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FGA20S140P 1400 V, 20 A Shorted-anode IGBT

Features

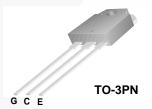
- High Speed Switching
- Low Saturation Voltage: V_{CE(sat)} =1.9 V @ I_C = 20 A
- High Input Impedance
- RoHS Compliant

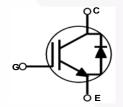
Applications

· Induction Heating, Microwave Oven

General Description

Using advanced field stop trench and shorted-anode technology, Fairchild'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 T_C = 25°C unless otherwise noted

Symbol	Description		Ratings	Unit	
V _{CES}	Collector to Emitter Voltage		1400	V	
V_{GES}	Gate to Emitter Voltage		±25	V	
Ic	Collector Current	$@ T_C = 25^{\circ}C$	40	Α	
·C	Collector Current	@ T _C = 100°C	20	Α	
I _{CM (1)}	Pulsed Collector Current		60	Α	
I _F	Diode Continuous Forward Current	@ T _C = 25°C	40	А	
I _F	Diode Continuous Forward Current	@ T _C = 100°C	20	А	
P _D	Maximum Power Dissipation	@ T _C = 25°C	272	W	
' U	Maximum Power Dissipation	$@ T_C = 100^{\circ}C$	136	W	
TJ	Operating Junction Temperature		-55 to +175	°C	
T _{stg}	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		0.55	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		40	°C/W

Notes: 1: Limited by Tjmax

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA20S140P	FGA20S140P	TO-3PN	-	-	30

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	eteristics					
I _{CES}	Collector Cut-Off Current	V _{CE} = 1400, V _{GE} = 0V	-	-	1	mA
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	-	-	±500	nA
On Charac	eteristics					
V _{GE(th)}	G-E Threshold Voltage	$I_C = 20$ mA, $V_{CE} = V_{GE}$	4.5	6.0	7.5	V
		$I_C = 20A, V_{GE} = 15V$ $T_C = 25^{\circ}C$	-	1.9	2.4	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	$I_C = 20A, V_{GE} = 15V,$ $T_C = 125^{\circ}C$	-	2.1	-	V
		I _C = 20A, V _{GE} = 15V, T _C = 175°C	_	2.2	-	V
V _{FM}	Diode Forward Voltage	$I_F = 20A, T_C = 25^{\circ}C$	-	1.7	2.4	V
FIVI		$I_F = 20A, T_C = 175^{\circ}C$	-	2.1	-	V
Dynamic C	Characteristics		1		•	
C _{ies}	Input Capacitance		-	1686	-	pF
C _{oes}	Output Capacitance	$V_{CE} = 30V, V_{GE} = 0V,$ f = 1MHz	-	45	-	pF
C _{res}	Reverse Transfer Capacitance	1 = 11/1112	-	32	-	pF
Switching	Characcteristics		"		1	
t _{d(on)}	Turn-On Delay Time		-	20		ns
t _r	Rise Time		-	245	-	ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 600V, I_{C} = 20A,$	-	400	-	ns
t _f	Fall Time	$R_G = 10\Omega$, $V_{GE} = 15V$,	-	130	-	ns
E _{on}	Turn-On Switching Loss	Resistive Load, T _C = 25°C	-	0.76	-	mJ
E _{off}	Turn-Off Switching Loss	-	- /	0.56	-	mJ
E _{ts}	Total Switching Loss		-	1.32	-	mJ
t _{d(on)}	Turn-On Delay Time		-	21	-	ns
t _r	Rise Time		-	301	-	ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 600V, I_{C} = 20A,$	-	420	-	ns
t _f	Fall Time	$R_G = 10\Omega, V_{GE} = 15V,$	-	356	- /	ns
E _{on}	Turn-On Switching Loss	Resistive Load, T _C = 175°C	-	0.95	-	mJ
E _{off}	Turn-Off Switching Loss		-	1.39	- \	mJ
E _{ts}	Total Switching Loss		<u>-</u>	2.34	-	mJ
Qg	Total Gate Charge		-	203.5	-	nC
Q _{ge}	Gate to Emitter Charge	$V_{CE} = 600V, I_{C} = 20A,$ $V_{GE} = 15V$	-	10.8	-	nC
Q _{gc}	Gate to Collector Charge	vGE = 13 v	-	84.6	-	nC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

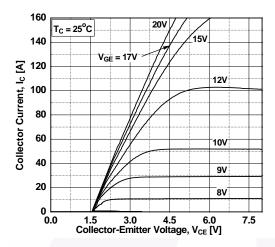


Figure 3. Typical Saturation Voltage Characteritics

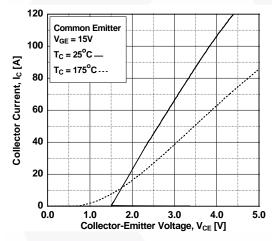


Figure 5. Saturation Voltage vs. Case

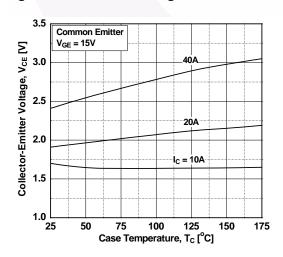


Figure 2. Typical Saturation Voltage Characteristics

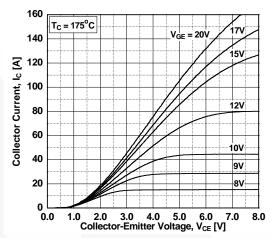


Figure 4. Transfer Characteristics

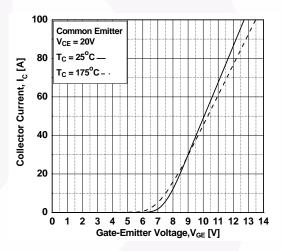
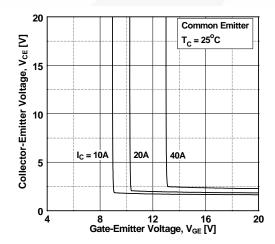


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. Vge

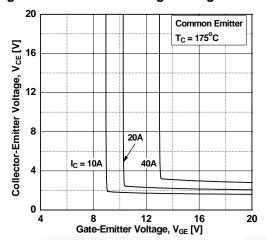


Figure 9. Gate Charge Characteristics

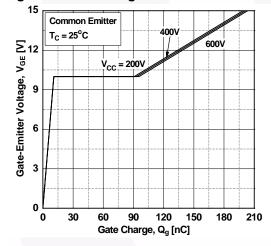


Figure 11. Turn-On Characteristics vs Gate Resistance

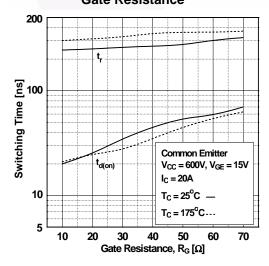


Figure 8. Capacitance Characteristics

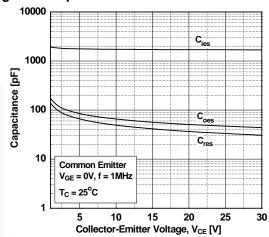


Figure 10. SOA Characteristics

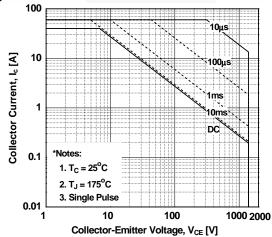
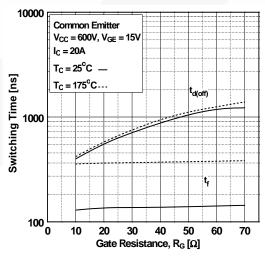


Figure 12. Turn-off Characteristics vs.
Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics VS. Collector Current

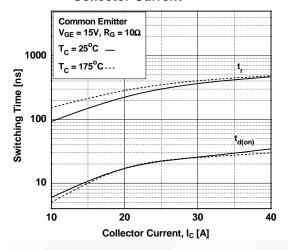


Figure 15. Switching Loss VS. Gate Resistance

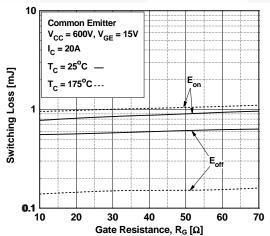


Figure 17. Turn off Switching SOA Characteristics

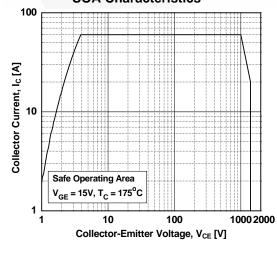


Figure 14.Turn-off Characteristics VS.
Collector Current

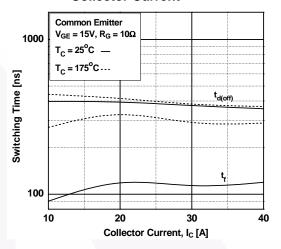


Figure 16. Switching Loss VS. Gate Resistance

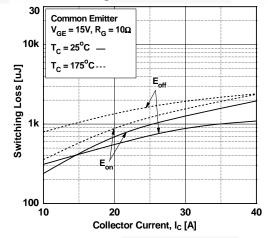


Figure 18. Forward Characteristics

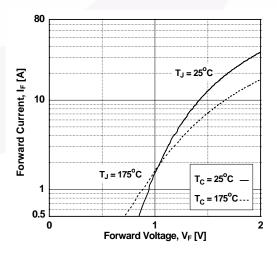
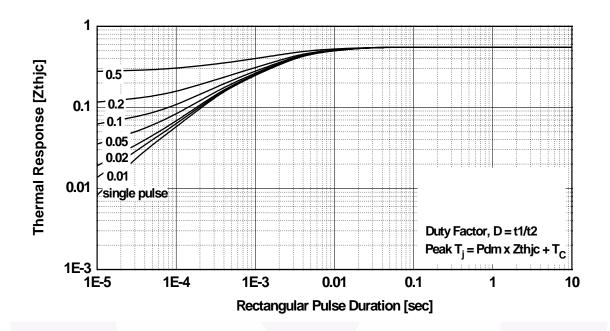


Figure 19. Transient Thermal Impedance of IGBT



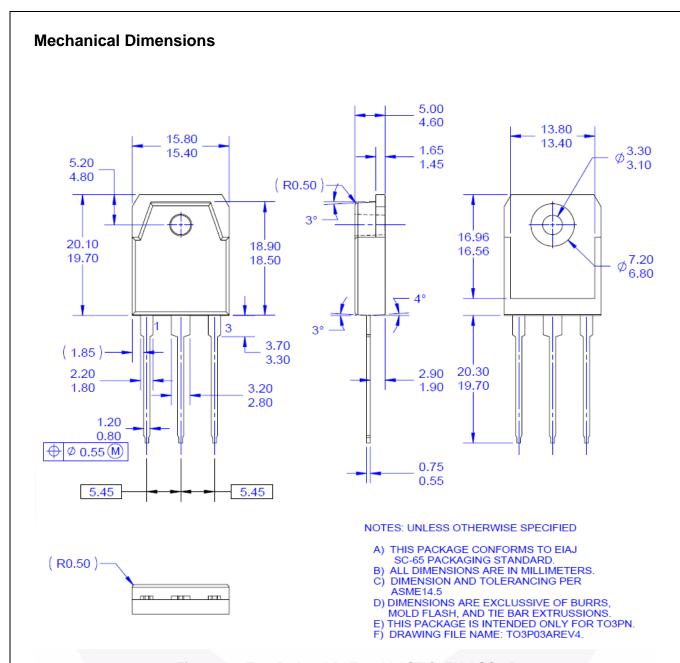


Figure 20. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

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Dimensions in Millimeters





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