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# FGA50N100BNTD

## 1000 V NPT Trench IGBT

### General Description

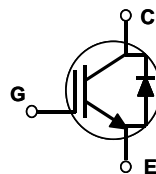
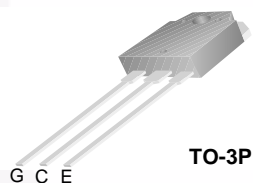
Using Fairchild's proprietary trench design and advanced NPT technology, the 1000V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device offers the optimum performance for hard switching application such as UPS, welder applications.

### 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

UPS, Welder, Induction Heating, Microwave Oven



### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Description	Ratings	Unit
$V_{CES}$	Collector-Emitter Voltage	1000	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 25$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	50	A
	Collector Current @ $T_C = 100^\circ\text{C}$	35	A
$I_{CM(1)}$	Pulsed Collector Current	100	A
$I_F$	Diode Continuous Forward Current @ $T_C = 25^\circ\text{C}$	30	A
	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	15	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	156	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	63	W
$T_J$	Operating Junction Temperature	-55 to +150	°C
$T_{stg}$	Storage Temperature Range	-55 to +150	°C
$T_L$	Maximum Lead Temp. for soldering	300	°C
	Purposes, 1/8" from case for 5 seconds		

**Notes :**

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

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction-to-Case	--	0.8	°C/W
$R_{\theta JC}(DIODE)$	Thermal Resistance, Junction-to-Case	--	2.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	25	°C/W

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGA50N100BNTDTU	FGA50N100BNTD	TO-3P	Rail / Tube	N/A	N/A	30

## Electrical Characteristics of IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### Off Characteristics

$BV_{CES}$	Collector Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	1000	--	--	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = 1000\text{ V}, V_{GE} = 0\text{ V}$	--	--	1.0	mA
$I_{GES}$	G-E Leakage Current	$V_{GE} = \pm 25\text{ V}, V_{CE} = 0\text{ V}$	--	--	$\pm 500$	nA

### On Characteristics

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

### Dynamic Characteristics

$C_{ies}$	Input Capacitance	$V_{CE} = 10\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	--	6000	--	pF
$C_{oes}$	Output Capacitance		--	260	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	200	--	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_C = 60\text{ A}, R_G = 51\ \Omega, V_{GE} = 15\text{ V},$ 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	$V_{CE} = 600\text{ V}, I_C = 60\text{ A}, V_{GE} = 15\text{ V}, T_C = 25^\circ\text{C}$	--	275	350	nC
$Q_{ge}$	Gate-Emitter Charge		--	45	--	nC
$Q_{gc}$	Gate-Collector Charge		--	95	--	nC

## Electrical Characteristics of DIODE T<sub>C</sub> = 25°C unless otherwise noted

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

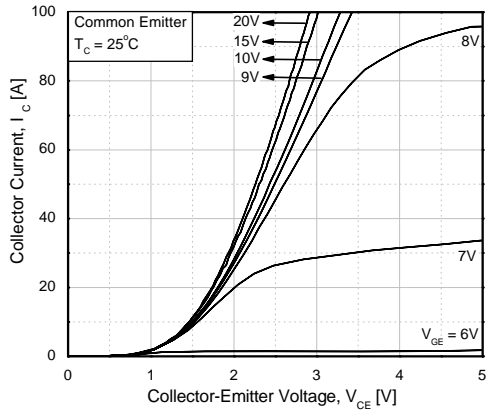


Fig 1. Typical Output Characteristics

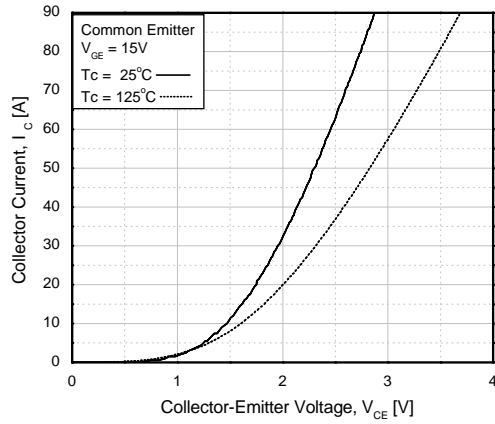


Fig 2. Typical Saturation Voltage Characteristics

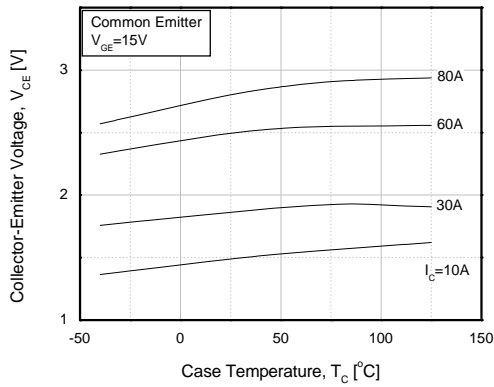


Fig 3. Saturation Voltage vs. Case Temperature at Varient Current Level

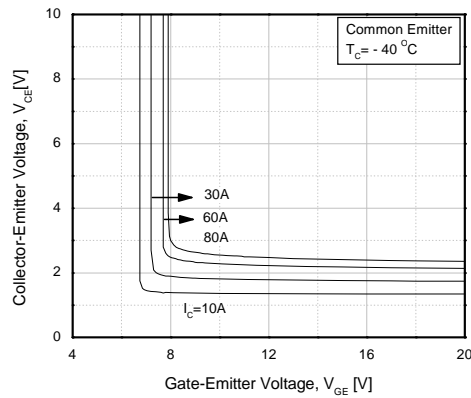


Fig 4. Saturation Voltage vs.  $V_{GE}$

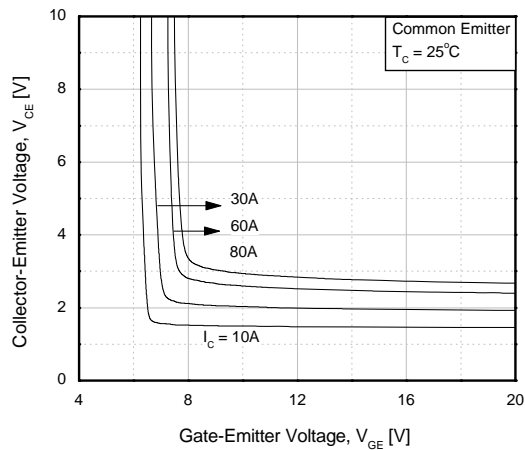


Fig 5. Saturation Voltage vs.  $V_{GE}$

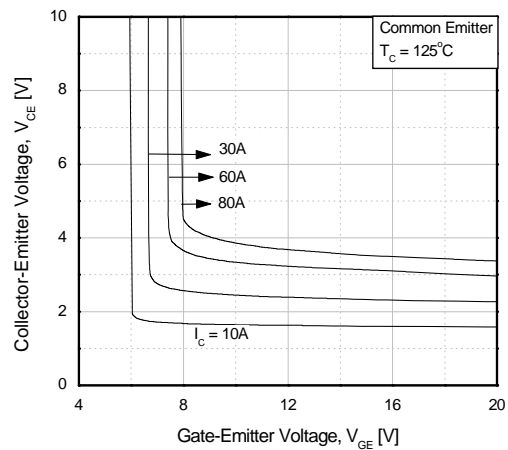
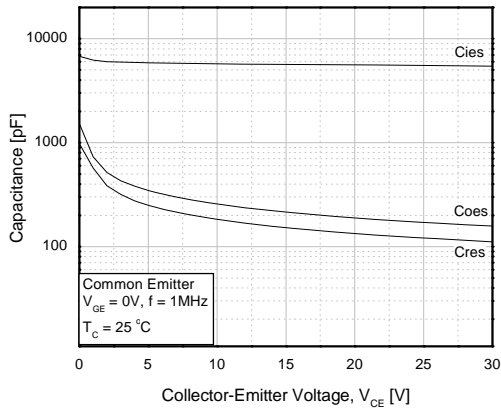
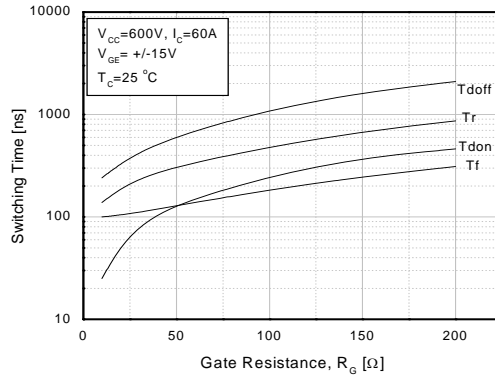


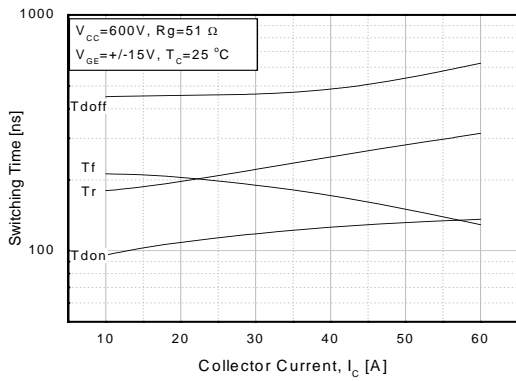
Fig 6. Saturation Voltage vs.  $V_{GE}$



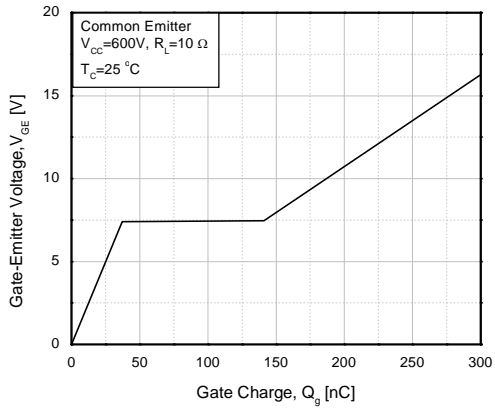
**Fig 7. Capacitance Characteristics**



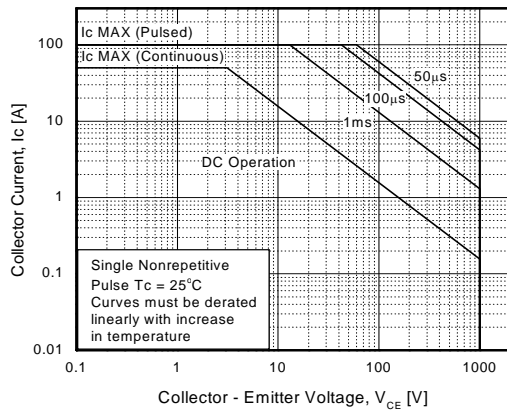
**Fig 8. Switching Characteristics vs. Gate Resistance**



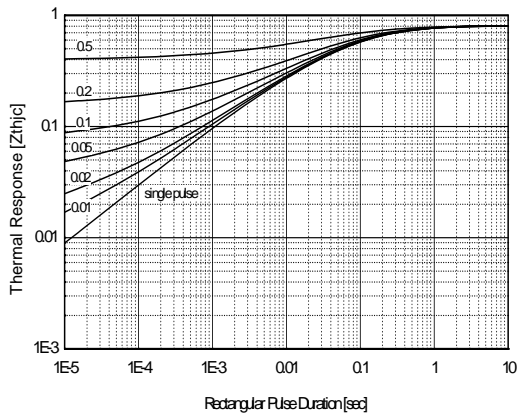
**Fig 9. Switching Characteristics vs. Collector Current**



**Fig 10. Gate Charge Characteristics**



**Fig 11. SOA Characteristics**



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

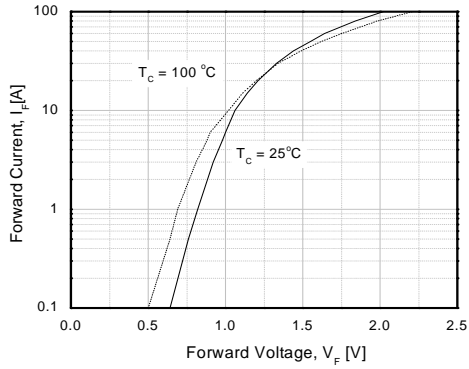


Fig 13. Forward Characteristics

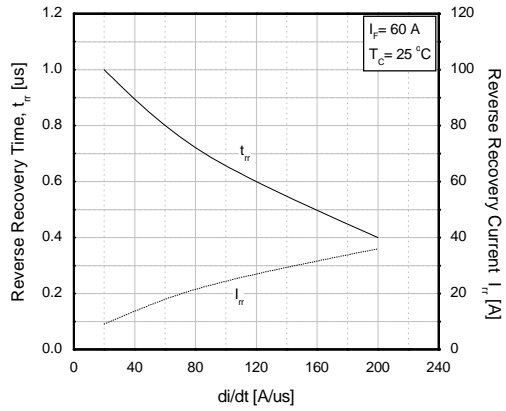


Fig 14. Reverse Recovery Characteristics vs.  $di_F/dt$

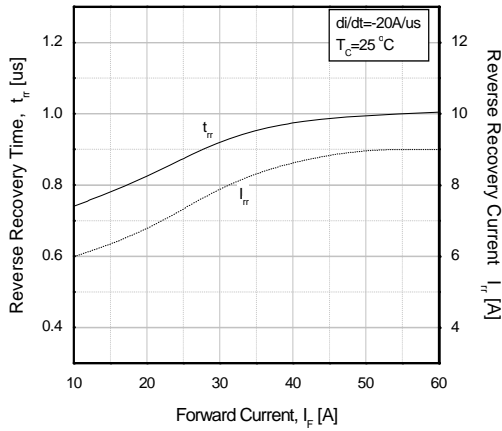


Fig 15. Reverse Recovery Characteristics vs. Forward Current

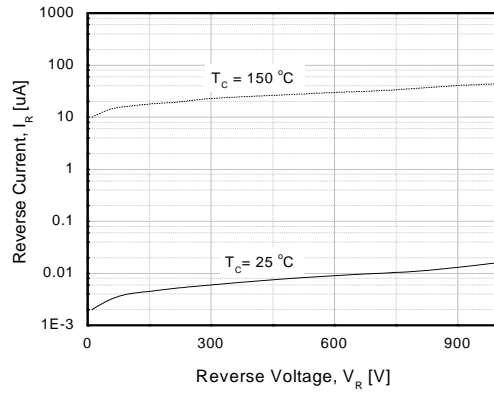


Fig 16. Reverse Current vs. Reverse Voltage

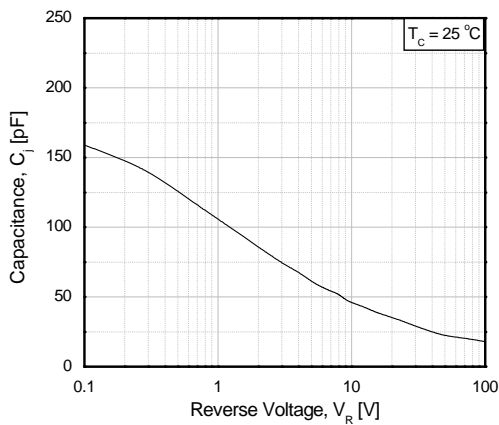
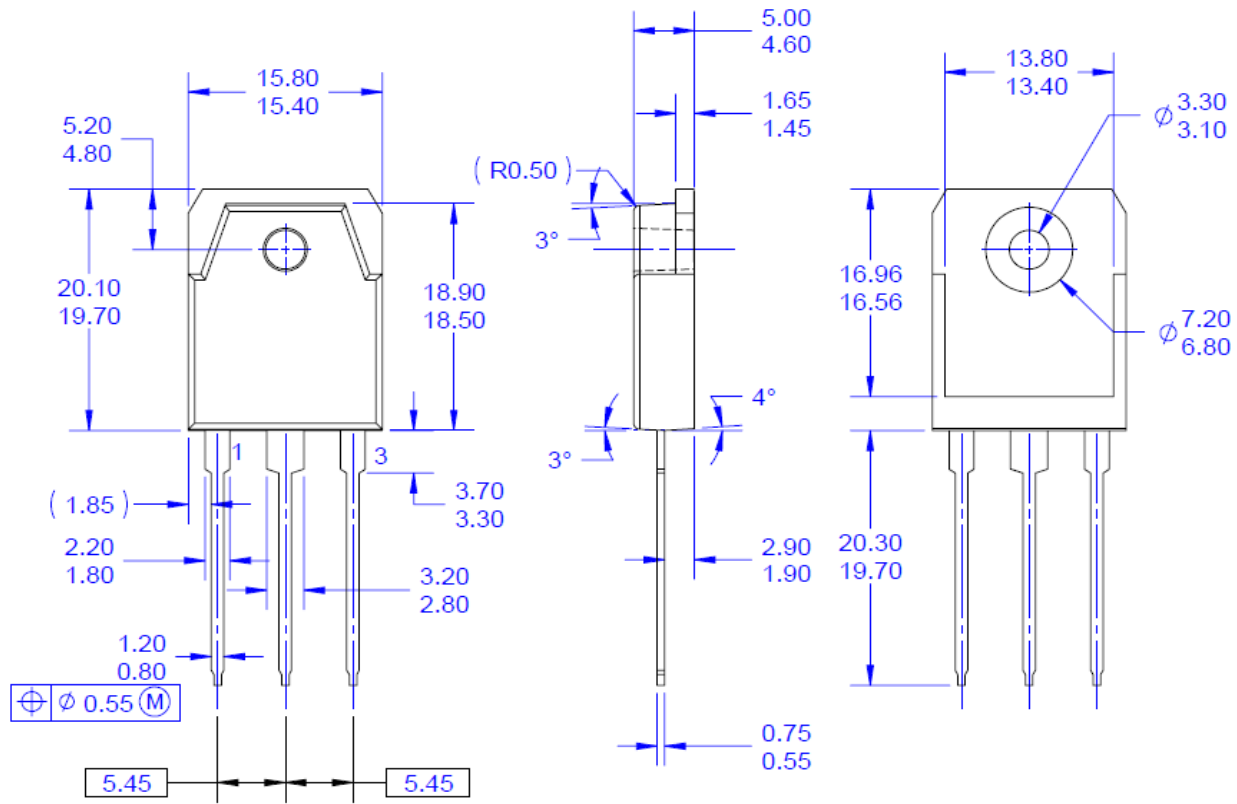


Fig 17. Junction capacitance

**Mechanical Dimensions**



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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) THIS PACKAGE IS INTENDED ONLY FOR T03PN.
- F) DRAWING FILE NAME: T03P03AREV4.

**Figure 18. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65**

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