

# FGA25S125P 1250 V, 25 A Shorted-anode IGBT

# April 2013

#### **Features**

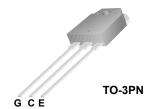
- · High Speed Switching
- Low Saturation Voltage: V<sub>CE(sat)</sub> = 1.8 V @ I<sub>C</sub> = 25 A
- · High Input Impedance
- · RoHS Compliant

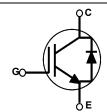
#### **Applications**

· Induction Heating, Microwave Oven

# **General Description**

Using advanced field stop trench and shorted-anode technology, Fairchild<sup>®</sup>'s shorted-anode trench IGBTs offer superior conduction and switching performances for soft switching applications. The device can operate in parallel configuration with exceptional avalanche capability . This device is designed for induction heating and microwave oven.





#### **Absolute Maximum Ratings**

Symbol	Description		Rating	Unit
V <sub>CES</sub>	Collector to Emitter Voltage		1250	V
V <sub>GES</sub>	Gate to Emitter Voltage		± 25	V
Ic	Collector Current	@ T <sub>C</sub> = 25°C	50	Α
	Collector Current	@ T <sub>C</sub> = 100°C	25	Α
I <sub>CM (1)</sub>	Pulsed Collector Current		75	Α
I <sub>F</sub>	Diode Continuous Forward Current	@ T <sub>C</sub> = 25°C	50	Α
	Diode Continuous Forward Current	@ T <sub>C</sub> = 100°C	25	Α
P <sub>D</sub>	Maximum Power Dissipation	@ T <sub>C</sub> = 25°C	250	W
. 0	Maximum Power Dissipation	@ T <sub>C</sub> = 100°C	125	W
TJ	Operating Junction Temperature		-55 to +175	°C
T <sub>stg</sub>	Storage Temperature Range		-55 to +175	°C
TL	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C

#### **Thermal Characteristics**

Symbol	Parameter	Тур.	Max.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case, Max	-	0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	-	40	°C/W

#### Notes

1: Limited by Tjmax

# **Package Marking and Ordering Information**

<b>Device Marking</b>	Device	Package	Reel Size	Tape Width	Quantity
FGA25S125P	FGA25S125P	TO-3PN	=	=	30

# Electrical Characteristics of the IGBT $\,\, T_{C}$ = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	teristics					
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = 1250V, V <sub>GE</sub> = 0V	-	-	1	mA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	-	-	±500	nA
On Charac	teristics					
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 25mA, V <sub>CE</sub> = V <sub>GE</sub>	4.5	6.0	7.5	V
5_()		I <sub>C</sub> = 25A, V <sub>GE</sub> = 15V T <sub>C</sub> = 25°C	-	1.8	2.35	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 25A, V <sub>GE</sub> = 15V T <sub>C</sub> = 125°C	-	2.05	-	٧
		I <sub>C</sub> = 25A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 175°C	-	2.16	-	٧
		I <sub>F</sub> = 25A, T <sub>C</sub> = 25°C	-	1.7	2.4	V
$V_{FM}$	Diode Forward Voltage	I <sub>F</sub> = 25A, T <sub>C</sub> = 175°C	-	2.1	-	V
Dynamic C	haracteristics					
C <sub>ies</sub>	Input Capacitance		-	2150	-	pF
C <sub>oes</sub>	Output Capacitance	$V_{CE} = 30V_{,} V_{GE} = 0V_{,}$	-	48	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance	f = 1MHz	-	36	-	pF
Switching	Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time		-	24	-	ns
t <sub>r</sub>	Rise Time	$V_{CC}$ = 600V, $I_{C}$ = 25A, $R_{G}$ = 10 $\Omega$ , $V_{GE}$ = 15V, Resistive Load, $T_{C}$ = 25°C	-	250	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	502	-	ns
t <sub>f</sub>	Fall Time		-	138	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	1085	-	uJ
E <sub>off</sub>	Turn-Off Switching Loss		-	580	-	uJ
E <sub>ts</sub>	Total Switching Loss		-	1665	-	uJ
t <sub>d(on)</sub>	Turn-On Delay Time		-	21.2	-	ns
t <sub>r</sub>	Rise Time		-	304	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	V <sub>CC</sub> = 600V, I <sub>C</sub> = 25A,	-	490	-	ns
t <sub>f</sub>	Fall Time	$R_G = 10\Omega$ , $V_{GE} = 15V$ , Resistive Load,, $T_C = 175^{\circ}C$	-	232	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	1310	-	uJ
E <sub>off</sub>	Turn-Off Switching Loss		-	952	-	uJ
E <sub>ts</sub>	Total Switching Loss		-	2262	-	uJ
Q <sub>g</sub>	Total Gate Charge		-	204	-	nC
Q <sub>ge</sub>	Gate to Emitter Charge	$V_{CE} = 600V, I_{C} = 25A,$	-	15	-	nC
Q <sub>gc</sub>	Gate to Collector Charge	V <sub>GE</sub> = 15V	-	103	-	nC

**Figure 1. Typical Output Characteristics** 

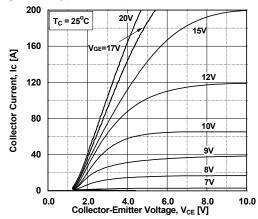


Figure 3. Typical Saturation Voltage Characteristics

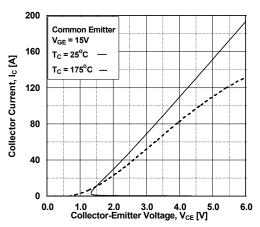


Figure 5. Saturation Voltage vs. Case
Temperature at Variant Current Level

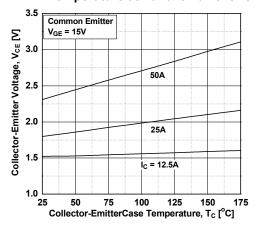


Figure 2. Typical Output Characteristics

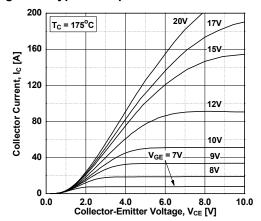


Figure 4. Transfer Characteristics

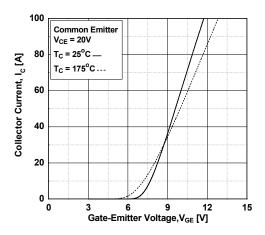


Figure 6. Saturation Voltage vs. V<sub>GE</sub>

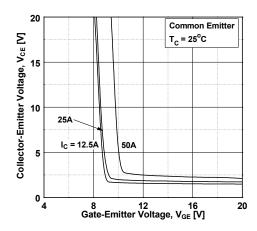


Figure 7. Saturation Voltage vs. V<sub>GE</sub>

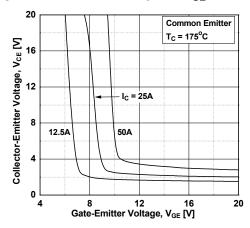


Figure 9. Gate charge Characteristics

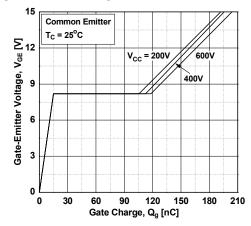


Figure 11. Turn-on Characteristics vs.
Gate Resistance

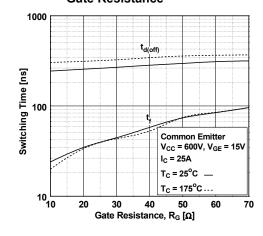


Figure 8. Capacitance Characteristics

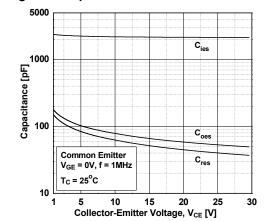


Figure 10. SOA Characteristics

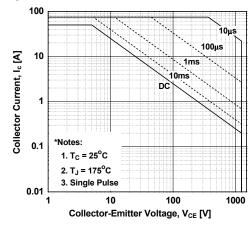


Figure 12. Turn-off Characteristics vs.
Gate Resistance

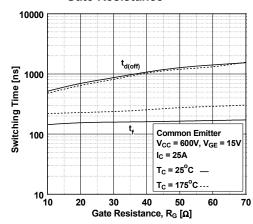


Figure 13. Turn-on Characteristics vs. Collector Current

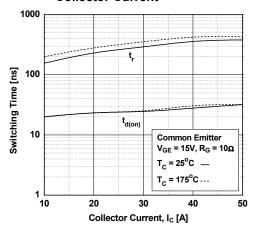


Figure 15. Switching Loss vs. Gate Resistance

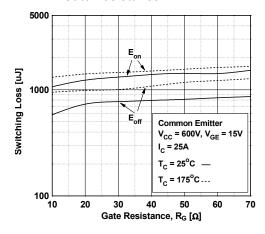


Figure 17. Turn off Switching SOA Characteristics

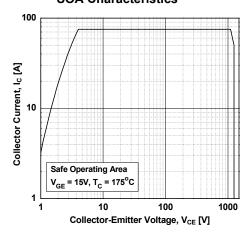


Figure 14. Turn-off Characteristics vs. Collector Current

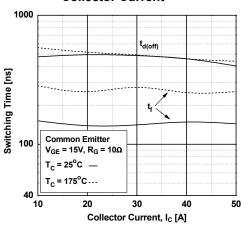


Figure 16. Switching Loss vs.
Collector Current

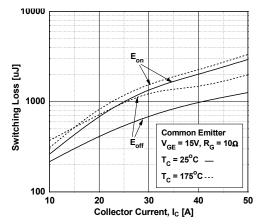


Figure 18. Forward Characteristics

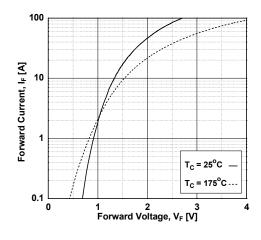
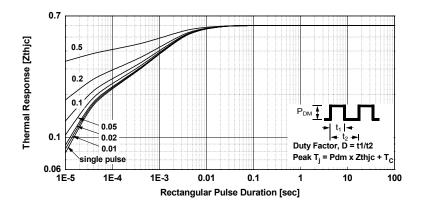
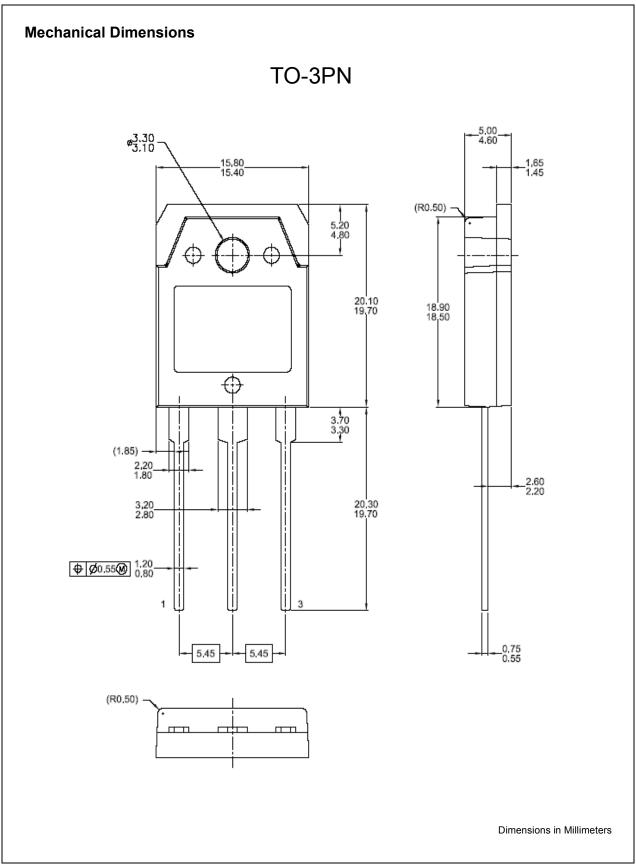


Figure 19. Transient Thermal Impedance of IGBT









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