



August 2001

**IGBT**

## SGR20N40L / SGU20N40L

### General Description

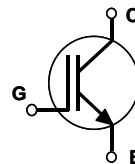
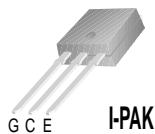
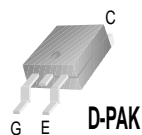
Insulated Gate Bipolar Transistors (IGBTs) with a trench gate structure provide superior conduction and switching performance in comparison with transistors having a planar gate structure. They also have wide noise immunity. These devices are very suitable for strobe applications

### Features

- High input impedance
- High peak current capability (150A)
- Easy gate drive
- Surface Mount : SGR20N40L
- Straight Lead : SGU20N40L

### Application

Strobe flash.



### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Description	SGR / SGU20N40L	Units
V <sub>CES</sub>	Collector - Emitter Voltage	400	V
V <sub>GES</sub>	Gate - Emitter Voltage	± 6	V
I <sub>CM</sub> (1)	Pulsed Collector Current	150	A
P <sub>C</sub>	Maximum Power Dissipation @ T <sub>C</sub> = 25°C	45	W
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>stg</sub>	Storage Temperature Range	-40 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	Typ.	Max.	Units
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	--	3.0	°C/W
R <sub>θJA</sub> (D-PAK)	Thermal Resistance, Junction-to-Ambient (PCB Mount) (2)	--	50	°C/W
R <sub>θJA</sub> (I-PAK)	Thermal Resistance, Junction-to-Ambient	--	110	°C/W

#### Notes :

(2) Mounted on 1" square PCB (FR4 or G-10 Material)

SGR20N40L / SGU20N40L

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	450	--	--	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	--	--	10	$\mu A$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	$\pm 0.1$	$\mu A$
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 1mA, V_{CE} = V_{GE}$	0.5	1.0	1.4	V
$V_{CE(sat)}$	C-E Saturation Current	$I_C = 150A, V_{GE} = 4.5V$	2.0	4.5	8.0	V
Dynamic Characteristics						
$C_{ies}$	Input Capacitance	$V_{GE} = 0V, V_{CE} = 30V,$ $f = 1MHz$	--	3800	--	pF
$C_{oes}$	Output Capacitance		--	50	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	35	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 150A,$ $V_{GE} = 4.5V, R_G = 15\Omega^*$ Resistive Load	--	0.2	--	$\mu s$
$t_r$	Rise Time		--	1.7	--	$\mu s$
$t_{d(off)}$	Turn-Off Delay Time		--	0.3	0.5	$\mu s$
$t_f$	Fall Time		--	1.5	2.0	$\mu s$

\* Notes : Recommendation of  $R_G$  Value :  $R_G \geq 15\Omega$

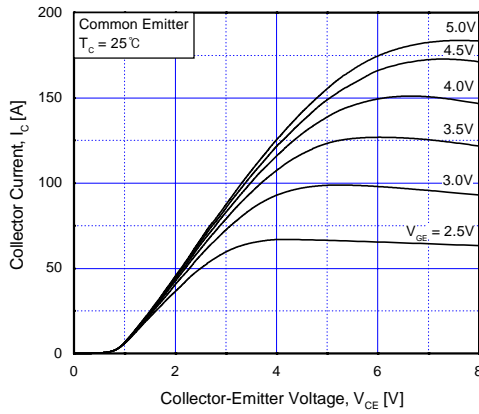


Fig 1. Typical Output Characteristics

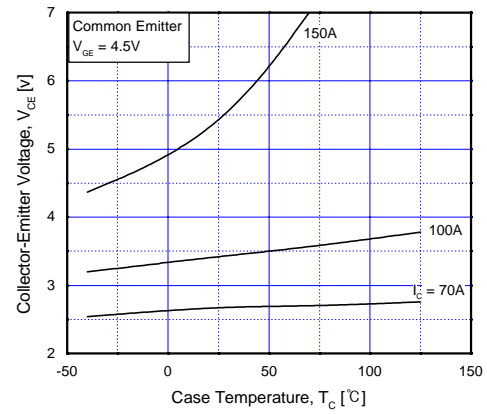


Fig 2. Saturation Voltage vs. Case Temperature at Variant Current Level

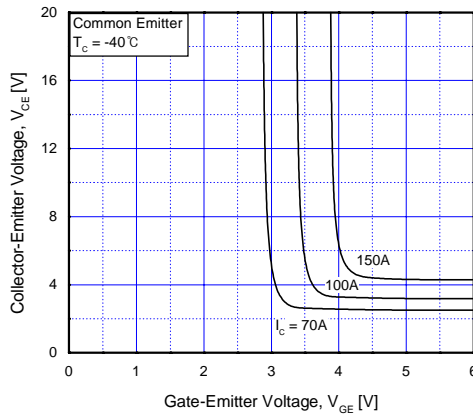


Fig 3. Saturation Voltage vs.  $V_{GE}$

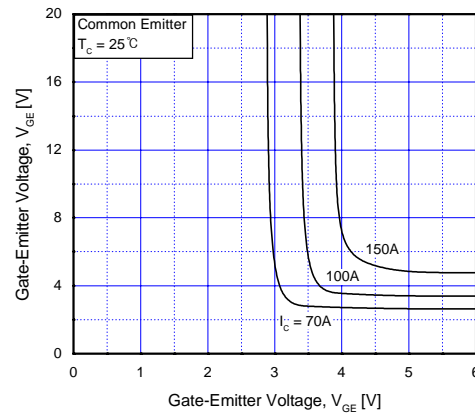


Fig 4. Saturation Voltage vs.  $V_{GE}$

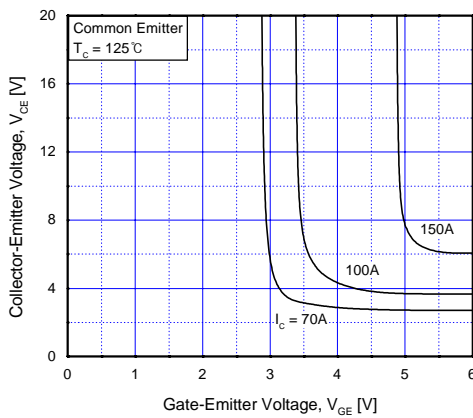


Fig 5. Saturation Voltage vs.  $V_{GE}$

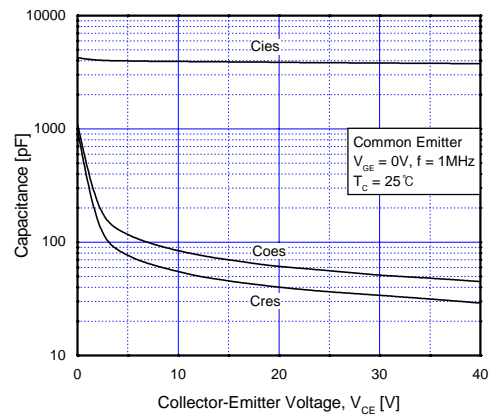
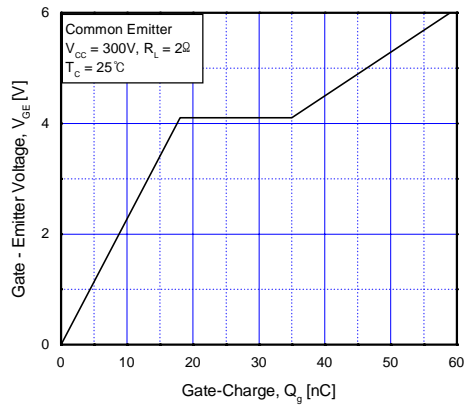
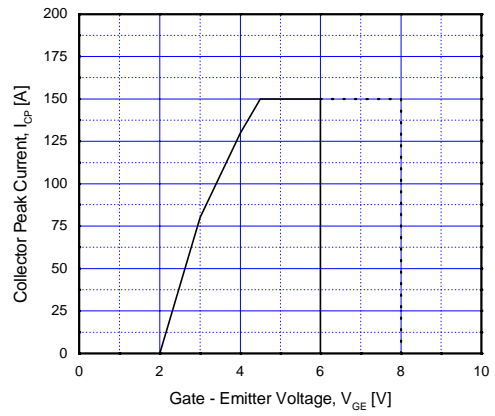


Fig 6. Capacitance Characteristics



**Fig 7. Turn-On Characteristics vs. Gate Resistance**



**Fig 8. Collector Current Limit vs. Gate-Emitter Voltage Limit**

## 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.

ACE <sub>x</sub> <sup>TM</sup>	FAST <sup>®</sup>	OPTOPLANAR <sup>TM</sup>	STAR*POWER <sup>TM</sup>
Bottomless <sup>TM</sup>	FAST <sub>r</sub> <sup>TM</sup>	PACMAN <sup>TM</sup>	Stealth <sup>TM</sup>
CoolFET <sup>TM</sup>	FRFET <sup>TM</sup>	POP <sup>TM</sup>	SuperSOT <sup>TM</sup> -3
CROSSVOLT <sup>TM</sup>	GlobalOptoisolator <sup>TM</sup>	Power247 <sup>TM</sup>	SuperSOT <sup>TM</sup> -6
DenseTrench <sup>TM</sup>	GTO <sup>TM</sup>	PowerTrench <sup>®</sup>	SuperSOT <sup>TM</sup> -8
DOME <sup>TM</sup>	HiSeC <sup>TM</sup>	QFET <sup>TM</sup>	SyncFET <sup>TM</sup>
EcoSPARK <sup>TM</sup>	ISOPLANAR <sup>TM</sup>	QS <sup>TM</sup>	TruTranslation <sup>TM</sup>
E <sup>2</sup> CMOS <sup>TM</sup>	LittleFET <sup>TM</sup>	QT Optoelectronics <sup>TM</sup>	TinyLogic <sup>TM</sup>
EnSigna <sup>TM</sup>	MicroFET <sup>TM</sup>	Quiet Series <sup>TM</sup>	UHC <sup>TM</sup>
FACT <sup>TM</sup>	MICROWIRE <sup>TM</sup>	SLIENT SWITCHER <sup>®</sup>	UltraFET <sup>®</sup>
FACT Quiet Series <sup>TM</sup>	OPTOLOGIC <sup>TM</sup>	SMART START <sup>TM</sup>	VCX <sup>TM</sup>

STAR\*POWER is used under license

## 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 INTERNATIONAL.

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.