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September 2013

FGPF15N60UNDF 600 V, 15 A Short Circuit Rated IGBT

Features

- Short Circuit Rated 10us
- High Current Capability
- High Input Impedance
- Fast Switching
- RoHS Compliant

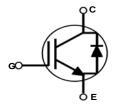
General Description

Using advanced NPT IGBT technology, Fairchild's the NPT IGBTs offer the optimum performance for low-power inverterdriven applications where low-losses and short-circuit ruggedness features are essential, such as sewing machine, CNC, motor control and home appliances.

Applications

· Sewing Machine, CNC, Home Appliances, Motor Control





Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V _{CES}	Collector to Emitter Voltage		600	V
V _{GES}	Gate to Emitter Voltage		± 20	V
I _C	Collector Current	@ T _C = 25°C	30	A
	Collector Current	@ T _C = 100°C	15	A
I _{CM (1)}	Pulsed Collector Current	@ T _C = 25°C	45	Α
I _F	Diode Forward Current	@ T _C = 25°C	15	A
·F	Diode Forward Current	@ T _C = 100°C	7.5	A
P _D	Maximum Power Dissipation	@ T _C = 25°C	42	W
. Б	Maximum Power Dissipation	$@ T_C = 100^{\circ}C$	17	W
T _J	Operating Junction Temperature		-55 to +150	°C
T _{stg}	Storage Temperature Range		-55 to +150	°C

Notes:

Thermal Characteristics

Symbol	Parameter	Тур.	Max.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	-	3.0	°C/W
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction to Case	-	4.9	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (PCB Mount)(2)	-	62.5	°C/W

Notes

2: Mountde on 1" square PCB (FR4 or G-10 material)

^{1:} Repetitive rating: Pulse width limited by max. junction temperature

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGPF15N60UNDF	FGPF15N60UNDF	TO-220F			50ea

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	teristics					
BV _{CES}	Collector to Emitter Breakdown Voltage	$V_{GE} = 0 \text{ V}, I_{C} = 250 \mu\text{A}$	600	-	-	V
I _{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0 V$	-	-	1	mA
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, $V_{CE} = 0 V$	-	-	±10	μΑ
On Charac	teristics					
V _{GE(th)}	G-E Threshold Voltage	I_C = 15 mA, V_{CE} = V_{GE}	5.5	6.8	8.5	V
		I _C = 15 A, V _{GE} = 15 V	-	2.2	2.7	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	$I_C = 15 \text{ A}, V_{GE} = 15 \text{ V},$ $T_C = 125^{\circ}\text{C}$	-	2.7	-	V
Dynamic C	haracteristics					
C _{ies}	Input Capacitance		-	619	-	pF
C _{oes}	Output Capacitance	$V_{CE} = 30 \text{ V}, V_{GE} = 0 \text{ V},$ f = 1 MHz	-	80	-	pF
C _{res}	Reverse Transfer Capacitance	1 = 11VIDZ	-	24	-	pF
Switching	Characteristics		•			
t _{d(on)}	Turn-On Delay Time		-	9.3	-	ns
t _r	Rise Time		-	9.8	-	ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 400 \text{ V}, I_{C} = 15 \text{ A},$	-	54.8	-	ns
t _f	Fall Time	$R_G = 10 \Omega$, $V_{GE} = 15 V$,	-	9.9	12.8	ns
E _{on}	Turn-On Switching Loss	Inductive Load, T _C = 25°C	-	0.37	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.067	-	mJ
E _{ts}	Total Switching Loss		-	0.44	-	mJ
t _{d(on)}	Turn-On Delay Time		-	8.9	-	ns
t _r	Rise Time		- /	9.9	-	ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 400 \text{ V}, I_{C} = 15 \text{ A},$	-	56.6	- /	ns
t _f	Fall Time	$R_G = 10 \Omega$, $V_{GE} = 15 V$,	-	13.2	-	ns
E _{on}	Turn-On Switching Loss	Inductive Load, T _C = 125°C	-	0.54	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.11	-	mJ
E _{ts}	Total Switching Loss		-	0.65	- /	mJ
T _{sc}	Short Circuit Withstand Time	$V_{CC} = 350 \text{ V},$ $R_G = 100 \Omega, V_{GE} = 15 \text{ V},$ $T_C = 150^{\circ}\text{C}$	10	-	-	μs

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

Q_g	Total Gate Charge		-	43	-	nC
Q _{ge}	Gate to Emitter Charge	$V_{CE} = 400 \text{ V}, I_{C} = 15 \text{ A},$ $V_{GE} = 15 \text{ V}$	-	6	-	nC
Q _{gc}	Gate to Collector Charge	VGE = 10 V	-	26	-	nC

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

Symbol	Parameter		Test Conditions		Min.	Тур.	Max	Unit	
V _{FM}	Diode Forward Voltage	I= = 1	15 A		$T_C = 25^{\circ}C$	-	1.6	2.2	V
Plode Forward Voltage	'F =	1071		T _C = 125°C	-	1.5	-	•	
t	Diode Reverse Recovery Time	1 -	$= 15 \text{ A}, \text{ dI}_{\text{F}}/\text{dt} = 200 \text{ A}/\mu\text{s}$		$T_{\rm C} = 25^{\rm o}{\rm C}$	-	82.4		ns
'rr					T _C = 125°C		142	-	
Q _{rr}	Diode Reverse Recovery Charge			Ī	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	213	=	nC
oct.				Ī	T _C = 125°C	-	541	-	

Figure 1. Typical Output Characteristics

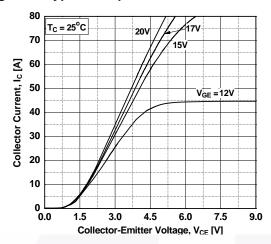


Figure 3. Typical Saturation Voltage Characteristics

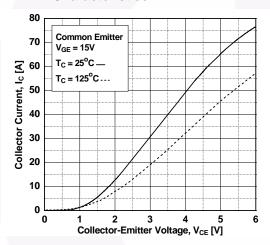


Figure 5. Saturation Voltage vs. Case
Temperature at Variant Current Level

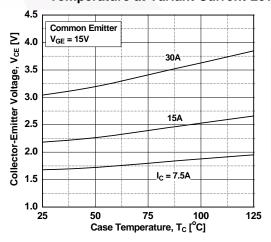


Figure 2. Typical Output Characteristics

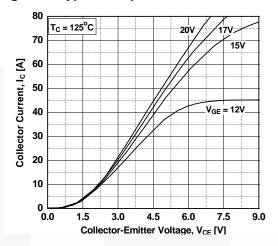


Figure 4. Transfer Characteristics

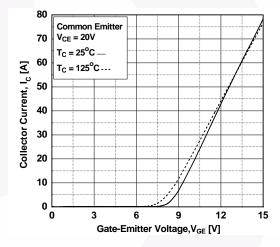


Figure 6. Saturation Voltage vs. V_{GE}

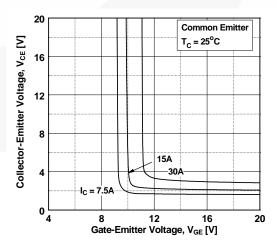


Figure 7. Saturation Voltage vs. V_{GE}

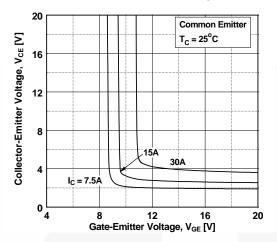


Figure 9. Gate charge Characteristics

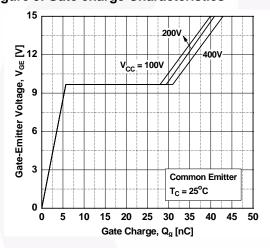


Figure 11. Turn-on Characteristics vs.
Gate Resistance

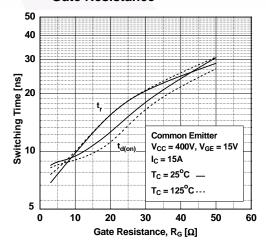


Figure 8. Capacitance Characteristics

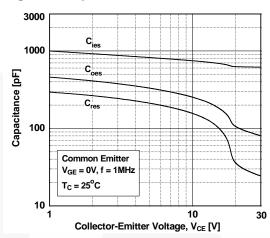


Figure 10. SOA Characteristics

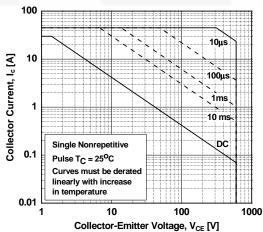


Figure 12. Turn-off Characteristics vs.
Gate Resistance

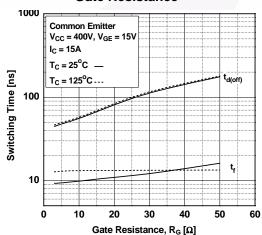


Figure 13. Turn-on Characteristics vs.
Collector Current

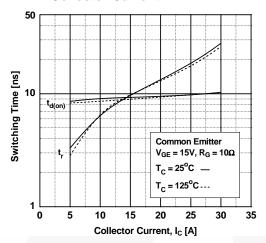


Figure 15. Switching Loss vs.
Gate Resistance

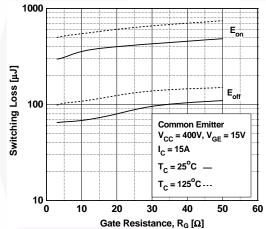


Figure 17. Turn off Switching SOA Characteristics

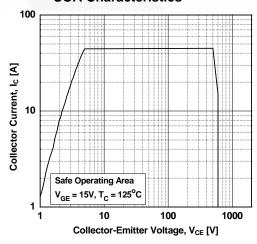


Figure 14. Turn-off Characteristics vs.
Collector Current

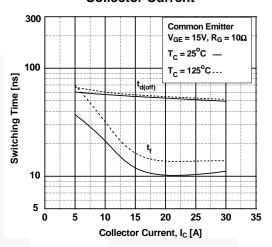


Figure 16. Switching Loss vs Collector Current

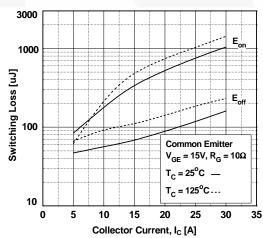


Figure 18. Forward Characteristics

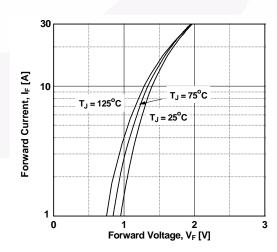


Figure 19. Reverse Current

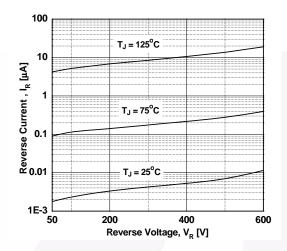


Figure 20. Stored Charge

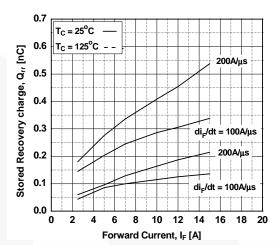


Figure 21. Reverse Recovery Time

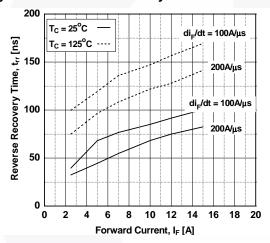
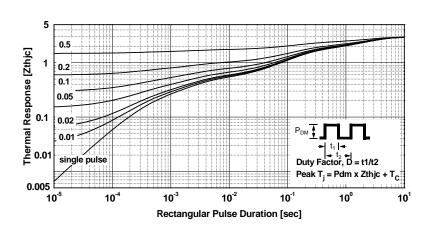


Figure 22. Transient Thermal Impedance of IGBT



Mechanical Dimensions

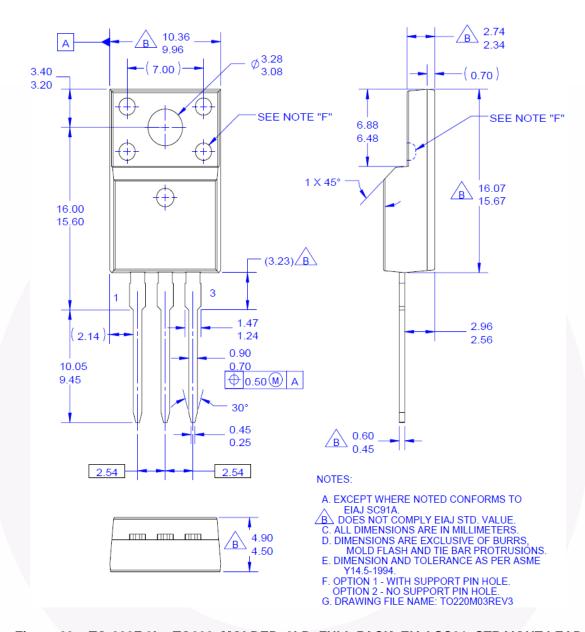


Figure 23. TO-220F 3L - TO220, MOLDED, 3LD, FULL PACK, EIAJ SC91, STRAIGHT LEAD

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Dimensions in Millimeters





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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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Rev. 166

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