

July 2008

FGH40N60UF 600V, 40A Field Stop IGBT

Features

- · High current capability
- Low saturation voltage: $V_{CE(sat)} = 1.8V @ I_C = 40A$
- · High input impedance
- · Fast switching
- · RoHS compliant

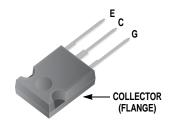
Applications

· Induction Heating, UPS, SMPS, PFC



General Description

Using Novel Field Stop IGBT Technology, Fairchild's new sesries of Field Stop IGBTs offer the optimum performance for Induction Heating, UPS, SMPS and PFC applications where low conduction and switching losses are essential.





Absolute Maximum Ratings

Symbol	Description		Ratings	Units	
V _{CES}	Collector to Emitter Voltage		600	V	
V _{GES}	Gate to Emitter Voltage		± 20	V	
I _C	Collector Current	@ T _C = 25°C	80	А	
10	Collector Current	$@ T_C = 100^{\circ}C$	40	А	
I _{CM (1)}	Pulsed Collector Current	@ T _C = 25°C	120	Α	
P _D	Maximum Power Dissipation	@ $T_C = 25^{\circ}C$	290	W	
. ט	Maximum Power Dissipation	$@ T_C = 100^{\circ}C$	116	W	
T _J	Operating Junction Temperature		-55 to +150	°C	
T _{stg}	Storage Temperature Range		-55 to +150	°C	
TL	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C	

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

Thermal Characteristics

Symbol	Parameter	Тур.	Max.	Units
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	-	0.43	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGH40N60UF	FGH40N60UFTU	TO-247	Tube	30ea	-

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
Off Charac	eteristics					
BV _{CES}	Collector to Emitter Breakdown Voltage	$V_{GE} = 0V, I_{C} = 250\mu A$	600	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0V, I_{C} = 250\mu A$	-	0.6	-	V/°C
I _{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	-	-	250	μА
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	-	-	±400	nA
On Charac	teristics		·			
V _{GE(th)}	G-E Threshold Voltage	$I_{C} = 250 \mu A, V_{CE} = V_{GE}$	4.0	5.0	6.5	V
OL(III)		I _C = 40A, V _{GE} = 15V	-	1.8	2.4	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 40A, V _{GE} = 15V, T _C = 125°C	-	2.0	-	V
Dynamic C	Characteristics					
C _{ies}	Input Capacitance		-	2110	-	pF
C _{oes}	Output Capacitance	$V_{CE} = 30V, V_{GE} = 0V,$ f = 1MHz	-	200	-	pF
C _{res}	Reverse Transfer Capacitance	1 = 11VIDZ	-	60	-	pF
 	Characteristics		_	24	_	
t _{d(on)}	Turn-On Delay Time Rise Time	_	-	44	-	ns ns
t _r	Turn-Off Delay Time		-	112	-	ns
t _{d(off)}	Fall Time	$V_{CC} = 400V, I_{C} = 40A,$ $R_{G} = 10\Omega, V_{GE} = 15V,$	_	30	60	ns
t _f E _{on}	Turn-On Switching Loss	Inductive Load, T _C = 25°C	_	1.19	-	mJ
E _{off}	Turn-Off Switching Loss		_	0.46		mJ
E _{ts}	Total Switching Loss		_	1.65	_	mJ
	Turn-On Delay Time		_	24	_	ns
t _{d(on)}	Rise Time	_	-	45	_	ns
t _{d(off)}	Turn-Off Delay Time	\/ - 400\/ I - 40A	-	120	_	ns
t _f	Fall Time	V_{CC} = 400V, I_{C} = 40A, R_{G} = 10 Ω , V_{GE} = 15V, Inductive Load, T_{C} = 125 o C	-	40	_	ns
E _{on}	Turn-On Switching Loss		-	1.2	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.69	-	mJ
E _{ts}	Total Switching Loss	-	-	1.89	-	mJ
Q _g	Total Gate Charge		-	120	-	nC
•	Gate to Emitter Charge	$V_{CE} = 400V, I_{C} = 40A,$	-	14	-	nC
Q_{ge}	Cate to Ellitter Charge	V _{GE} = 15V				

Figure 1. Typical Output Characteristics

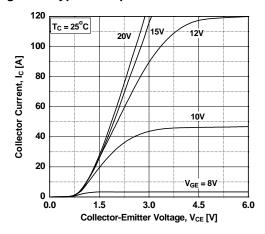


Figure 3. Typical Saturation Voltage Characteristics

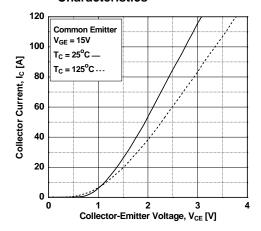


Figure 5. Saturation Voltage vs. Case
Temperature at Variant Current Level

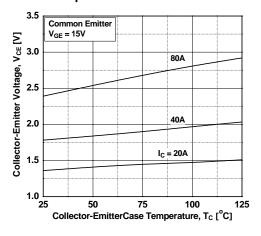


Figure 2. Typical Output Characteristics

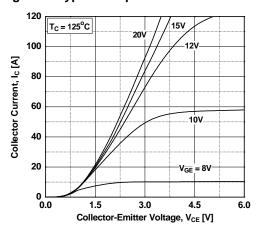


Figure 4. Transfer Characteristics

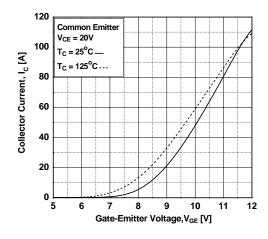


Figure 6. Saturation Voltage vs. V_{GE}

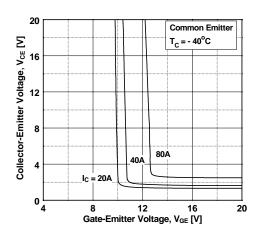


Figure 7. Saturation Voltage vs. V_{GE}

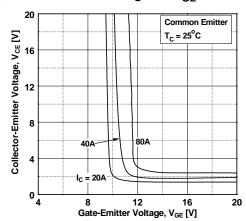


Figure 9. Capacitance Characteristics

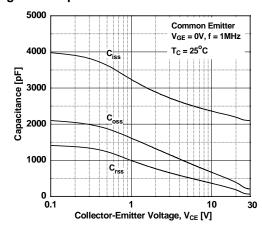


Figure 11. SOA Characteristics

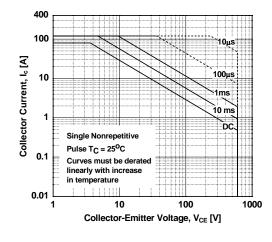


Figure 8. Saturation Voltage vs. V_{GE}

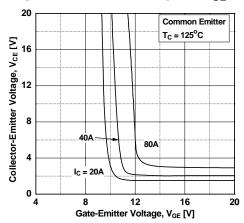


Figure 10. Gate charge Characteristics

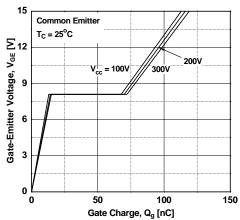


Figure 12. Turn-on Characteristics vs.
Gate Resistance

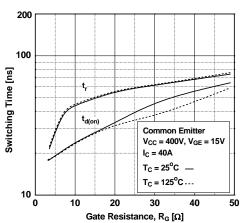


Figure 13. Turn-off Characteristics vs.
Gate Resistance

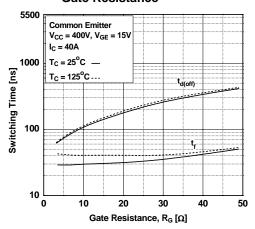


Figure 14. Turn-on Characteristics vs. Collector Current

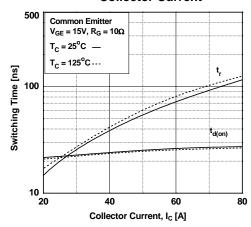


Figure 15. Turn-off Characteristics vs. Collector Current

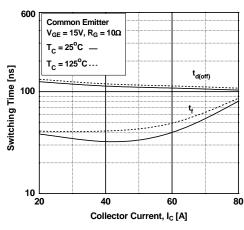


Figure 16. Switching Loss vs. Gate Resistance

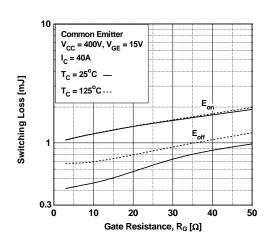


Figure 17. Switching Loss vs. Collector Current

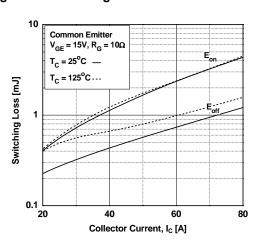
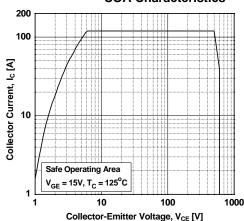
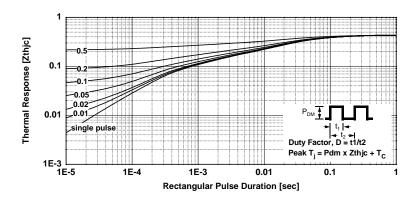


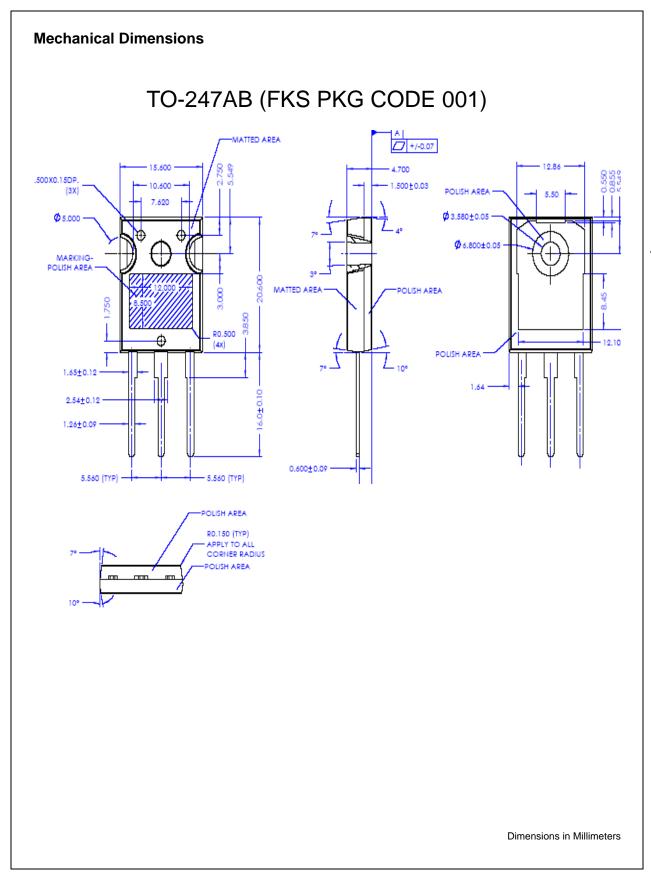
Figure 18. Turn off Switching SOA Characteristics



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Figure 19.Transient Thermal Impedance of IGBT









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