FAIRCHILD SEMICONDUCTOR®

March 2013

FGA50S110P

1100 V, 50 A Shorted-anode IGBT

Features

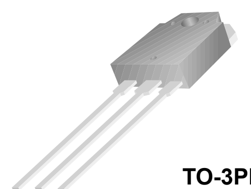
- Intrinsic anti-parallel diode for soft-switching applications
- High switching frequency range 10 kHz to 50kHz
- High temperature stable behavior (T_{jmax} = 175°C)
- Low saturation voltage drop : $V_{CE(sat)}$ = 2.06 V @ I_C = 50 A
- Robust pot detection noise immunity
- RoHS compliant (Pb-free lead plating)

Applications

- Induction cooker, Rice-jar, and Microwave oven
- Soft-switching applications

General Description

Using advanced field stop trench and shorted-anode technology, Fairchild®'s shorted-anode trench IGBTs offer superior conduction and switching performances for switching applications. This device is tailored to induction cooker and microwave oven.



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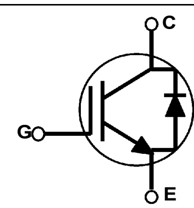


Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		1100	V
V_{GES}	Gate to Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	50	A
	Collector Current	@ T_C = 100°C	30	A
$I_{CM\ (1)}$	Pulsed Collector Current		120	A
I_F	Diode Continuous Forward Current	@ T_C = 25°C	50	A
	Diode Continuous Forward Current	@ T_C = 100°C	30	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	300	W
	Maximum Power Dissipation	@ T_C = 100°C	150	W
T_J	Operating Junction Temperature		-55 to +175	°C
T_{stg}	Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	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 T_{jmax}

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA50S110P	FGA50S110P	TO-3PN	-	-	30

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
I_{CES}	Collector Cut-Off Current	V_{CE} = 1100 V, V_{GE} = 0 V	-	-	1	mA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0 V	-	-	±500	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 50 mA, V_{CE} = V_{GE}	4.5	5.6	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 50 A, V_{GE} = 15 V T_C = 25°C	-	2.06	2.6	V
		I_C = 50 A , V_{GE} = 15 V T_C = 125°C	-	2.54	-	V
		I_C = 50 A, V_{GE} = 15 V, T_C = 175°C	-	2.7	-	V
V_{FM}	Diode Forward Voltage	I_F = 50 A, T_C = 25°C	-	1.96	2.6	V
		I_F = 50 A, T_C = 175°C	-	2.67	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	-	2056	-	pF
C_{oes}	Output Capacitance		-	47.8	-	pF
C_{res}	Reverse Transfer Capacitance		-	35.8	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 50 A, R_G = 10 Ω, V_{GE} = 15 V, Resistive Load, T_C = 25°C	-	24	-	ns
t_r	Rise Time		-	294	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	280	-	ns
t_f	Fall Time		-	95	-	ns
E_{on}	Turn-On Switching Loss		-	2240	-	mJ
E_{off}	Turn-Off Switching Loss		-	990	-	mJ
E_{ts}	Total Switching Loss		-	3230	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 50 A, R_G = 10 Ω, V_{GE} = 15 V, Resistive Load,, T_C = 175°C	-	24	-	ns
t_r	Rise Time		-	346	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	308	-	ns
t_f	Fall Time		-	184	-	ns
E_{on}	Turn-On Switching Loss		-	2640	-	mJ
E_{off}	Turn-Off Switching Loss		-	1820	-	mJ
E_{ts}	Total Switching Loss		-	4460	-	mJ
Q_g	Total Gate Charge	V_{CE} = 600 V, I_C = 50 A, V_{GE} = 15 V	-	195	-	nC
Q_{ge}	Gate to Emitter Charge		-	15.4	-	nC
Q_{gc}	Gate to Collector Charge		-	99.9	-	nC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

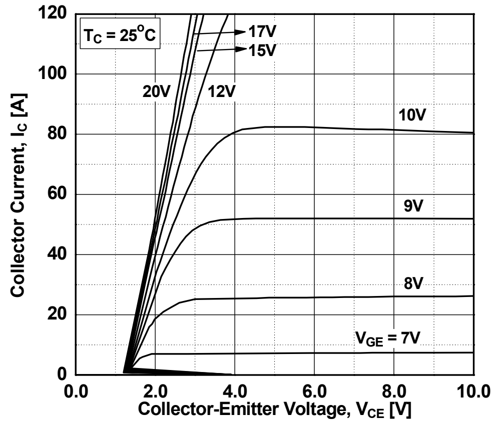


Figure 2. Typical Output Characteristics

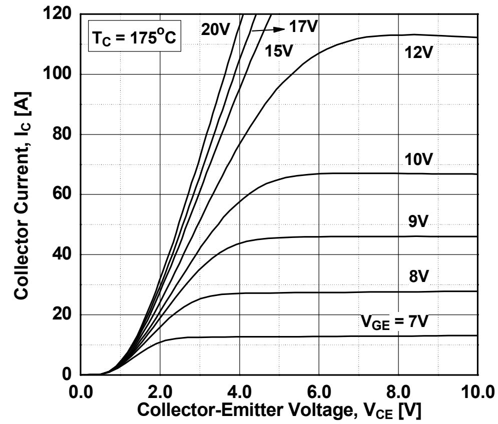


Figure 3. Typical Saturation Voltage Characteristics

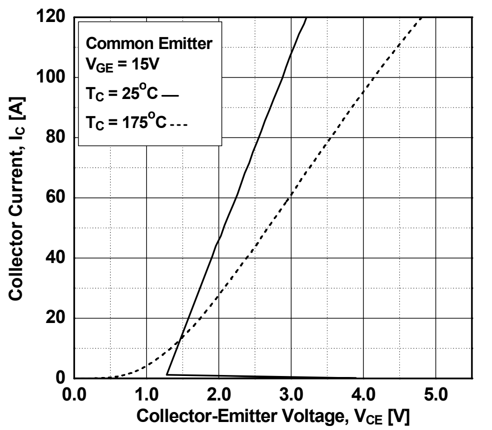


Figure 4. Transfer Characteristics

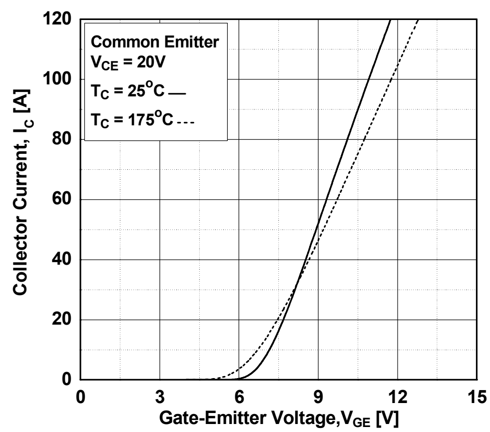


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

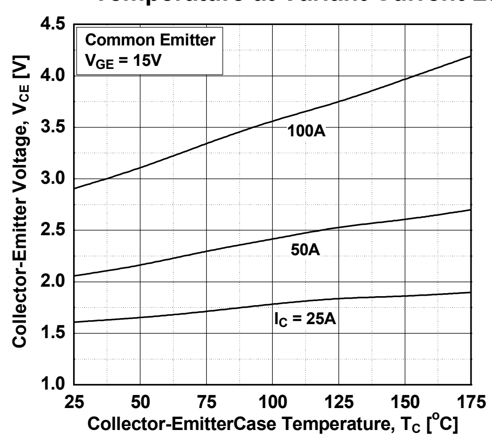
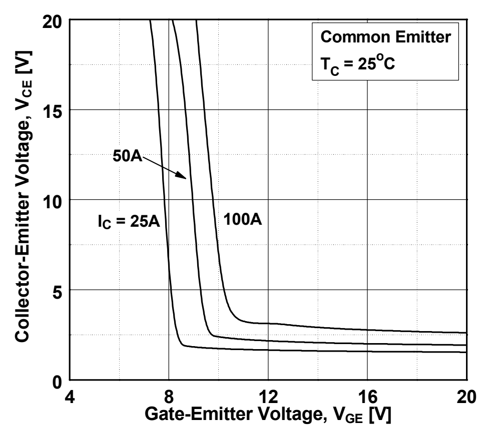


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

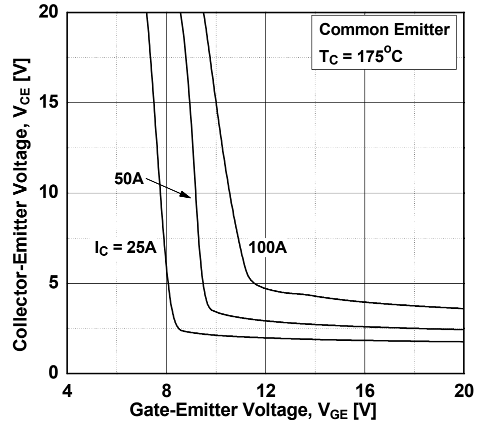


Figure 8. Capacitance Characteristics

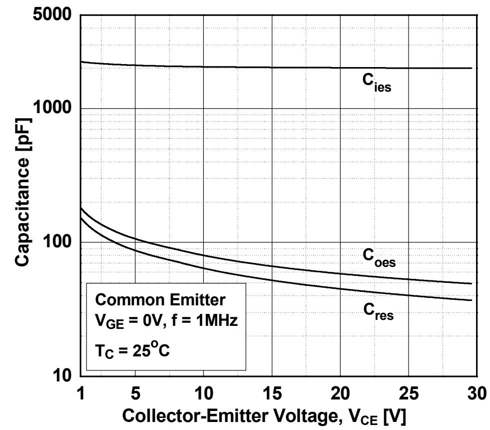


Figure 9. Gate charge Characteristics

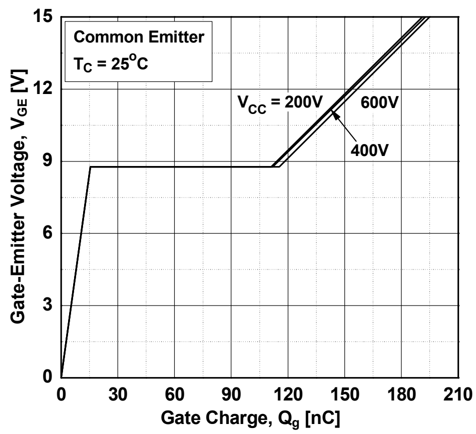


Figure 10. SOA Characteristics

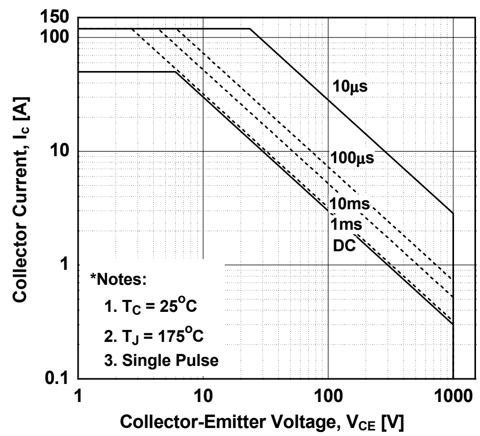


Figure 11. Turn-on Characteristics vs. Gate Resistance

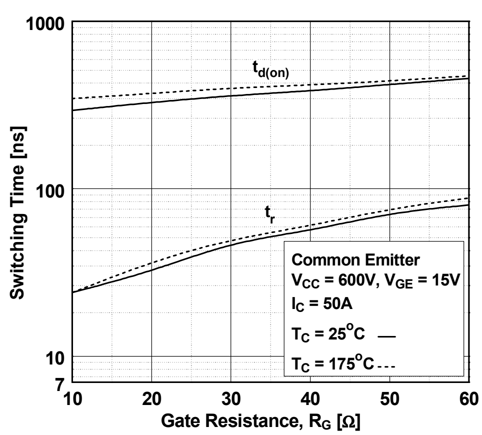
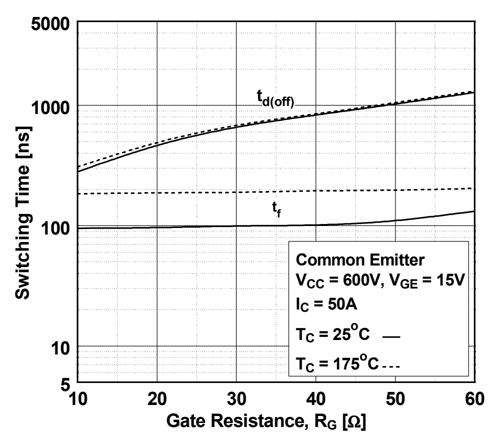


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

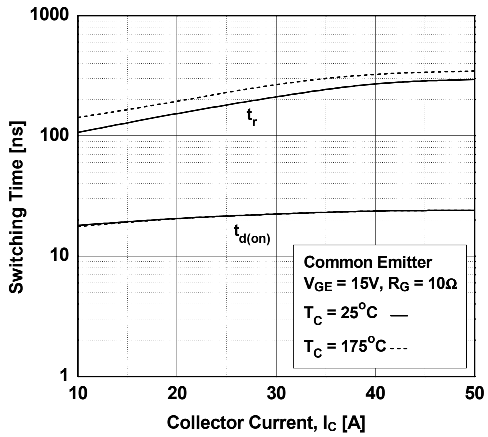


Figure 14. Turn-off Characteristics vs. Collector Current

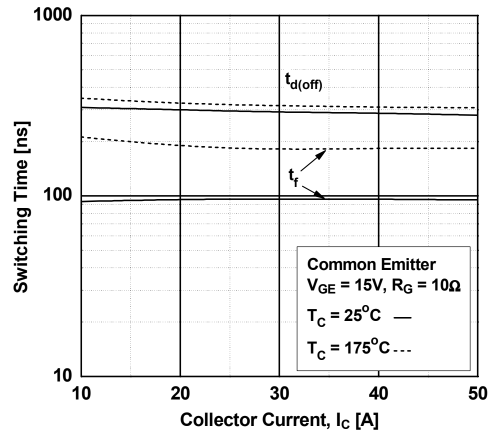


Figure 15. Switching Loss vs. Gate Resistance

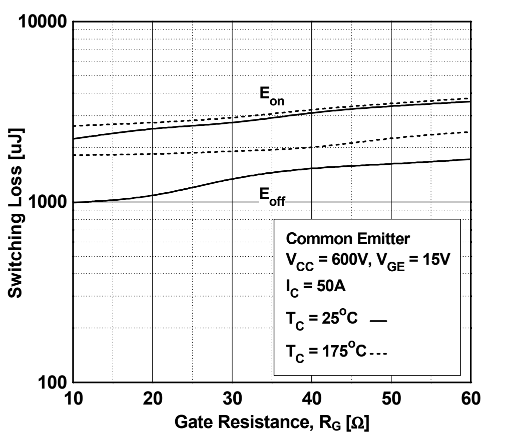


Figure 16. Switching Loss vs. Collector Current

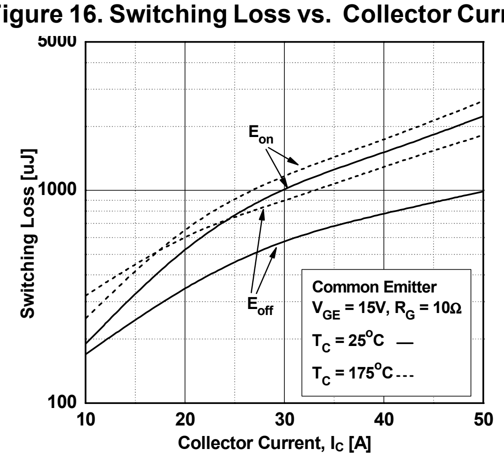


Figure 17. Turn off Switching SOA Characteristics

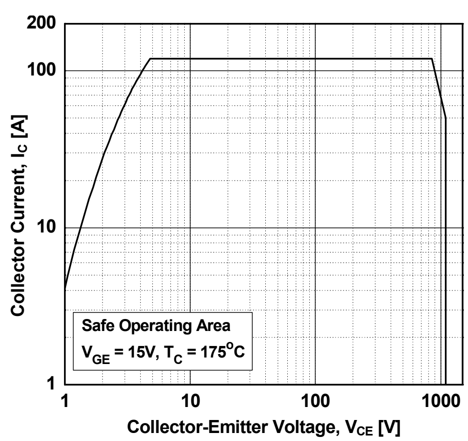
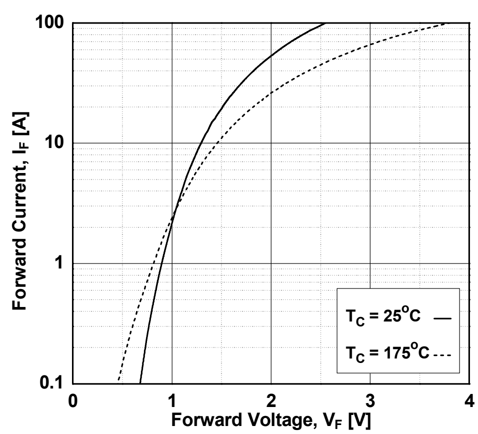
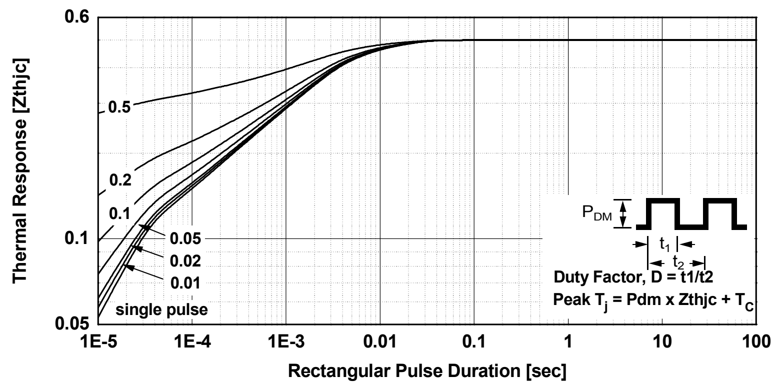


Figure 18. Forward Characteristics



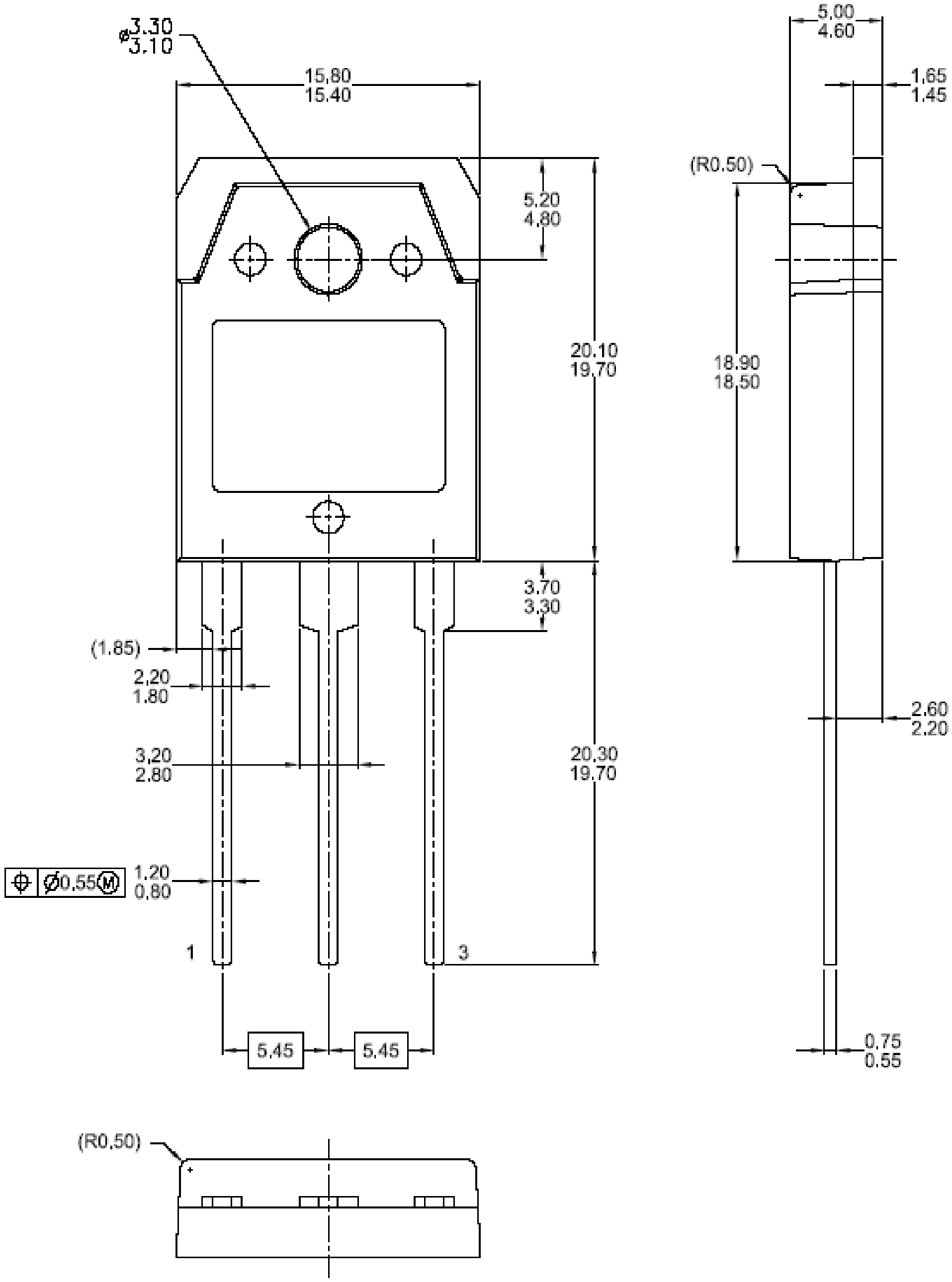
Typical Performance Characteristics

Figure 19. Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-3PN



Dimensions in Millimeters

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