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November 2013



# 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.

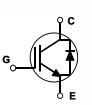
### Features

- High Speed Switching
- Low Saturation Voltage : V<sub>CE(sat)</sub> = 2.5 V @ I<sub>C</sub> = 60 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 <sub>CES</sub>	Collector-Emitter Voltage		1000	V
V <sub>GES</sub>	Gate-Emitter Voltage		± 25	V
I <sub>C</sub>	Collector Current	@ T <sub>C</sub> = 25°C	50	A
	Collector Current	@ T <sub>C</sub> = 100°C	35	A
I <sub>CM (1)</sub>	Pulsed Collector Current		100	A
Dio	Diode Continuous Forward Current	@ T <sub>C</sub> = 25°C	30	A
	Diode Continuous Forward Current	@ T <sub>C</sub> = 100°C	15	A
P <sub>D</sub>	Maximum Power Dissipation	@ $T_{C} = 25^{\circ}C$	156	W
	Maximum Power Dissipation	@ T <sub>C</sub> = 100°C	63	W
TJ	Operating Junction Temperature	-55 to +150	°C	
T <sub>stg</sub>	Storage Temperature Range	-55 to +150	°C	
TL	Maximum Lead Temp. for soldering		300	°C
'L	Purposes, 1/8" from case for 5 second	poses, 1/8" from case for 5 seconds		

Notes :

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

## **Thermal Characteristics**

Symbol	Parameter	Тур.	Max.	Unit
R <sub>0JC</sub> (IGBT)	Thermal Resistance, Junction-to-Case		0.8	°C/W
R <sub>0JC</sub> (DIODE)	Thermal Resistance, Junction-to-Case		2.4	°C/W
$R_{ hetaJA}$	Thermal Resistance, Junction-to-Ambient		25	°C/W

Part Number FGA50N100BNTDTU		Top Mark FGA50N100BNTD	Packag	Packing Method	Reel Size	Tape Width		Quantity	
			TO-3P	Rail / Tube	N/A			:	30
Electric	al Char	acteristics of	IGBT	T <sub>C</sub> = 25°C unless oth		Min.	Тур.	Max.	Un
Symbol		Farameter		Test Conditions		wiin.	тур.	Widx.	UII
Off Cha	racteristic	cs							
BV <sub>CES</sub>	Collector I	Emitter Breakdown Voltage		V <sub>GE</sub> = 0 V, I <sub>C</sub> = 1 mA		1000			V
ICES	Collector (	Cut-Off Current		V <sub>CE</sub> = 1000 V, V <sub>GE</sub> = 0 V				1.0	m/
IGES	G-E Leakage Current			$V_{GE} = \pm 25 \text{ V}, \text{ V}_{CE} = 0 \text{ V}$				± 500	nA
On Cha	racteristic	cs shold Voltage		I <sub>C</sub> = 60 mA, V <sub>CE</sub>		4.0	5.0	7.0	V
	-	ollector to Emitter		$I_{\rm C} = 10  {\rm A},  V_{\rm GE} = 15  {\rm V}$			1.5	1.8	V
V <sub>CE(sat)</sub>	Saturation Voltage			$I_{\rm C} = 60 \text{ A},  V_{\rm GE}$			2.5	2.9	V
Dynami	c Charact	teristics							
C <sub>ies</sub>	Input Cap	acitance			0.14		6000		pF
C <sub>oes</sub>	Output Ca	apacitance		− V <sub>CE</sub> =10 V <sub>,</sub> V <sub>GE</sub> = 0 V, − f = 1 MHz			260		pF
C <sub>res</sub>	Reverse T	ransfer Capacitance	sfer Capacitance				200		pF
	ng Charao	cteristics							
t <sub>d(on)</sub>	Turn-On D	Delay Time		$V_{CC} = 600 \text{ V}, I_C = 60 \text{ A},$			140		ns
t <sub>r</sub>	Rise Time						320		ns
t <sub>d(off)</sub>	Turn-Off D	Delay Time		- R <sub>G</sub> = 51 Ω, V <sub>GE</sub> =15 V, - Resistive Load, T <sub>C</sub> = 25°C		/	630		ns
t <sub>f</sub>	Fall Time						130	250	ns
Qa	Total Gate		<u>۱</u>	$l_{00} = 600 \text{ V} l_{0}$	= 60 A		275	350	nC
			$V_{CE} = 600 \text{ V}, \text{ I}_{C} = 60 \text{ A},$ $V_{GE} = 15 \text{ V}, \text{ , } \text{ T}_{C} = 25^{\circ}\text{C}$						-
Q <sub>ge</sub>		ter Charge					45 95		nC nC

## Electrical Characteristics of DIODE $T_{C} = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V	Diode Forward Voltage	I <sub>F</sub> = 15 A		1.2	1.7	V
V <sub>FM</sub> C	Didde Forward Voltage	I <sub>F</sub> = 60 A		1.8	2.1	V
t <sub>rr</sub>	Diode Reverse Recovery Time	$I_F = 60 \text{ A} \text{ di}_F/\text{dt} = 20 \text{ A/us}$		1.2	1.5	us
IR	Instantaneous Reverse Current	Vrrm = 1000 V		0.05	2	uA

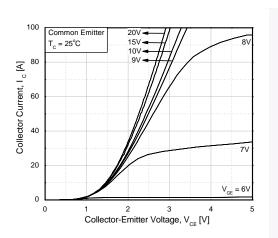
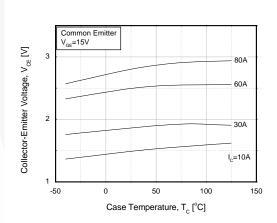
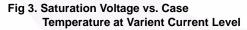


Fig 1. Typical Output Characteristics





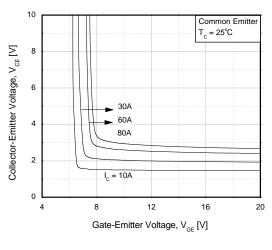


Fig 5. Saturation Voltage vs.  $\rm V_{GE}$ 

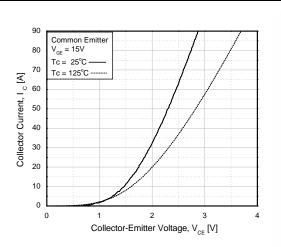
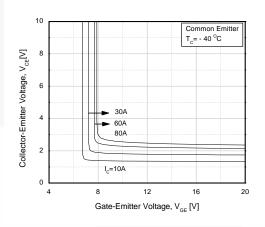
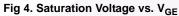


Fig 2. Typical Saturation Voltage Characteristics





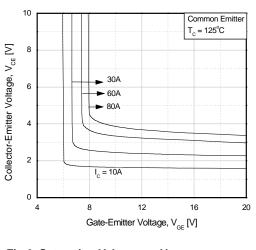
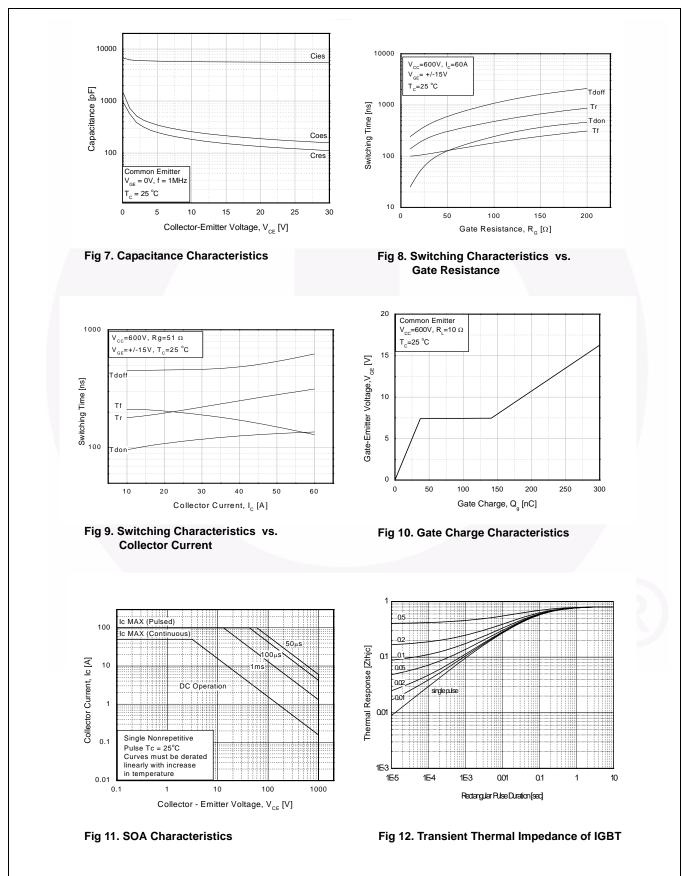
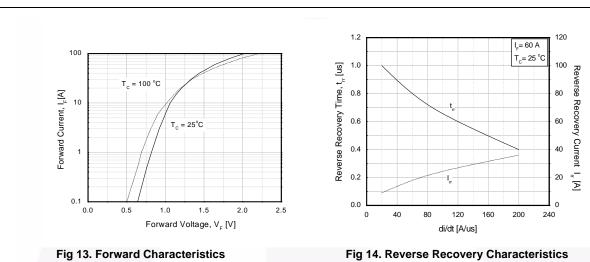


Fig 6. Saturation Voltage vs.  $V_{GE}$ 

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di/dt=-20A/us

12

10

8

6

4

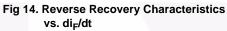
60

Reverse Recovery Current

Ā

T<sub>c</sub>=25 ℃

50



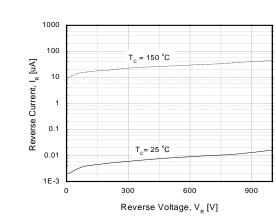


Fig 15. Reverse Recovery Characteristics vs.

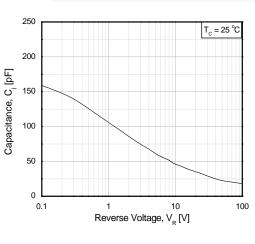


Fig 17. Junction capacitance

Fig 16. Reverse Current vs. Reverse Voltage

1.2

1.0

0.8

0.6

0.4

10

20

Forward Current

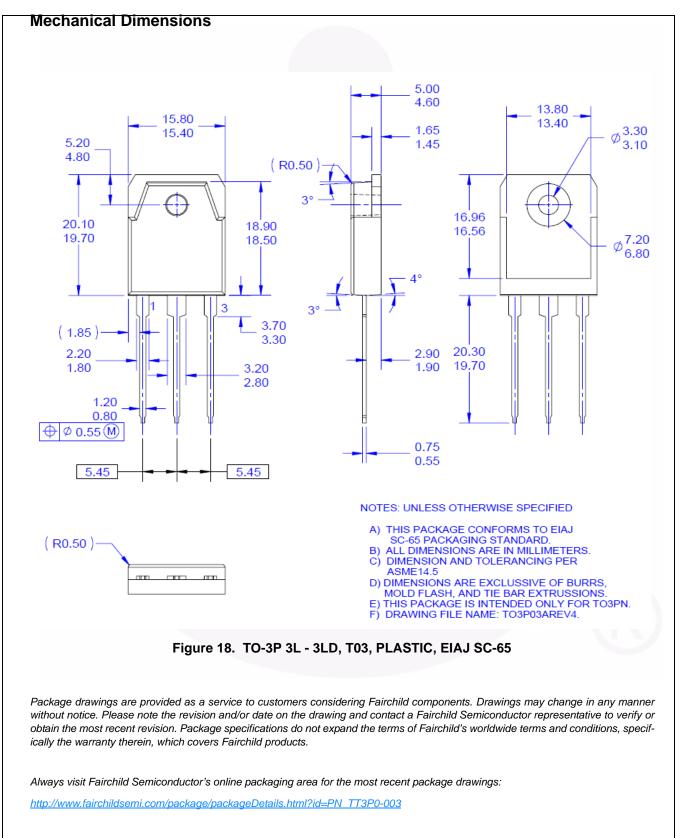
t

30

40

Forward Current, I<sub>F</sub> [A]

Reverse Recovery Time, t<sub>r</sub> [us]





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