

# FGL60N100BNTD

## NPT-Trench IGBT

### General Description

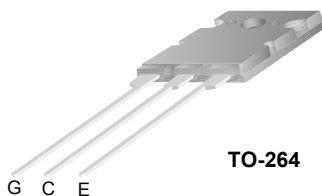
Trench insulated gate bipolar transistors (IGBTs) with NPT technology show outstanding performance in conduction and switching characteristics as well as enhanced avalanche ruggedness. These devices are well suited for Induction Heating ( I-H ) applications

### Features

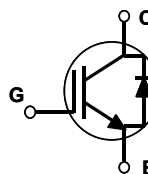
- High Speed Switching
- Low Saturation Voltage :  $V_{CE(sat)} = 2.5\text{ V @ } I_C = 60\text{ A}$
- High Input Impedance
- Built-in Fast Recovery Diode

### Application

Micro- Wave Oven, I-H Cooker, I-H Jar, Induction Heater, Home Appliance



TO-264



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Description	FGL60N100BNTD	Units
$V_{CES}$	Collector-Emitter Voltage	1000	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 25$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	60	A
	Collector Current @ $T_C = 100^\circ\text{C}$	42	A
$I_{CM(1)}$	Pulsed Collector Current	120	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	15	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	180	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	72	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

**Notes :**

(1) Repetitive rating : Pulse width limited by max. junction temperature

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction-to-Case	--	0.69	$^\circ\text{C/W}$
$R_{\theta JC}(DIODE)$	Thermal Resistance, Junction-to-Case	--	2.08	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	25	$^\circ\text{C/W}$

**Electrical Characteristics of IGBT**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{CES}$	Collector Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	1000	--	--	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = 1000V, V_{GE} = 0V$	--	--	1.0	mA
$I_{GES}$	G-E Leakage Current	$V_{GE} = \pm 25, V_{CE} = 0V$	--	--	$\pm 500$	nA

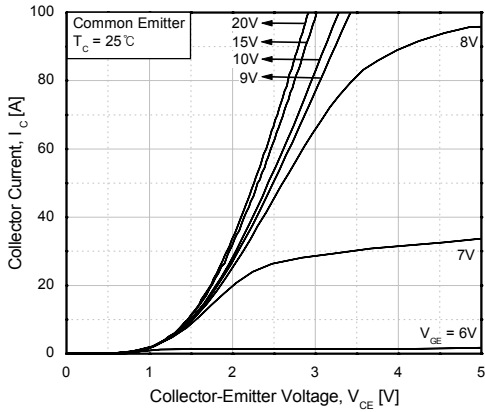
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 60mA, V_{CE} = V_{GE}$	4.0	5.0	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 10A, V_{GE} = 15V$	--	1.5	1.8	V
		$I_C = 60A, V_{GE} = 15V$	--	2.5	2.9	V

<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE}=10V, V_{GE} = 0V,$ $f = 1MHz$	--	6000	--	pF
$C_{oes}$	Output Capacitance		--	260	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	200	--	pF

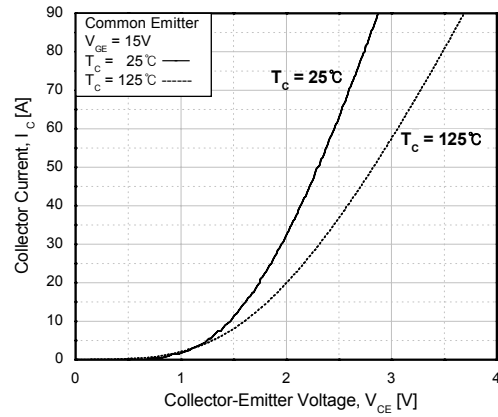
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600V, I_C = 60A,$ $R_G = 51\Omega, V_{GE}=15V,$ Resistive Load, $T_C = 25^\circ\text{C}$	--	140	--	ns
$t_r$	Rise Time		--	320	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	630	--	ns
$t_f$	Fall Time		--	130	250	ns
$Q_g$	Total Gate Charge	$V_{CE} = 600V, I_C = 60A,$ $V_{GE} = 15V, T_C = 25^\circ\text{C}$	--	275	350	nC
$Q_{ge}$	Gate-Emitter Charge		--	45	--	nC
$Q_{gc}$	Gate-Collector Charge		--	95	--	nC

**Electrical Characteristics of DIODE**  $T_C = 25^\circ\text{C}$  unless otherwise noted

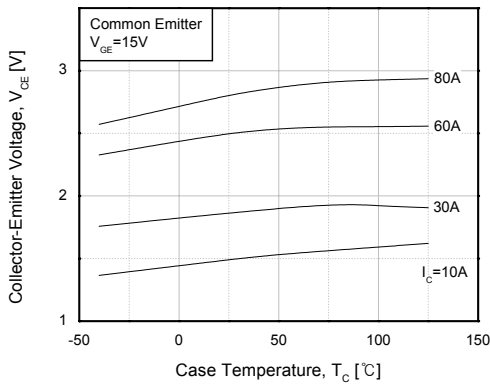
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{FM}$	Diode Forward Voltage	$I_F = 15A$	--	1.2	1.7	V
		$I_F = 60A$	--	1.8	2.1	V
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 60A, di/dt = 20 A/us$	--	1.2	1.5	us
$I_R$	Instantaneous Reverse Current	$V_{RRM} = 1000V$	--	0.05	2	uA



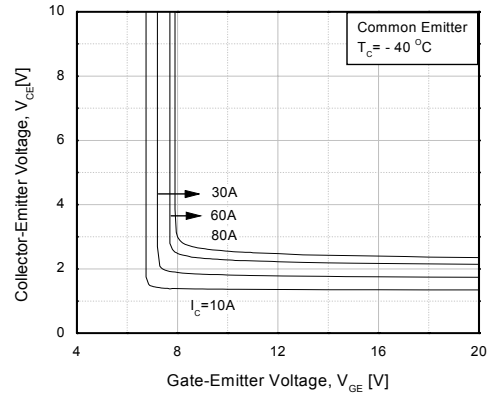
**Fig 1. Typical Output Characteristics**



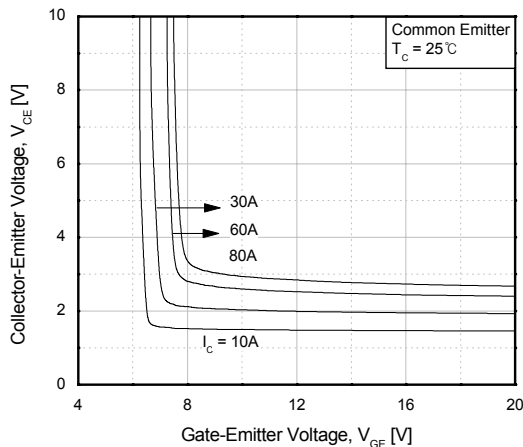
**Fig 2. Typical Saturation Voltage Characteristics**



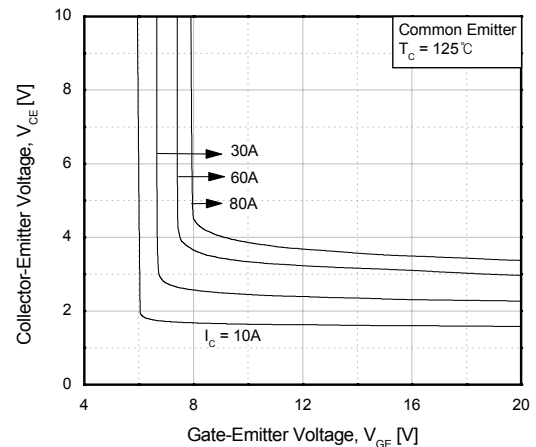
**Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level**



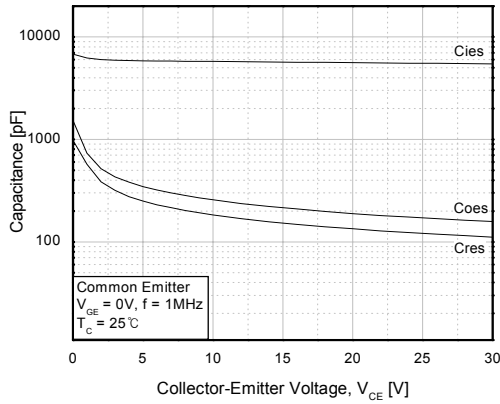
**Fig 4. Saturation Voltage vs. V<sub>GE</sub>**



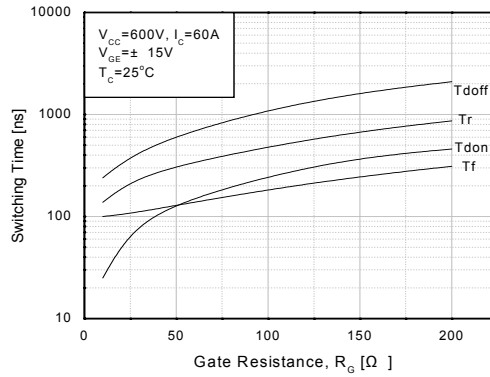
**Fig 5. Saturation Voltage vs. V<sub>GE</sub>**



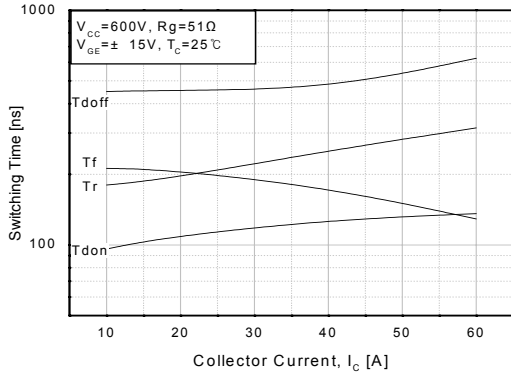
**Fig 6. Saturation Voltage vs. V<sub>GE</sub>**



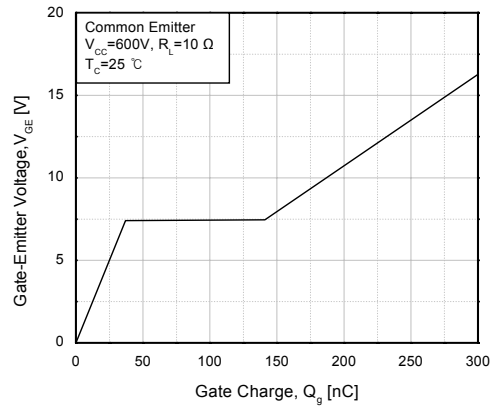
**Fig 7. Capacitance Characteristics**



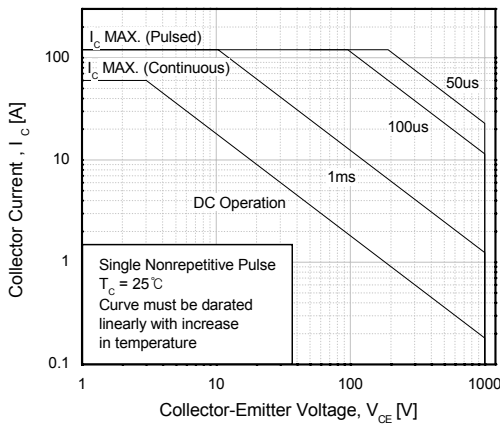
**Fig 8. Switching Characteristics vs. Gate Resistance**



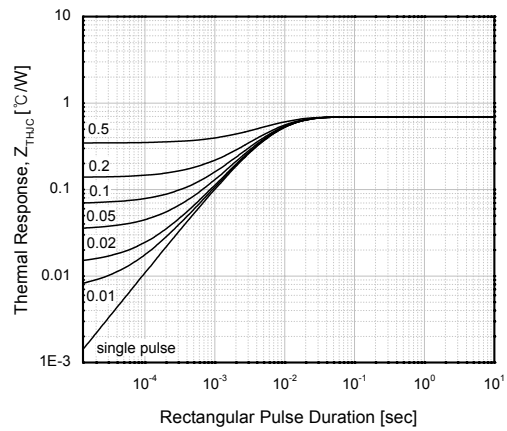
**Fig 9. Switching Characteristics vs. Collector Current**



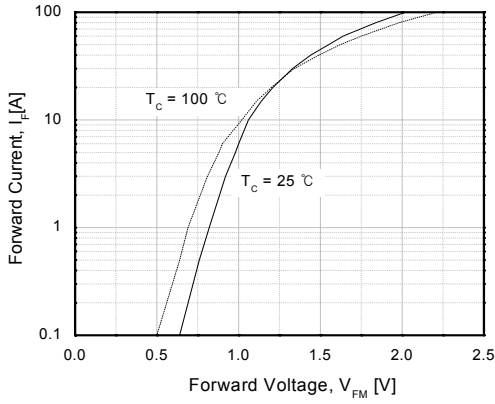
**Fig 10. Gate Charge Characteristics**



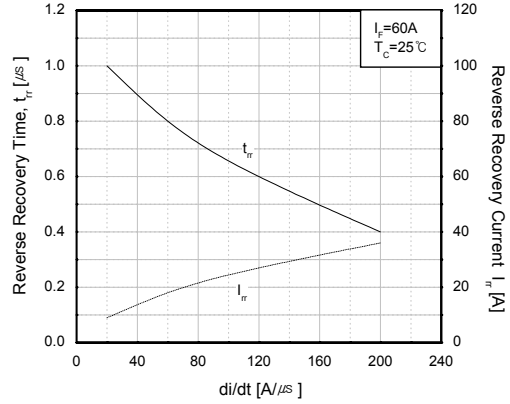
**Fig 11. SOA Characteristics**



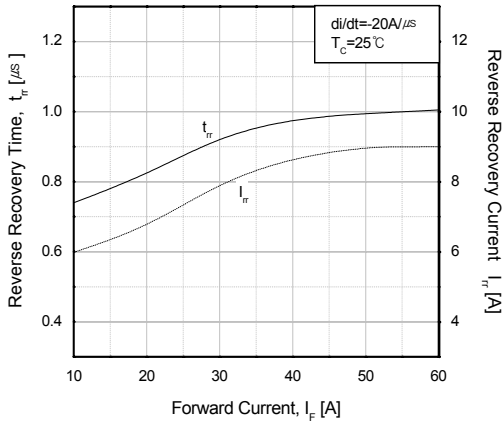
**Fig 12. Transient Thermal Impedance of IGBT**



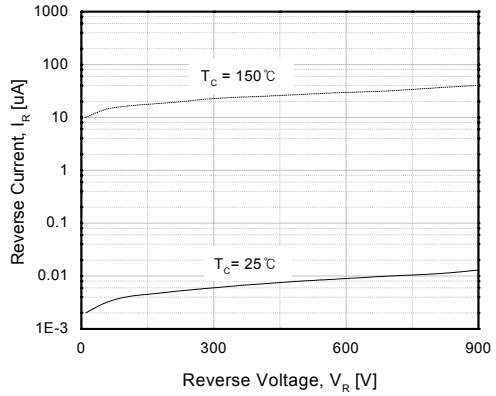
**Fig 13. Forward Characteristics**



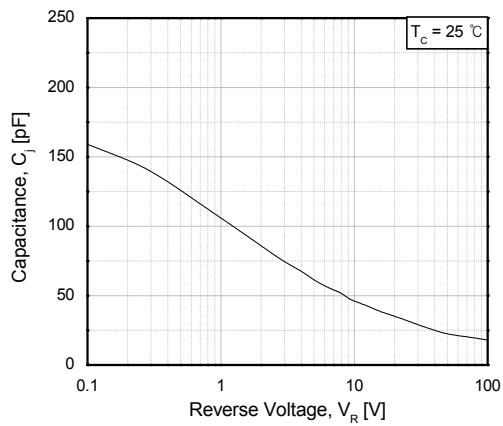
**Fig 14. Reverse Recovery Characteristics vs. di/dt**



**Fig 15. Reverse Recovery Characteristics vs. Forward Current**



**Fig 16. Reverse Current vs. Reverse Voltage**



**Fig 17. Junction capacitance**



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