



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

# SGS5N150UF

## General Description

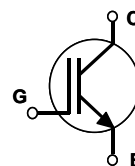
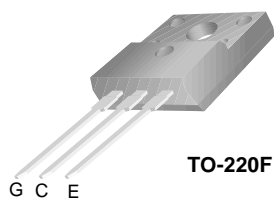
Fairchild's Insulated Gate Bipolar Transistor (IGBT) provides low conduction and switching losses. SGS5N150UF is designed for the Switching Power Supply applications.

## Features

- High Speed Switching
- Low Saturation Voltage :  $V_{CE(sat)} = 4.7 \text{ V @ } I_C = 5 \text{ A}$
- High Input Impedance

## Application

Switching Power Supply - High Input Voltage Off-line Converter



## Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Description	SGS5N150UF	Units
$V_{CES}$	Collector-Emitter Voltage	1500	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	10	A
	Collector Current @ $T_C = 100^\circ\text{C}$	5	A
$I_{CM(1)}$	Pulsed Collector Current	20	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	50	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	20	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Notes :

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

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	2.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C/W}$

## Electrical Characteristics of IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	1500	--	--	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	--	--	1.0	mA
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	$\pm 100$	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 5mA, V_{CE} = V_{GE}$	2.0	3.0	4.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 5A, V_{GE} = 10V$	--	4.7	5.5	V
Dynamic Characteristics						
$C_{ies}$	Input Capacitance	$V_{CE} = 10V, V_{GE} = 0V,$ $f = 1MHz$	--	780	--	pF
$C_{oes}$	Output Capacitance		--	130	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	70	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600V$ $I_C = 5A$ $R_G = 10\Omega$ $V_{GE} = 10V$ Inductive Load $T_C = 25^\circ C$	--	10	--	ns
$t_r$	Rise Time		--	15	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	30	50	ns
$t_f$	Fall Time		--	70	120	ns
$E_{on}$	Turn-On Switching Loss		--	190	--	$\mu J$
$E_{off}$	Turn-Off Switching Loss	$T_C = 25^\circ C$	--	100	--	$\mu J$
$E_{ts}$	Total Switching Loss		--	290	580	$\mu J$
$Q_g$	Total Gate Charge		--	30	45	nC
$Q_{ge}$	Gate-Emitter Charge	$V_{CE} = 600V, I_C = 5A$	--	3	5	nC
$Q_{gc}$	Gate-Collector Charge	$V_{GE} = 10V$	--	15	25	nC

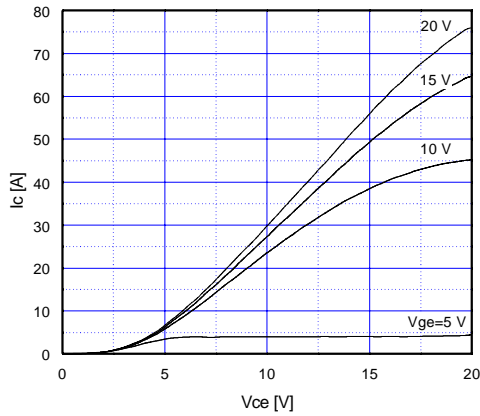


Fig 1. Typical Output Characteristics

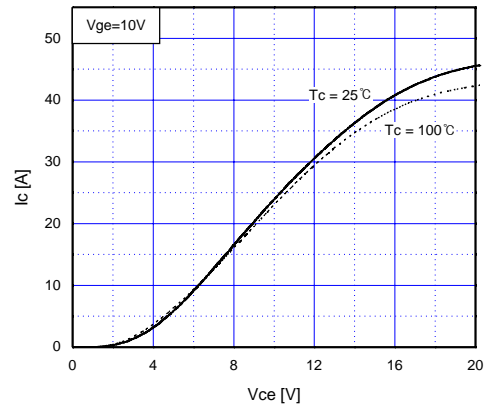


Fig 2. Typical Output Characteristics

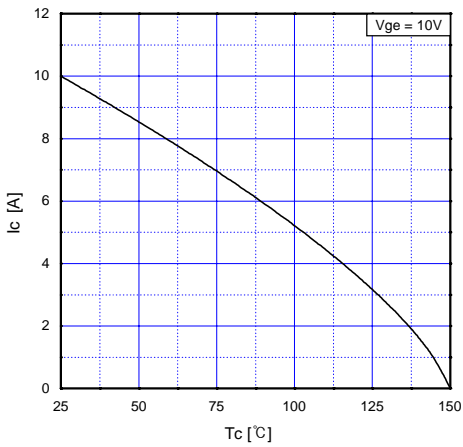


Fig 3. Maximum Collector Current vs. Case Temperature

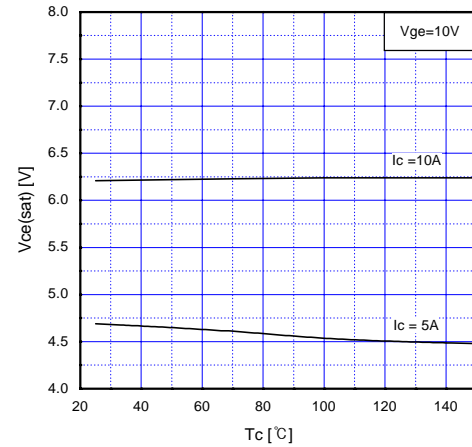


Fig 4. Saturation Voltage vs. Case Temperature

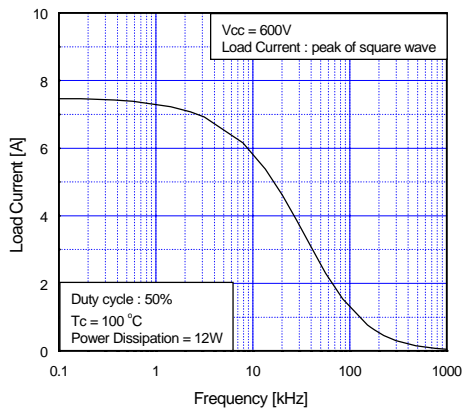


Fig 5. Load Current vs. Frequency

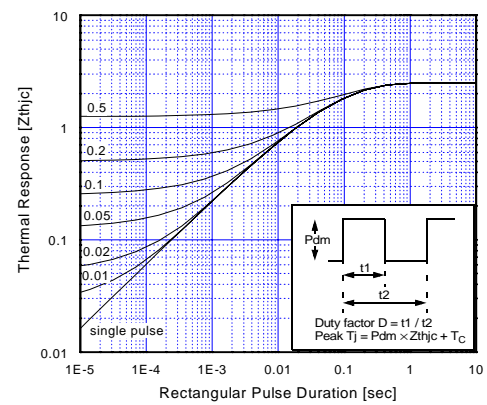


Fig 6. Transient Thermal Impedance of IGBT Junction to Case

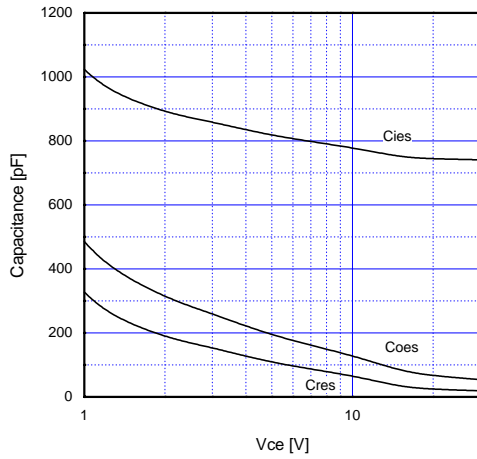


Fig 7. Typical Capacitance vs. Collector to Emitter Voltage

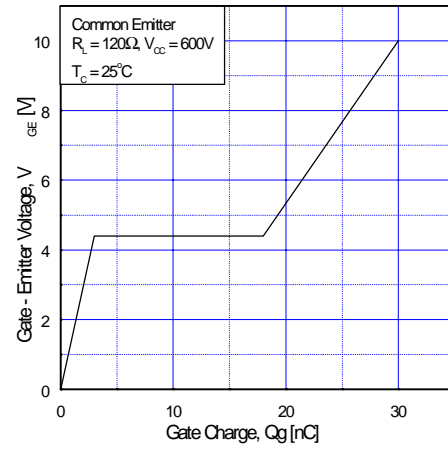


Fig 8. Typical Gate Charge Characteristic

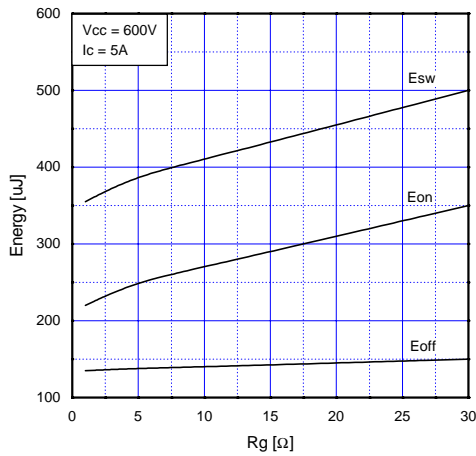


Fig 9. Typical Switching Loss vs. Gate Resistance

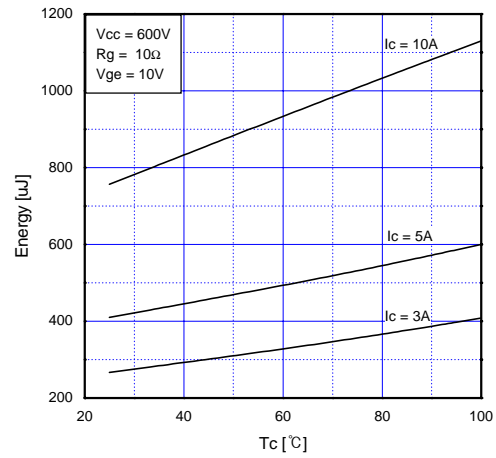


Fig 10. Typical Switching Loss vs. Case Temperature

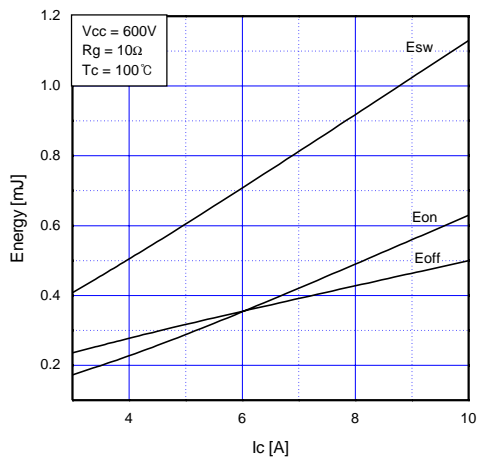


Fig 11. Typical Switching Loss vs. Collector Current

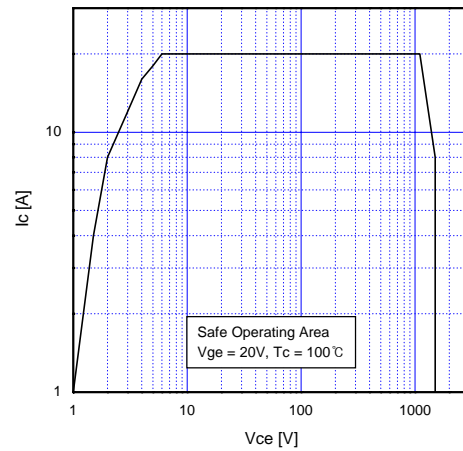
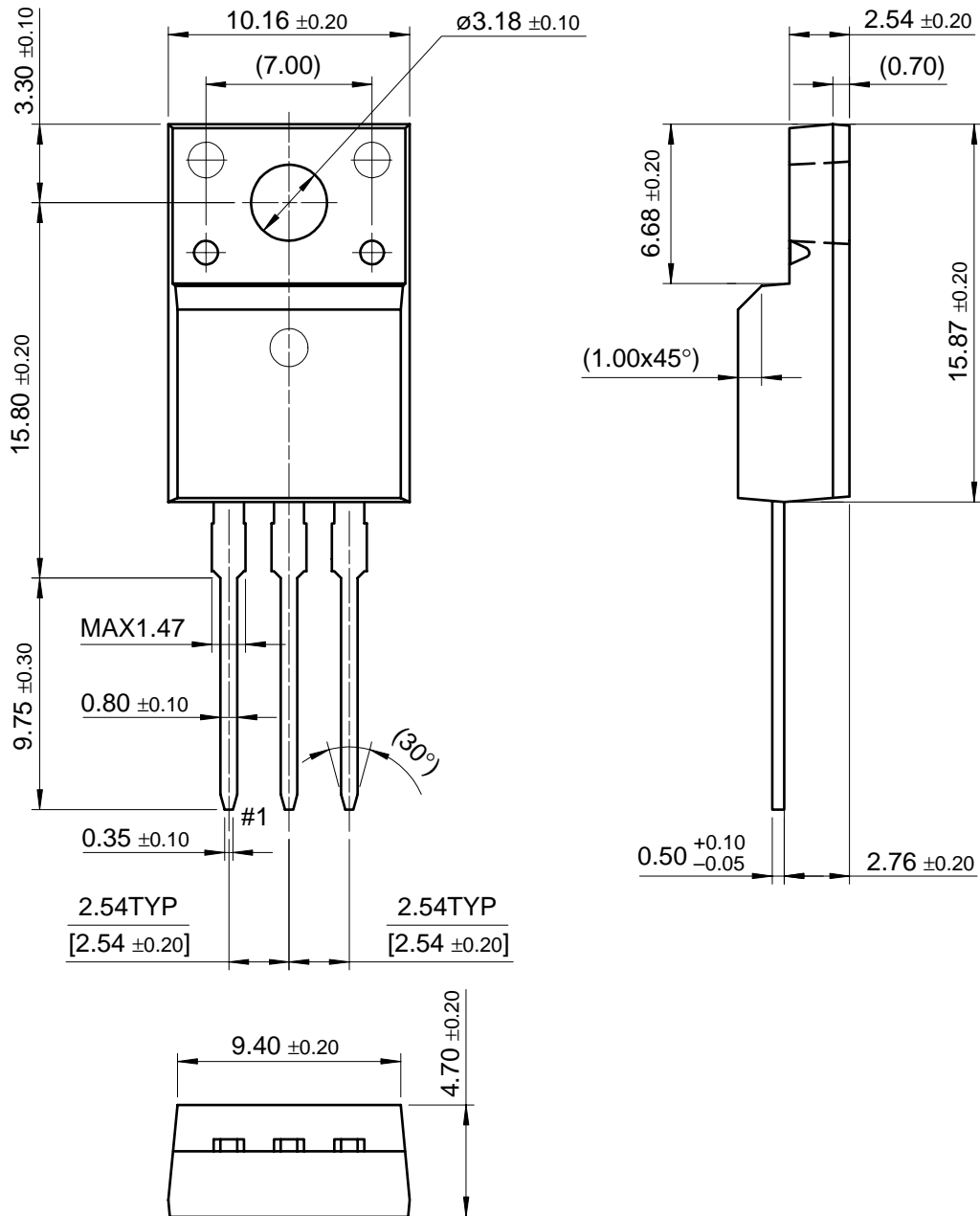


Fig 12. Turn-Off SOA

# Package Dimension

## TO-220F (FS PKG CODE AQ)

SGS5N150UF



Dimensions in Millimeters

## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FACT™	ImpliedDisconnect™	PACMAN™	SPM™
ActiveArray™	FACT Quiet series™	ISOPLANAR™	POP™	Stealth™
Bottomless™	FAST®	LittleFET™	Power247™	SuperSOT™-3
CoolFET™	FASTR™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	FRFET™	MicroPak™	QFET™	SuperSOT™-8
DOMETM	GlobalOptoisolator™	MICROWIRE™	QST™	SyncFET™
EcoSPARK™	GTO™	MSXTM	QT Optoelectronics™	TinyLogic®
E <sup>2</sup> CMOS™	HiSeC™	MSXPro™	Quiet Series™	TruTranslation™
EnSigna™	I <sup>2</sup> C™	OCXTM	RapidConfigure™	UHC™
Across the board. Around the world.™		OCXPro™	RapidConnect™	UltraFET®
Across the board. Around the world™		OPTOLOGIC®	SILENT SWITCHER®	VCXTM
The Power Franchise™		OPTOPLANAR™	SMART START™	

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.