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November 2013



FGH60N60SMD 600 V, 60 A Field Stop IGBT

Features

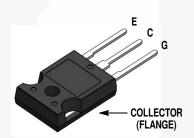
- Maximum Junction Temperature: T_J = 175°C
- Positive Temperaure Co-efficient for easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: V_{CE(sat)} = 1.9 V(Typ.) @ I_C = 60 A
- High Input Impedance
- Fast Switching: E_{OFF} = 7.5 uJ/A
- Tightened Parameter Distribution
- RoHS Compliant

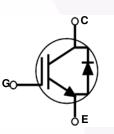
Applications

· Solar Inverter, UPS, Welder, PFC, Telecom, ESS

General Description

Using novel field stop IGBT technology, Fairchild's new series of field stop 2nd generation IGBTs offer the optimum performance for solar inverter, UPS, welder, telecom, ESS and PFC applications where low conduction and switching losses are essential.





Absolute Maximum Ratings

Symbol	Description	Ratings	Unit	
V _{CES}	Collector to Emitter Voltage	600	V	
V _{GES}	Gate to Emitter Voltage		± 20	V
GES	Transient Gate-to-Emitter Voltage	\pm 30	V	
Ic	Collector Current	@ T _C = 25°C	120	A
·U	Collector Current	@ T _C = 100 ^o C	60	A
I _{CM (1)}	Pulsed Collector Current	180	A	
I _F	Diode Forward Current	@ T _C = 25°C	60	A
۰F	Diode Forward Current	@ T _C = 100 ^o C	30	А
I _{FM (1)}	Pulsed Diode Maximum Forward Curr	180	А	
P _D	Maximum Power Dissipation	@ T _C = 25°C	600	W
' D	Maximum Power Dissipation	@ T _C = 100 ^o C	300	W
TJ	Operating Junction Temperature	-55 to +175	°C	
T _{stg}	Storage Temperature Range	-55 to +175	°C	
TL	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 second	300	°C	

Notes:

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

Symbo	ol		Paramete	r	Тур.		Max.		Unit	
R _{0JC} (IGBT)) Th	ermal Resistance,	Junction to Ca	se	-		0.25		°C/W	
R _{0JC} (Diode		ermal Resistance,	se	-		1.1		°C/W		
R _{0JA}	Th	ermal Resistance,	Junction to An	nbient			40		°C/W	
Packad	e Mar	king and Or	derina In	formation						
Part Nu		Top Mark	Package		Reel Size		Tape Wic	lth C	Quantity	
FGH60N60SMDFGH60N60SMDTO-247		Tube	N/A		N/A		30			
Electric	al Ch	aracteristics	of the IC	GBT $T_{C} = 25^{\circ}C$ unless othe	rwise noted					
Symbol		Parameter		Test Conditio	ns	Min.	Тур.	Max.	Unit	
Off Charac	cteristics	5								
BV _{CES}	Collect	or to Emitter Breakc	lown Voltage	$V_{GE} = 0 V, I_{C} = 250 \mu A$		600	-	-	V	
$\frac{\Delta BV_{CES}}{\Delta T_{J}}$	Temper Voltage	emperature Coefficient of Breakdown		$V_{GE} = 0 V, I_{C} = 250 \mu A$		-	0.6	-	V/ºC	
ICES	Collect	or Cut-Off Current		$V_{CE} = V_{CES}, V_{GE} = 0 V$	-		-	250	μA	
I _{GES}	G-E Le	akage Current		$V_{GE} = V_{GES}, V_{CE} = 0 V$	-		-	±400	nA	
On Charac	teristics					-				
V _{GE(th)}		reshold Voltage		I _C = 250 μA, V _{CE} = V _{GE}	$V_{CE} = V_{CE}$ 3.		4.5	6.0	V	
		$I_{\rm C} = 60 \text{ A}, V_{\rm GE} = 15 \text{ V}$			1.9	2.5	V			
V _{CE(sat)}	Collect	or to Emitter Satura	tion Voltage	$I_{C} = 60 \text{ A}, V_{GE} = 15 \text{ V},$ $T_{C} = 175^{\circ}\text{C}$		-	2.1	-	v	
Dynamic C	Characte	ristics						1		
C _{ies}	1	put Capacitance				-	2915	-	pF	
C _{oes}	Output	Capacitance		V _{CE} = 30 V _, V _{GE} = 0 V, f = 1 MHz	-		270	-	pF	
C _{res}	Revers	e Transfer Capacita	ince	T = T MHZ			85	-	pF	
Switching	Charact	oristics								
t _{d(on)}	1	n Delay Time				-	18	27	ns	
t _r	Rise Ti					-	47	70	ns	
t _{d(off)}	-	ff Delay Time		V _{CC} = 400 V, I _C = 60 A,		-	104	146	ns	
t _f	Fall Tin	-		$R_G = 3 \Omega$, $V_{GE} = 15 V$,		-	50	68	ns	
E _{on}	Turn-O	n Switching Loss		Inductive Load, T _C = 25	°C	-	1.26	1.94	mJ	
E _{off}	Turn-O	off Switching Loss				-	0.45	0.6	mJ	
E _{ts}		witching Loss				-	1.71	2.54	mJ	
t _{d(on)}	Turn-O	n Delay Time				-	18	-	ns	
t _r	Rise Ti	me				-	41	-	ns	
t _{d(off)}	Turn-O	ff Delay Time		V _{CC} = 400 V, I _C = 60 A,		-	115	-	ns	
t _f	Fall Tin			$R_{G} = 3 \Omega$, $V_{GE} = 15 V$,	-0 -	-	48	-	ns	
E _{on}	Turn-O	n Switching Loss		Inductive Load, T _C = 17	5°C	-	2.1	-	mJ	
E _{off}	Turn-O	ff Switching Loss				-	0.78	-	mJ	
E _{ts}	Total S	witching Loss				-	2.88	-	mJ	

Electrical Characteristics of the IGBT (Continued)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max	Unit
Qg	Total Gate Charge		-	189	284	nC
Q _{ge}	Gate to Emitter Charge	V _{CE} = 400 V, I _C = 60 A, V _{GE} = 15 V	-	20	30	nC
Q _{gc}	Gate to Collector Charge	VGE - 13 V	-	91	137	nC

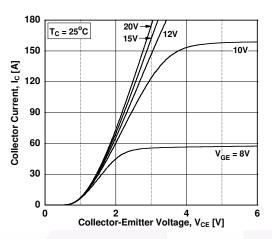
Electrical Characteristics of the Diode T_C = 25°C unless otherwise noted

Symbol	Parameter		Test Conditions		Min.	Тур.	Max	Unit
V _{FM} [Diode Forward Voltage	I _F = ($T_{\rm C} = 25^{\circ}{\rm C}$	-	2.1	2.7	v	
	M Diode i ofward voltage		1F - 00 /	T _C = 175°C	-	1.7		-
E _{rec}	Reverse Recovery Energy			T _C = 175°C	-	79	-	uJ
t _{rr}	Diode Reverse Recovery Time	I _F =30 A, di _F /dt = 200 A/μs	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	30	39	ns	
٩r		η ·	$10 \text{ A}, \text{ u}_{\text{F}}/\text{u}_{\text{C}} = 200 \text{ A}/\mu \text{S}$	T _C = 175°C	-	72	-	
Q _{rr}	Diode Reverse Recovery Charge	1		$T_{C} = 25^{\circ}C$	-	44	62	nC
∽ rr	Diodo Hotoroo Hotorory Chargo			$T_{\rm C} = 175^{\rm o}{\rm C}$	-	238	-	

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Typical Performance Characteristics

Figure 1. Typical Output Characteristics





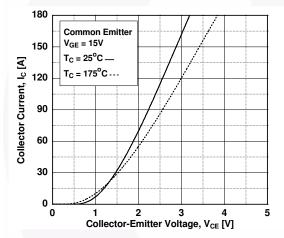


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

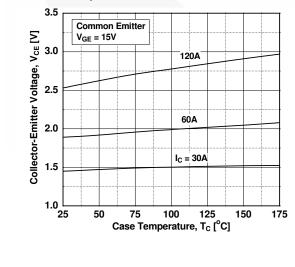


Figure 2. Typical Output Characteristics

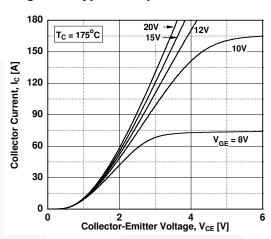


Figure 4. Transfer Characteristics

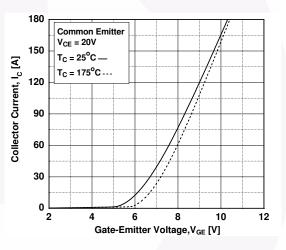
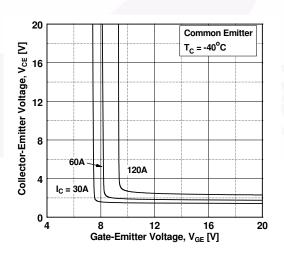
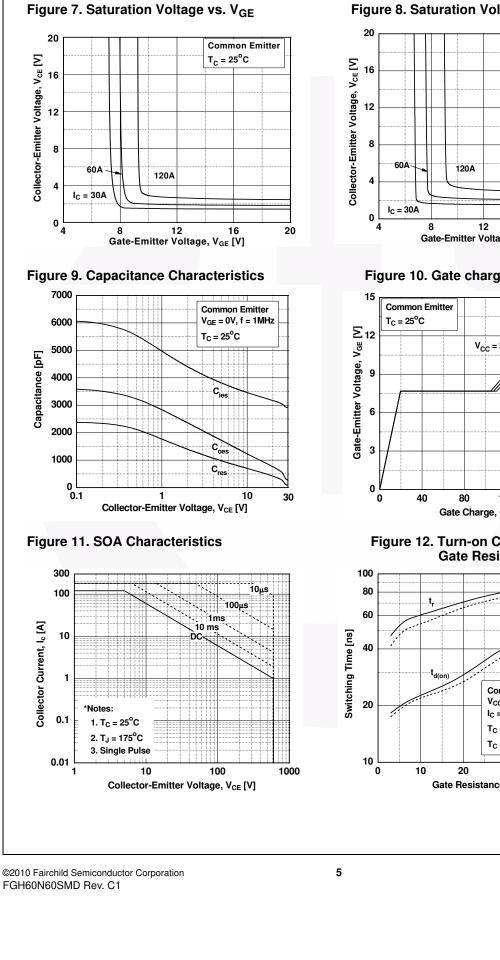


Figure 6. Saturation Voltage vs. V_{GE}



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Typical Performance Characteristics

Figure 8. Saturation Voltage vs. V_{GE}

Common Emitter

T_C = 175°C

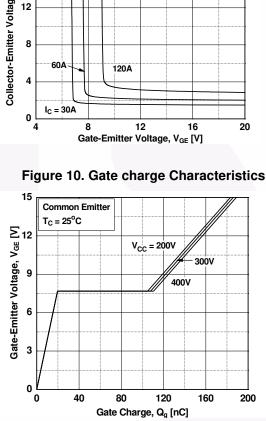
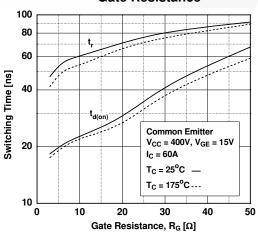
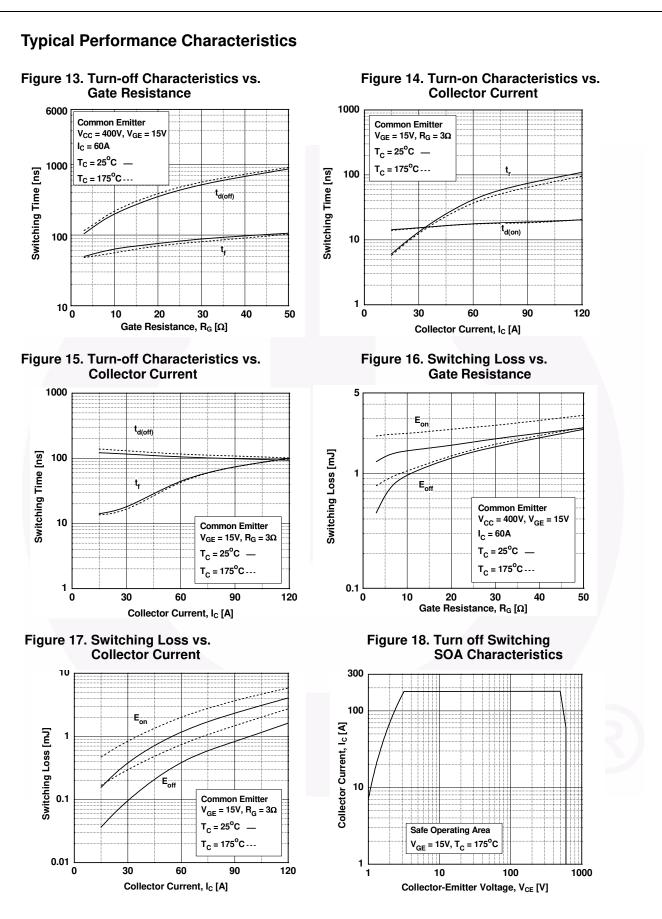


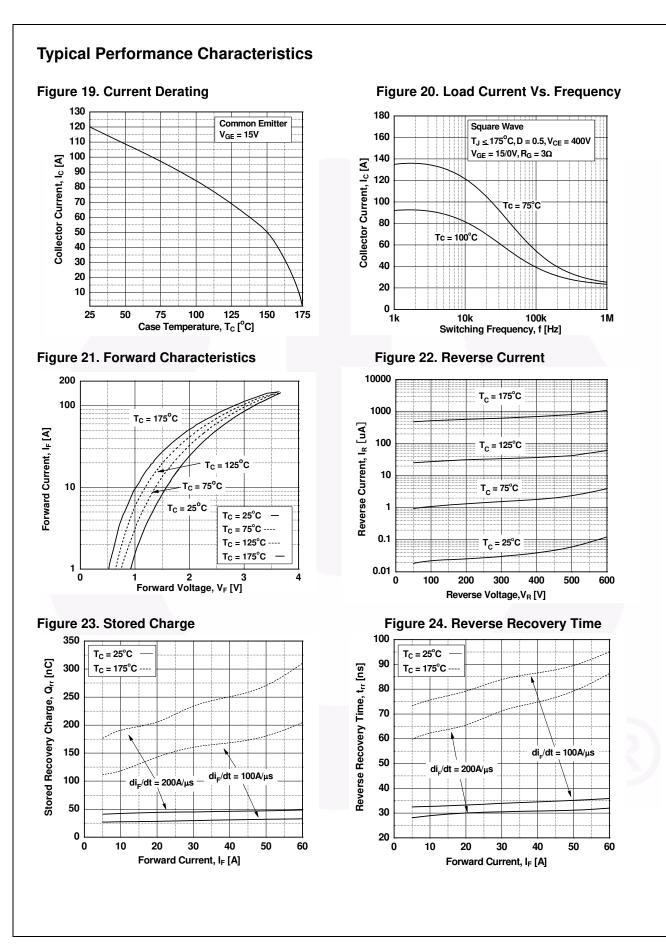
Figure 12. Turn-on Characteristics vs. Gate Resistance

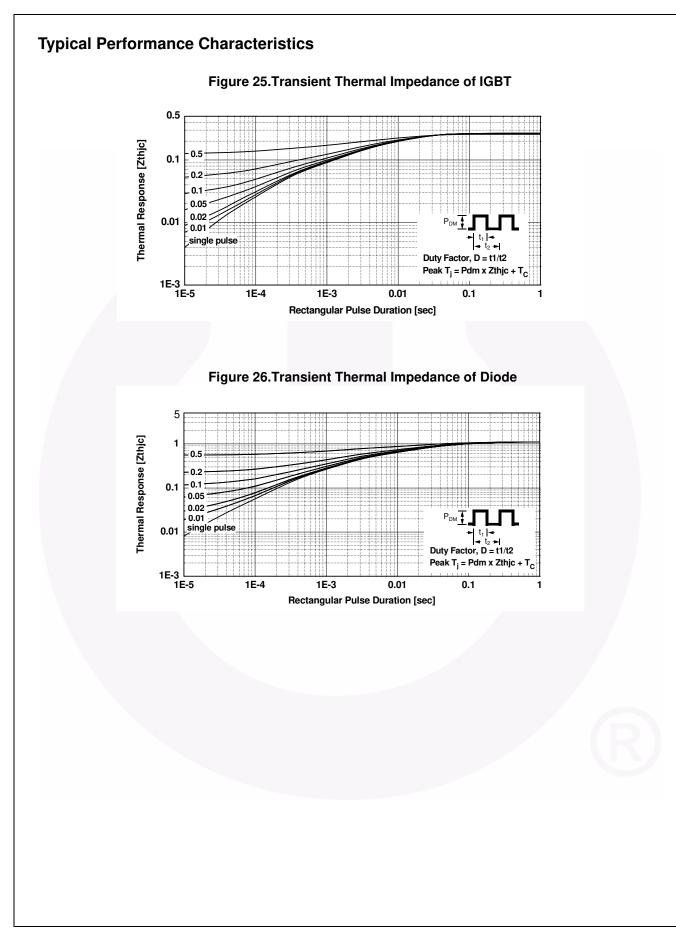


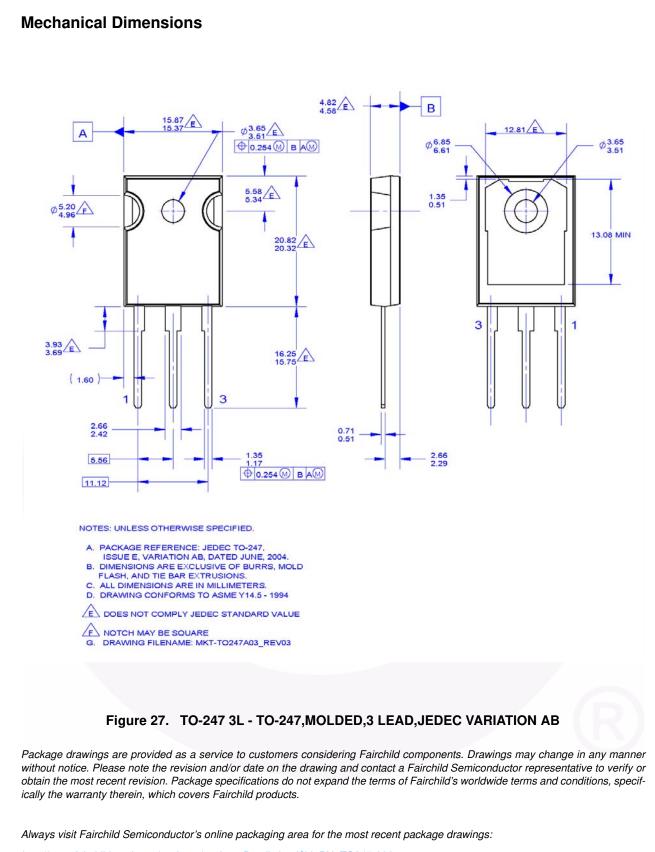




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FGH60N60SMD —

600 V, 60 A Field Stop IGBT



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60 A Field Stop IGB

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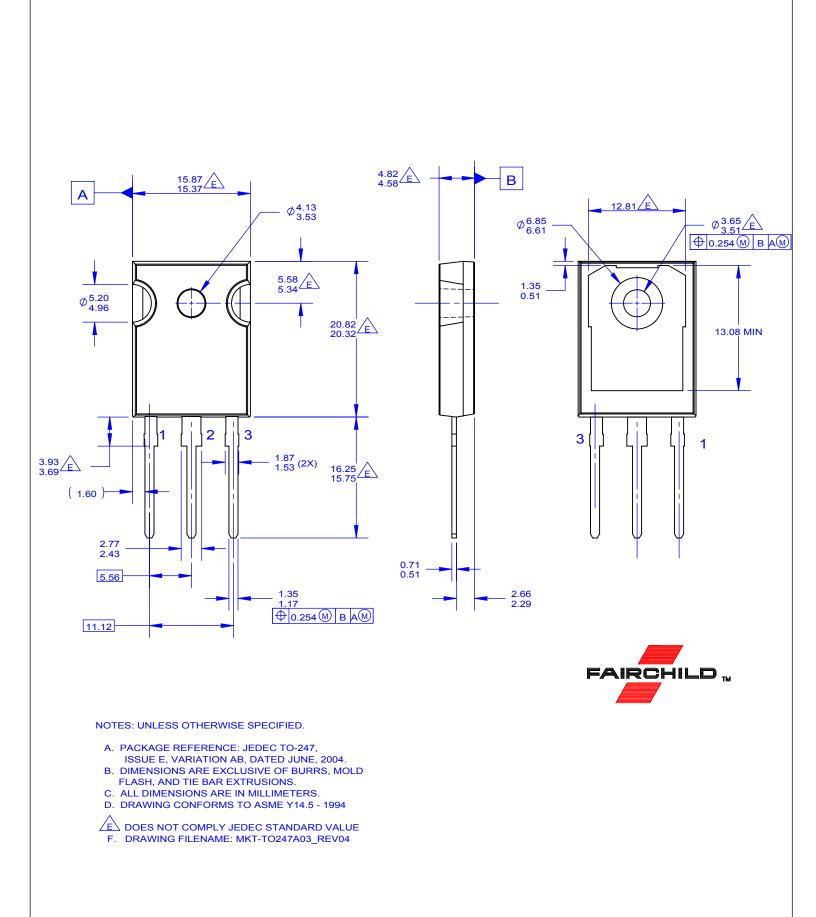
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