

April 2013

# **FGH30N60LSD** 600 V, 30 A PT IGBT

### **Features**

- Low Saturation Voltage: V<sub>CE(sat)</sub> = 1.1 V @ I<sub>C</sub> = 30 A
- · High Input Impedance
- · Low Conduction Loss

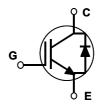
# **Applications**

· Solar Inverter, UPS

# **General Description**

Using Fairchild <sup>®</sup>'s advanced PT technology, the FGA30N60LSD IGBT offers superior conduction performances, which offer the optimum performance for medium switching application such as solar inverter, UPS applications where low conduction losses are the most important factor.





# **Absolute Maximum Ratings**

Symbol	Description		FGH30N60LSD	Unit
V <sub>CES</sub>	Collector-Emitter Voltage		600	V
V <sub>GES</sub>	Gate-Emitter Voltage		± 20	V
I <sub>C</sub>	Collector Current	@ T <sub>C</sub> = 25°C	60	Α
	Collector Current	@ T <sub>C</sub> = 100°C	30	Α
I <sub>CM (1)</sub>	Pulsed Collector Current		90	Α
I <sub>FSM</sub>	Non-repetitive Peak Surge Current 60Hz Single Half-Sine Wave		150	А
P <sub>D</sub>	Maximum Power Dissipation	@ T <sub>C</sub> = 25°C	480	W
	Maximum Power Dissipation	@ T <sub>C</sub> = 100°C	192	W
T <sub>J</sub>	Operating Junction Temperature		-55 to +150	°C
T <sub>stg</sub>	Storage Temperature Range		-55 to +150	°C
T <sub>L</sub>	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.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction-to-Case		0.26	°C/W
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction-to-Case		0.92	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient		40	°C/W

# Package Marking and Ordering Information

		Packaging			Max Qty	
Device Marking	Device	Package	Type	Qty per Tube	per Box	
FGH30N60LSD	FGH30N60LSDTU	TO-247	Tube	30ea	-	

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	teristics					
BV <sub>CES</sub>	Collector-Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 250uA	600			V
$\Delta B_{VCES}/$ $\Delta T_{J}$	Temperature Coefficient of Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 250uA		0.6		V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V			250	uA
I <sub>GES</sub>	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$			±250	nA
On Charac	teristics					
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 250uA, V <sub>CE</sub> = V <sub>GE</sub>	4.0	5.5	7.0	V
OL(III)	_	I <sub>C</sub> = 30A, V <sub>GE</sub> = 15V		1.1	1.4	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 30A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 125°C		1.0		V
		I <sub>C</sub> = 60 A, V <sub>GE</sub> = 15V		1.3		V
Dynamic C	haracteristics			1		
C <sub>ies</sub>	Input Capacitance			3550		pF
C <sub>oes</sub>	Output Capacitance	$V_{CE} = 30V_{,} V_{GE} = 0V_{,}$ f = 1MHz		245		pF
C <sub>res</sub>	Reverse Transfer Capacitance	- 1 - 1WITZ		90		pF
Switching	Characteristics			1		
t <sub>d(on)</sub>	Turn-On Delay Time			18		ns
t <sub>r</sub>	Rise Time	-		46		ns
t <sub>d(off)</sub>	Turn-Off Delay Time	V <sub>CC</sub> = 400 V, I <sub>C</sub> = 30A,		250		ns
t <sub>f</sub>	Fall Time	$R_G = 6.8\Omega$ , $V_{GE} = 15V$ ,		1.3	2.0	us
E <sub>on</sub>	Turn-On Switching Loss	Inductive Load, T <sub>C</sub> = 25°C		1.1		mJ
E <sub>off</sub>	Turn-Off Switching Loss	-		21		mJ
t <sub>d(on)</sub>	Turn-On Delay Time			17		ns
t <sub>r</sub>	Rise Time			45		ns
$t_{d(off)}$	Turn-Off Delay Time	V <sub>CC</sub> = 400 V, I <sub>C</sub> = 30A,		270		ns
t <sub>f</sub>	Fall Time	$R_G = 6.8\Omega$ , $V_{GE} = 15V$ ,		2.6		us
E <sub>on</sub>	Turn-On Switching Loss	Inductive Load, T <sub>C</sub> = 125°C		1.1		mJ
E <sub>off</sub>	Turn-Off Switching Loss	_		36		mJ
Qg	Total Gate Charge			225		nC
Q <sub>ge</sub>	Gate-Emitter Charge	$V_{CE} = 600 \text{ V}, I_{C} = 30\text{A},$		30		nC
Q <sub>gc</sub>	Gate-Collector Charge	- V <sub>GE</sub> = 15V		105		nC
L <sub>e</sub>	Internal Emitter Inductance	Measured 5mm from PKG		7		nH

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

Parameter	Conditions		Min.	Тур.	Max	Unit
V <sub>FM</sub>	I <sub>F</sub> = 15A I <sub>F</sub> = 15A	T <sub>C</sub> = 25 °C T <sub>C</sub> = 125 °C	-	1.8 1.6	2.2 -	V V
I <sub>RM</sub>	V <sub>R</sub> = 600V	T <sub>C</sub> = 25 °C	-	-	100	μΑ
t <sub>rr</sub>	$I_F$ =1A, di/dt = 100A/ $\mu$ s, $V_{CC}$ = 30V $I_F$ =15A, di/dt = 100A/ $\mu$ s, $V_{CC}$ = 390V	T <sub>C</sub> = 25 °C T <sub>C</sub> = 25 °C	-	-	35 40	ns ns
t <sub>a</sub> t <sub>b</sub> Q <sub>rr</sub>	$I_F$ =15A, di/dt = 100A/ $\mu$ s, $V_{CC}$ = 390V	$T_{C} = 25 ^{\circ}\text{C}$ $T_{C} = 25 ^{\circ}\text{C}$ $T_{C} = 25 ^{\circ}\text{C}$	- - -	18 13 27.5	- - -	ns ns nC

# **Typical Performance Characteristics**

**Figure 1.Typical Output Characteristics** 

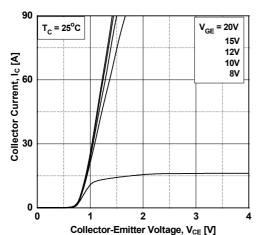


Figure 3. Typical Saturation Voltage Characteritics

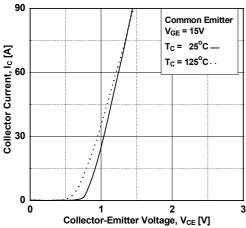


Figure 5. Saturation Voltage vs. Case
Temperature at Variant Current Level

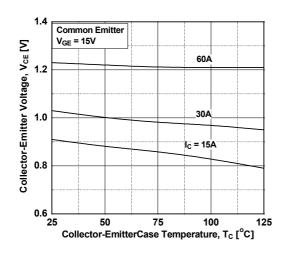


Figure 2. Typical Saturation Voltage Characteristics

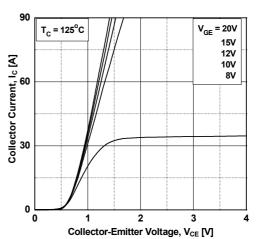


Figure 4. Transfer characteristics

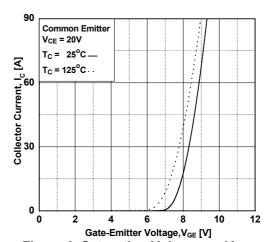
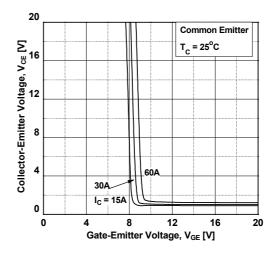


Figure 6. Saturation Voltage vs. Vge



# Typical Performance Characteristics (Continued)

Figure 7. Saturation Voltage vs. Vge

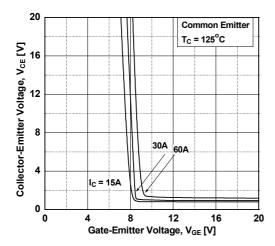


Figure 9. Gate Charge Characteristics

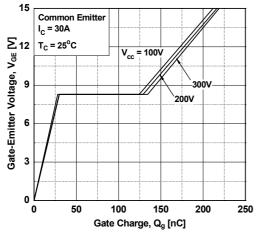


Figure 11. Load Current Vs. Frequency

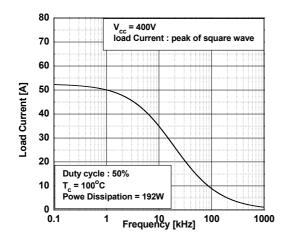


Figure 8. Capacitance characteristics

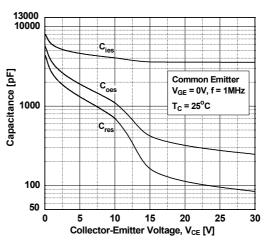


Figure 10. SOA Characteeristics

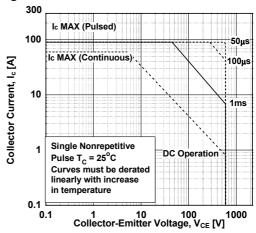
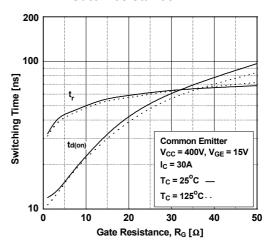


Figure 12. Turn-On Characteristics vs.
Gate Resistance



# Typical Performance Characteristics (Continued)

Figure 13. Turn-Off Characteristics vs.
Gate Resistance

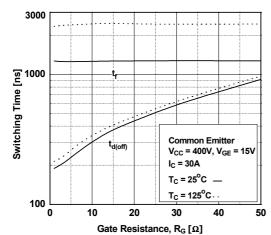


Figure 15. Turn-Off Characteristics vs. Collector Current

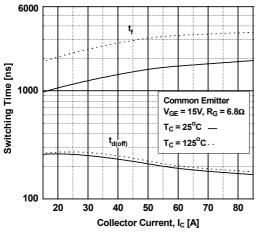


Figure 17.Switching Loss vs Collector Current

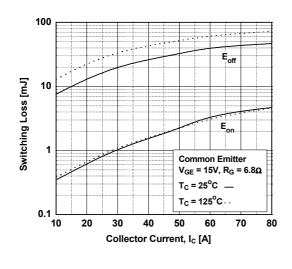


Figure 14. Turn-On Characteristics vs. Collector Current

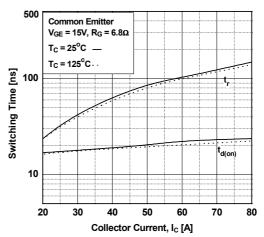


Figure 16. Switching Loss vs Gate Resistance

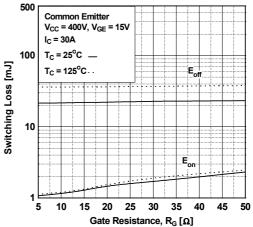
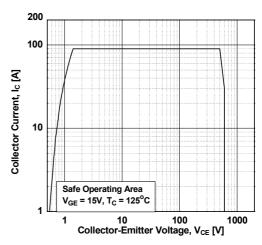


Figure 18. Turn-Off Switching SOA Characteristics





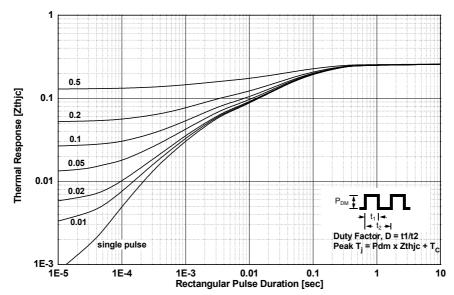
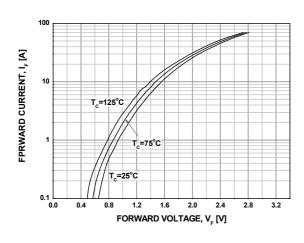


Figure 20. Typical Forward Voltage Drop

**Figure 21. Typical Reverse Current** 



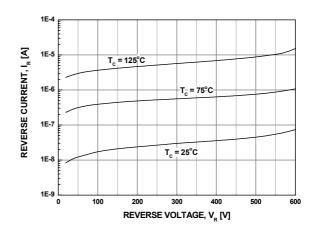
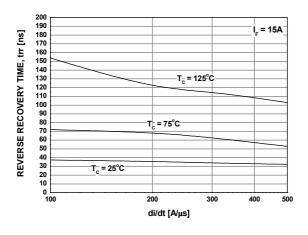
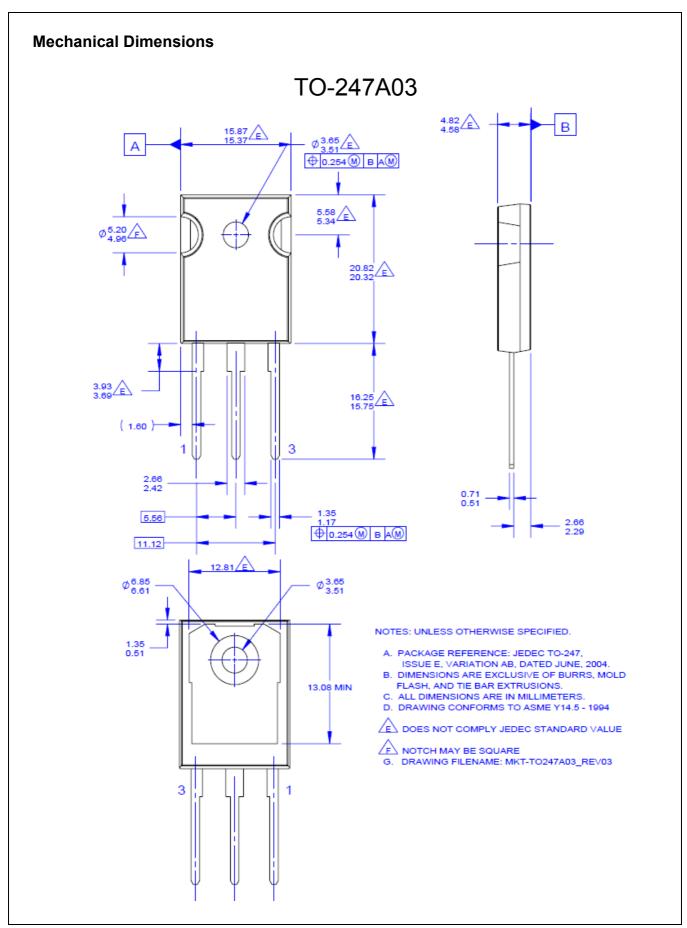


Figure 22. Typical Reverse Recovery Time









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