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September 2013

FGB7N60UNDF 600 V, 7 A Short Circuit Rated IGBT

Features

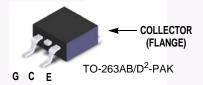
- Short Circuit Rated 10 us
- · High Current Capability
- High Input Impedance
- · Fast Switching
- RoHS Compliant

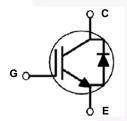
Applications

• Sewing Machine, CNC, Home Appliances, Motor Control

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.





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	$@ T_C = 25^{\circ}C$	14	А
i.C	Collector Current	$@ T_C = 100^{\circ}C$	7	Α
I _{CM (1)}	Pulsed Collector Current	@ T _C = 25°C	21	A
l _F	Diode Forward Current	@ T _C = 25°C	7	А
	Diode Forward Current	$@ T_C = 100^{\circ}C$	3.5	А
P _D	Maximum Power Dissipation	@ T _C = 25°C	83	W
	Maximum Power Dissipation	@ T _C = 100°C	33	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:

Thermal Characteristics

Symbol	Parameter	Тур.	Max.	Unit
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case		1.5	°C/W
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction to Case		3.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (PCB Mount)(2)		40	°C/W

Notes

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

^{2:} Mounted on 1" square PCB (FR4 or G-10 material)

Package Marking and Ordering Information

Device Marking Device		Package	Rel Size	Tape Width	Quantity
FGB7N60UNDF	FGB7N60UNDF	TO-263AB(D ² -PAK)		-	50

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	teristics					
BV _{CES}	Collector to Emitter Breakdown Voltage	$V_{GE} = 0V, I_{C} = 250\mu A$	600	-	-	V
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0V	-	-	1	mA
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	-	-	±10	uA
On Charac	teristics					
V _{GE(th)}	G-E Threshold Voltage	$I_C = 7mA$, $V_{CE} = V_{GE}$	5.5	6.8	8.5	V
		I _C = 7A, V _{GE} = 15V	-	1.9	2.3	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 7A, V _{GE} = 15V, T _C = 125°C	-	2.1	-	V
Dynamic C	haracteristics			!		
C _{ies}	Input Capacitance		-	275		pF
C _{oes}	Output Capacitance	$V_{CE} = 30V_{,} V_{GE} = 0V_{,}$ f = 1MHz	-	41		pF
C _{res}	Reverse Transfer Capacitance	I = IIVIMZ	-	10		pF
Switching	Characteristics					
t _{d(on)}	Turn-On Delay Time		-	5.9		ns
t _r	Rise Time	V_{CC} = 400V, I_{C} = 7A, R_{G} = 10 Ω , V_{GE} = 15V, Inductive Load, T_{C} = 25°C	-	4.2		ns
$t_{d(off)}$	Turn-Off Delay Time		-	32.3		ns
t _f	Fall Time		-	68	89	ns
E _{on}	Turn-On Switching Loss	inductive Load, T _C = 25°C	-	99		uJ
E _{off}	Turn-Off Switching Loss		-	104		uJ
E _{ts}	Total Switching Loss		-	203		uJ
t _{d(on)}	Turn-On Delay Time		-	6		ns
t _r	Rise Time		-	4.3		ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 400V, I_{C} = 7A,$	-	33.8		ns
t _f	Fall Time	$R_G = 10\Omega$, $V_{GE} = 15V$, Inductive Load, $T_C = 125^{\circ}C$	-	113		ns
E _{on}	Turn-On Switching Loss		-	181		uJ
E _{off}	Turn-Off Switching Loss		-	144	/	uJ
E _{ts}	Total Switching Loss		-	325		uJ
T _{sc}	Short Circuit Withstand Time	$V_{CC} = 350V,$ $R_G = 100\Omega, V_{GE} = 15V,$ $T_C = 150^{\circ}C$	10			us

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

Q_g	Total Gate Charge		-	18	-	nC
Q _{ge}	Gate to Emitter Charge	$V_{CE} = 400V, I_{C} = 7A,$ $V_{GE} = 15V$	-	3	-	nC
Q_{gc}	Gate to Collector Charge	VGE - 13V	-	13	-	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	$I_{F} = I_{A}$	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	1.7	2.2	V
			$T_{\rm C} = 125^{\rm o}{\rm C}$	-	1.6]
t _{rr}	Diode Reverse Recovery Time	I _F =7A, dI _F /dt = 200A/μs	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	32.3		ns
11			$T_{\rm C} = 125^{\rm o}{\rm C}$	-	70		
Q_{rr}	Diode Reverse Recovery Charge	ης - / / (, αις/αι - 200/ γμο	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	59		nC
711	- Table 1 and 1 an		$T_{\rm C} = 125^{\rm o}{\rm C}$	-	172	-	

Figure 1. Typical Output Characteristics

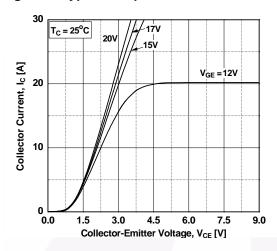


Figure 3. Typical Saturation Voltage Characteristics

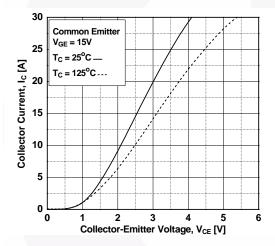


Figure 5. Saturation Voltage vs. Case
Temperature at Variant Current Level

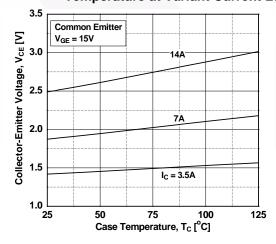


Figure 2. Typical Output Characteristics

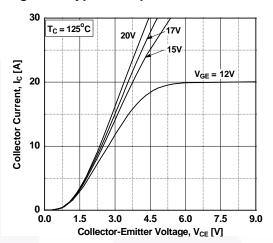


Figure 4. Transfer Characteristics

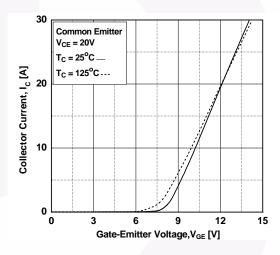


Figure 6. Saturation Voltage vs. V_{GE}

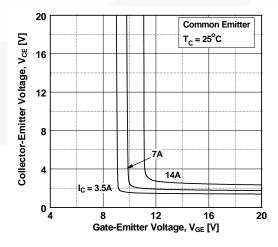


Figure 7. Saturation Voltage vs. V_{GE}

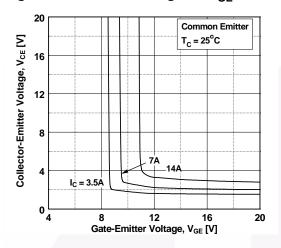


Figure 9. Gate charge Characteristics

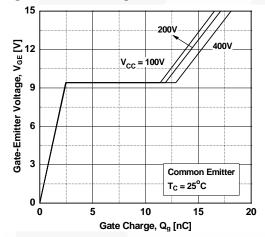


Figure 11. Turn-on Characteristics vs.
Gate Resistance

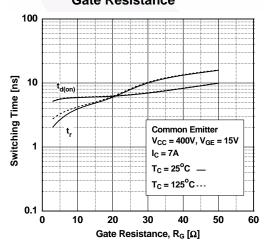


Figure 8. Capacitance Characteristics

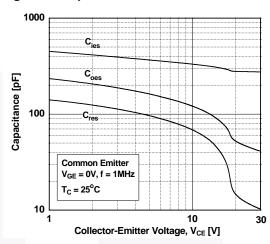


Figure 10. SOA Characteristics

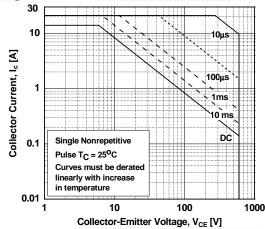


Figure 12. Turn-off Characteristics vs.
Gate Resistance

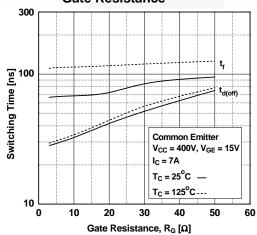


Figure 13. Turn-on Characteristics vs. Collector Current

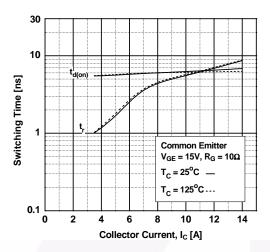


Figure 15. Switching Loss vs.

Gate Resistance

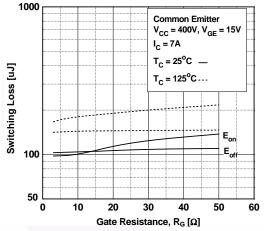


Figure 17. Turn off Switching SOA Characteristics

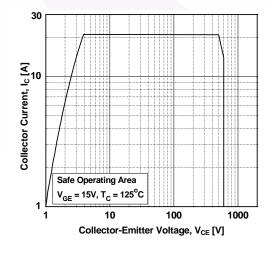


Figure 14. Turn-off Characteristics vs.
Collector Current

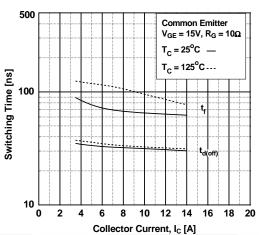


Figure 16. Switching Loss vs Collector Current

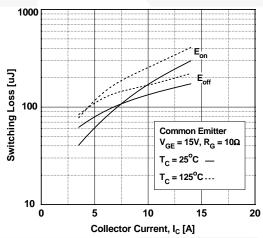


Figure 18. Forward Characteristics

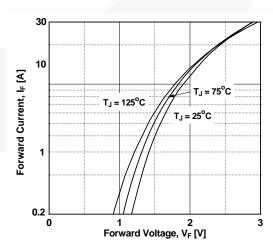


Figure 19. Reverse Current

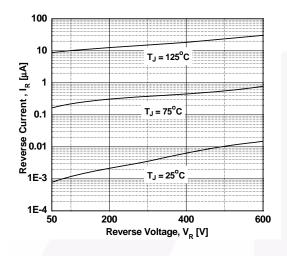


Figure 20. Stored Charge

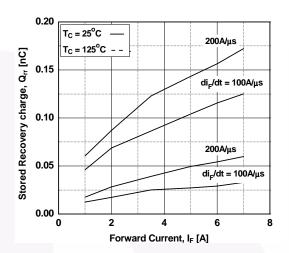


Figure 21. Reverse Recovery Time

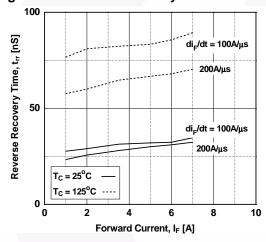
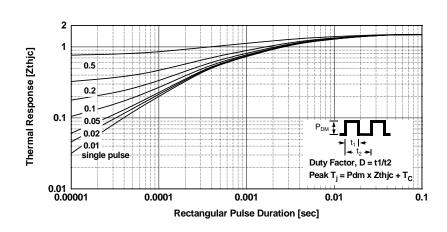


Figure 22. Transient Thermal Impedance of IGBT



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Mechanical Dimensions 9.45 10.00 (6.40)1.78 MAX 3.80 1,05 (2.12) -5.08 LAND PATTERN RECOMMENDATION UNLESS NOTED, ALL DIMS TYPICAL → 0.25 M B AM 5,08 6.22 MIN -6.86 MIN 15.88 14.61 SEE DETA**|**L A 2 NOTES; UNLESS OTHERWISE SPECIFIED A) ALL DIMENSIONS ARE IN MILLIMETERS. B) REFERENCE JEDEC, TO-263, VARIATION AB. C) DIMENSIONING AND TOLERANCING PER ANS| Y14,5M - 1994, D) LOCATION OF THE PIN HOLE MAY VARY GAGE PLANE (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE). LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N 0.25 FILENAME: TO263A02REV6 ○ 0.10 B 2.79 0,25 MAX (5.38)SEATING PLANE

Figure 23. TO-263 2L (D2PAK) - 2LD, TO263, SURFACE MOUNT

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Dimensions in Millimeters





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