25°C (our ideal heat dissipation condition)*2	2.36	°C /W
Thermal Resistance (junction- atmosphere)	R <sub>th(j-a)</sub>		47.5	°C /W

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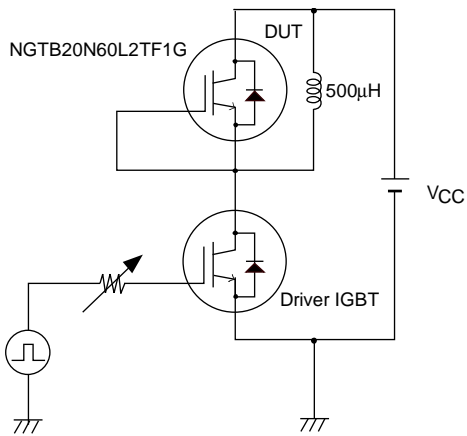
## Fig.1 Switching Time Test Circuit



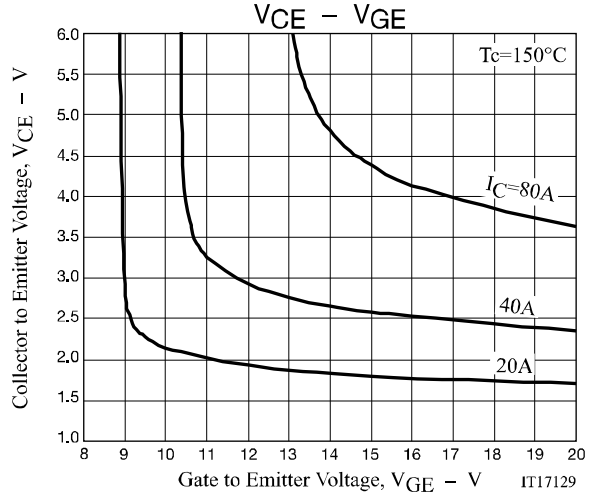
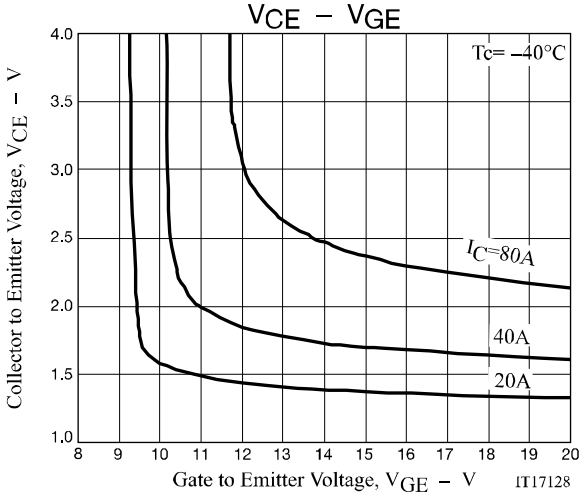
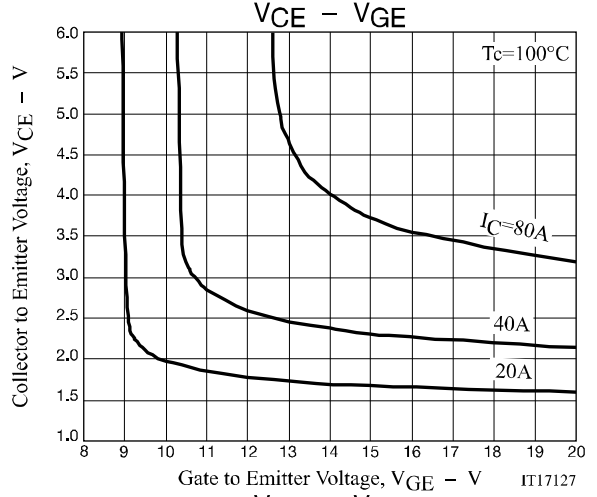
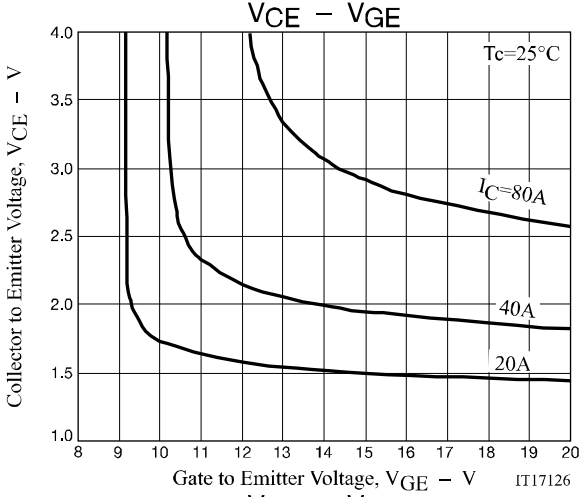
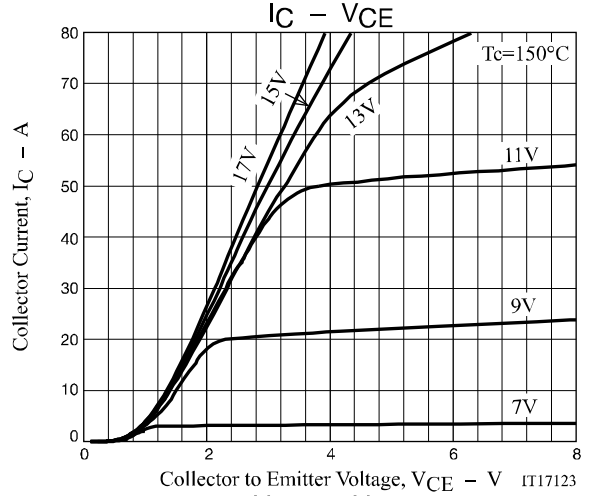
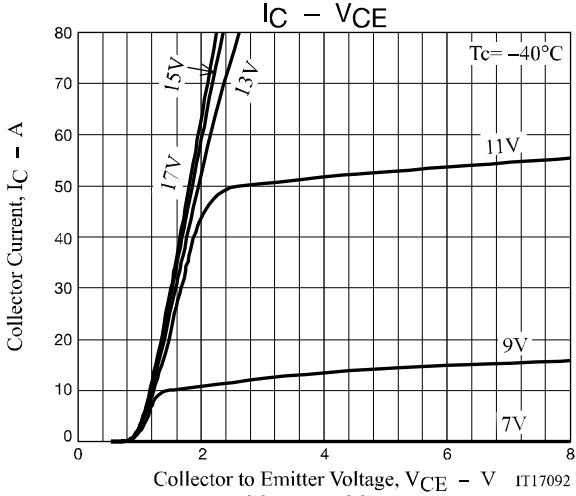
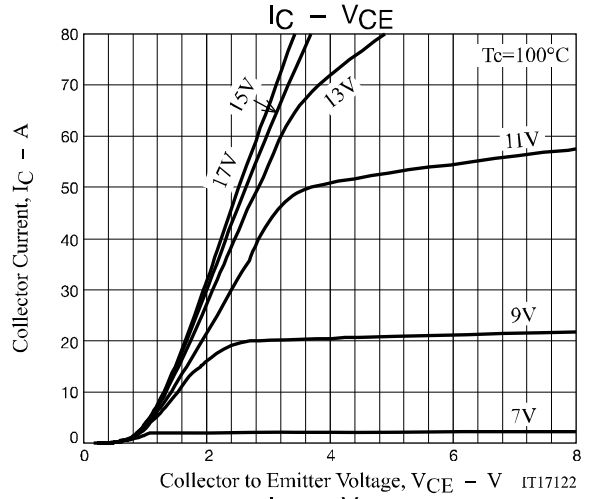
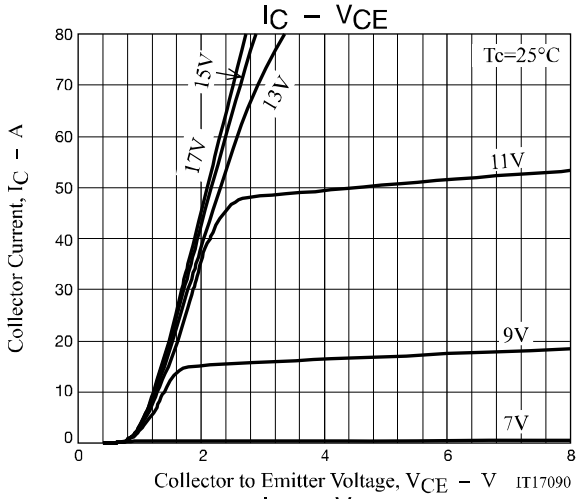
## Fig.2 Timing Chart



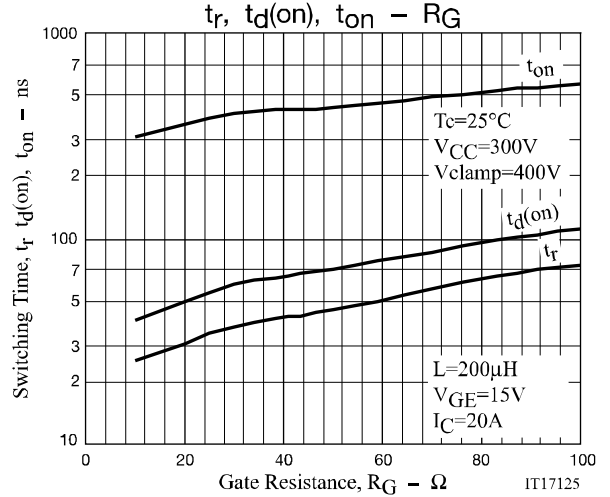
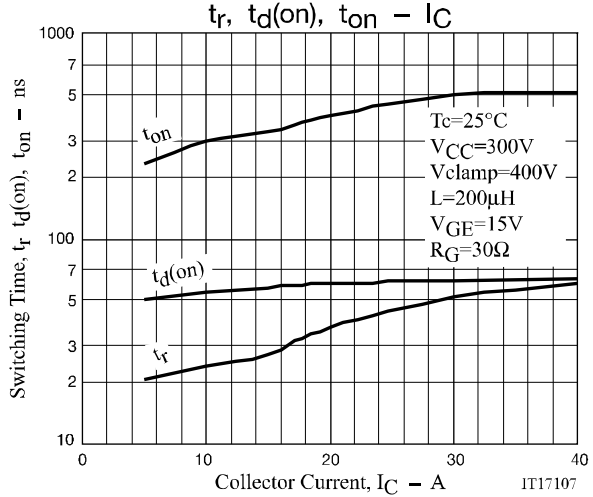
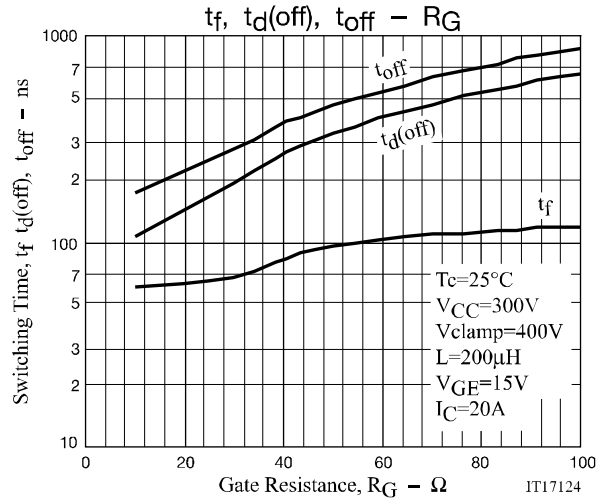
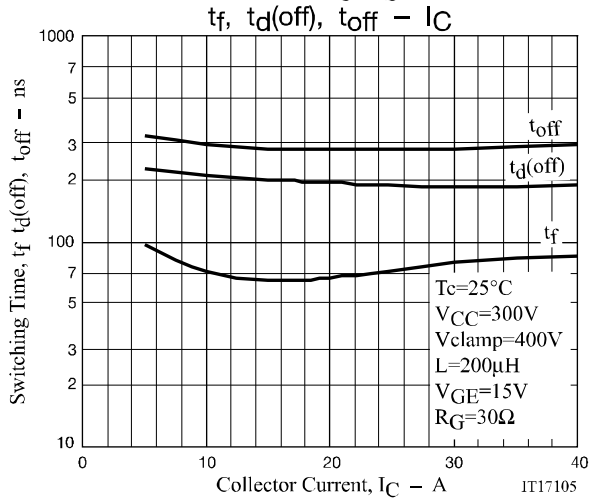
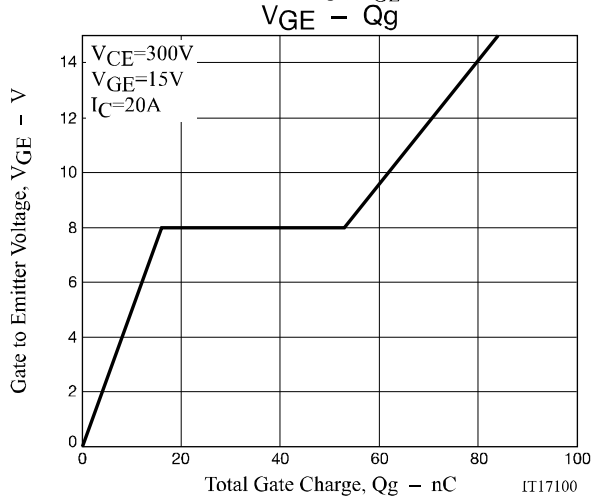
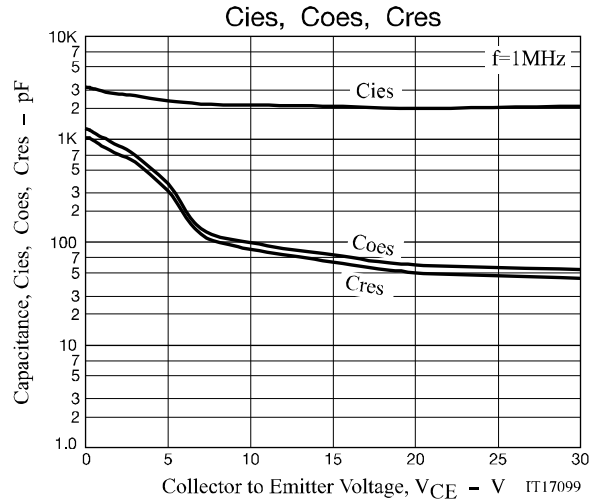
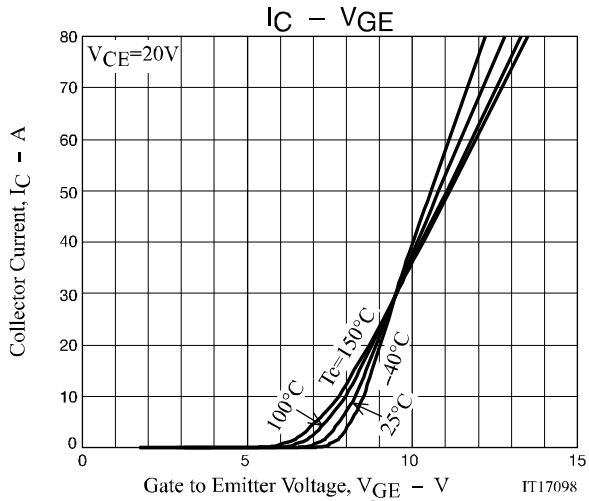
## Fig.3 Reverse Recovery Time Test Circuit



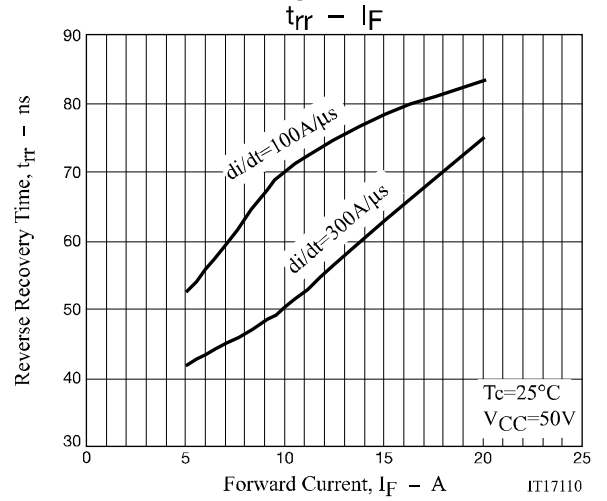
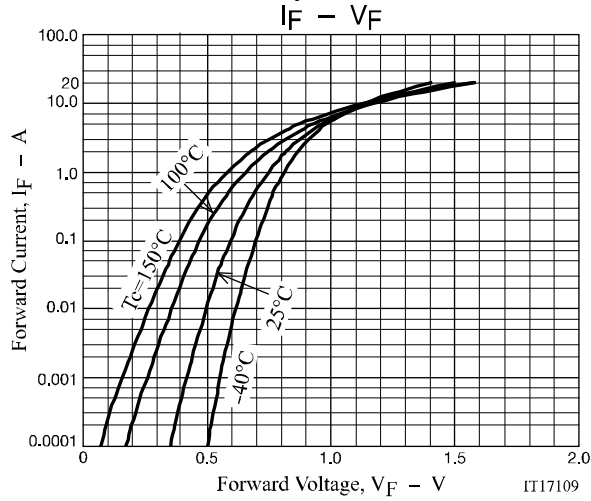
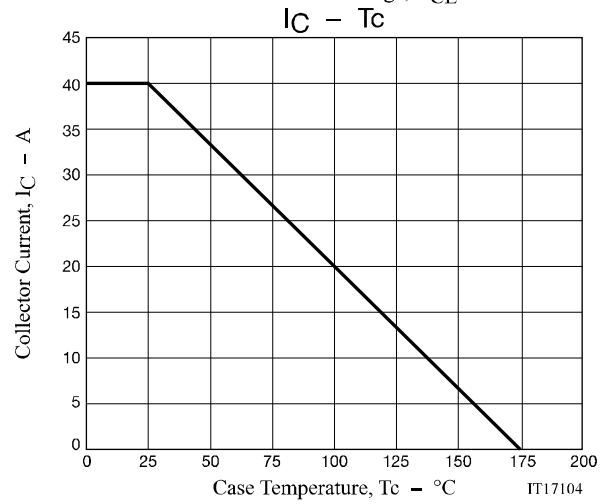
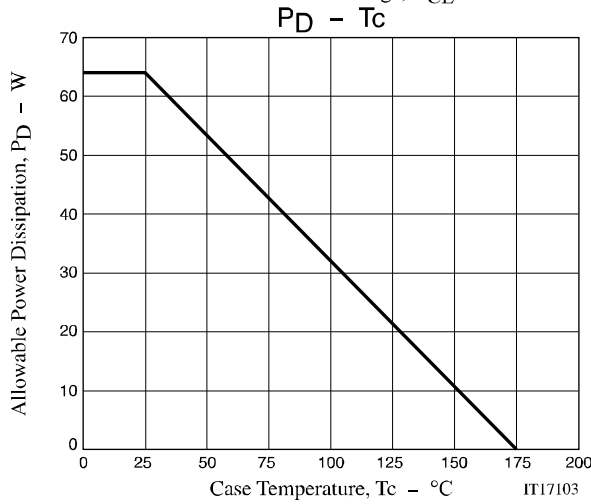
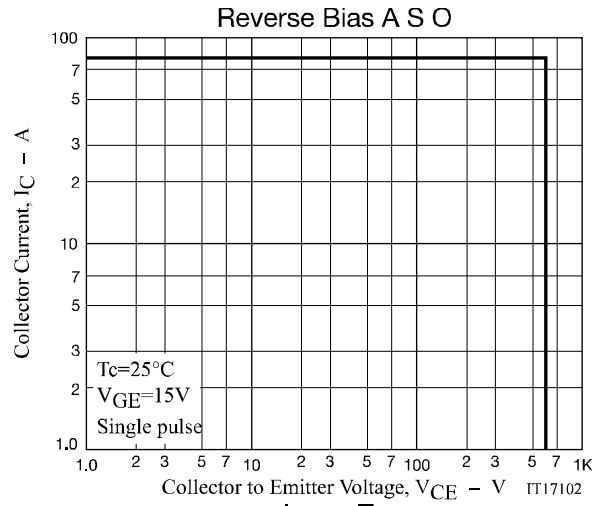
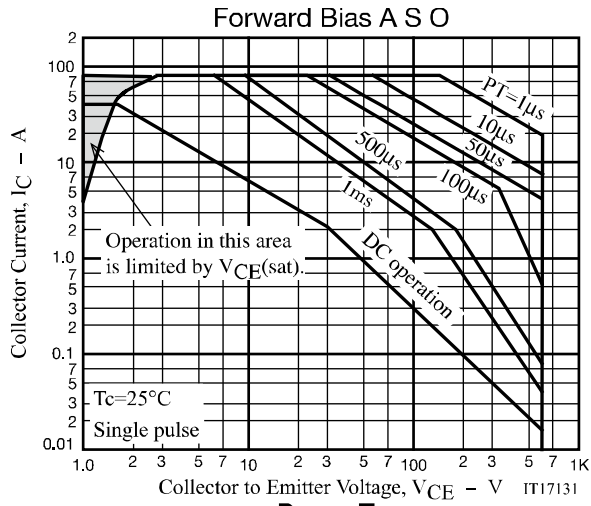
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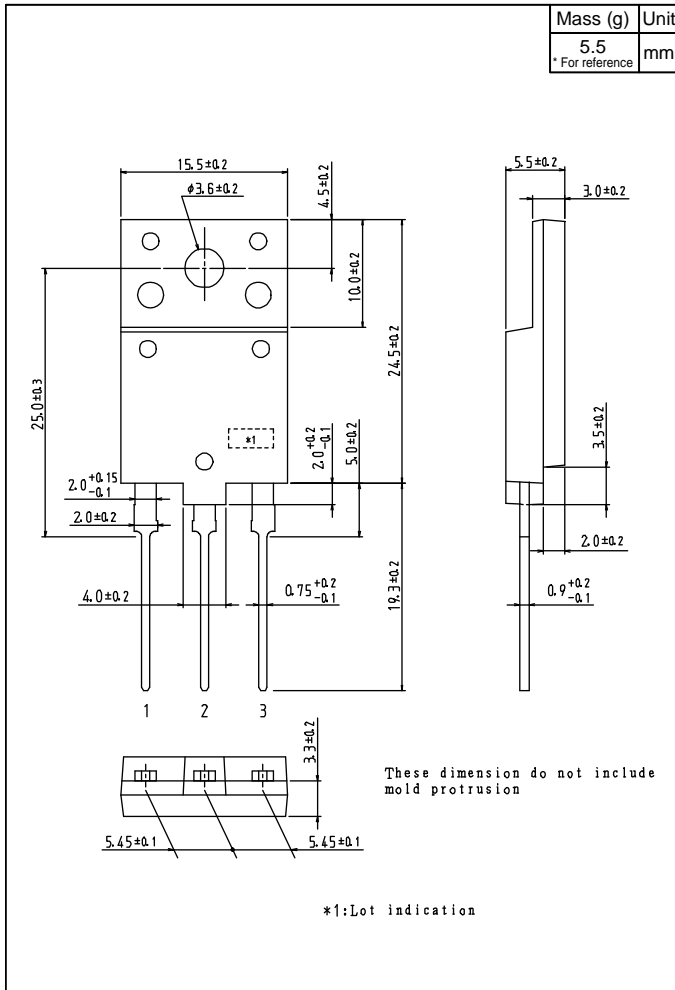
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# NGTB20N60L2TF1G

## Outline Drawing

NGTB20N60L2TF1G



# NGTB20N60L2TF1G

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