

FGA50N60LS

General Description

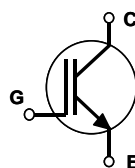
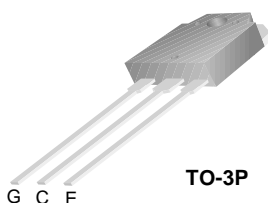
Fairchild's LS series product of Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses as well as short circuit ruggedness. The LS series is especially designed for applications in medium frequencies such as switched reluctance motor controls, AC & DC motor controls, general inverters etc.

Features

- Short circuit rated 10 μ s @ T_C = 100°C, V_{GE} = 15V
- Low saturation voltage : V_{CE(sat)} = 1.6 V @ I_C = 50A
- High input impedance
- Optimized for medium operating frequencies (1~5kHz)

Applications

Switched Reluctance Motor Controls , AC & DC motor controls, general purpose inverters, Robotics, and Servo controls



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description	FGA50N60LS	Units
V _{CES}	Collector-Emitter Voltage	600	V
V _{GES}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current @ T _C = 25°C	100	A
	Collector Current @ T _C = 100°C	50	A
I _{CM(1)}	Pulsed Collector Current	150	A
T _{SC}	Short Circuit Withstand Time @ T _C = 100°C	10	μs
P _D	Maximum Power Dissipation @ T _C = 25°C	240	W
	Maximum Power Dissipation @ T _C = 100°C	96	W
T _J	Operating Junction Temperature	-55 to +150	°C
T _{stg}	Storage Temperature Range	-55 to +150	°C
T _L	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 _{θJC}	Thermal Resistance, Junction-to-Case	--	0.52	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

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	$V_{GE} = 0V, I_C = 250\mu A$	600	--	--	V
$\Delta BV_{CES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	--	0.6	--	$V/^\circ C$
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	--	--	250	μA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 50mA, V_{CE} = V_{GE}$	3.5	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 50A, V_{GE} = 15V$	--	1.6	1.8	V
		$I_C = 80A, V_{GE} = 15V$	--	1.96	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V, V_{GE} = 0V,$ $f = 1MHz$	--	2660	--	pF
C_{oes}	Output Capacitance		--	250	--	pF
C_{res}	Reverse Transfer Capacitance		--	78	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 50A,$ $R_G = 5.9\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 25^\circ C$	--	54	--	ns
t_r	Rise Time		--	96	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	146	220	ns
t_f	Fall Time		--	326	600	ns
E_{on}	Turn-On Switching Loss		--	1.1	--	mJ
E_{off}	Turn-Off Switching Loss		--	3.2	--	mJ
E_{ts}	Total Switching Loss	--	4.3	6.0	mJ	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 50A,$ $R_G = 5.9\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 125^\circ C$	--	56	--	ns
t_r	Rise Time		--	87	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	134	215	ns
t_f	Fall Time		--	575	880	ns
E_{on}	Turn-On Switching Loss		--	1.2	--	mJ
E_{off}	Turn-Off Switching Loss		--	5.0	--	mJ
E_{ts}	Total Switching Loss	--	6.2	8.7	mJ	
T_{sc}	Short Circuit Withstand Time	$V_{CC} = 300V, V_{GE} = 15V$ @ $T_C = 100^\circ C$	10	--	--	μs
Q_g	Total Gate Charge	$V_{CE} = 300V, I_C = 50A,$ $V_{GE} = 15V$	--	167	240	nC
Q_{ge}	Gate-Emitter Charge		--	27	35	nC
Q_{gc}	Gate-Collector Charge		--	68	100	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	14	--	nH

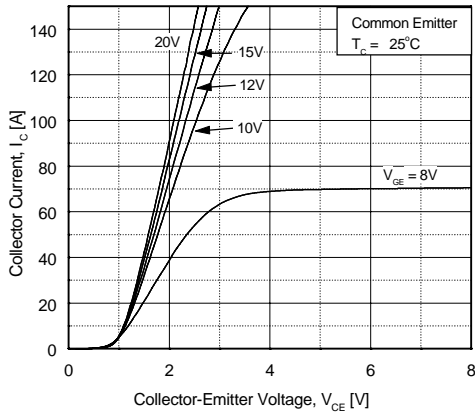


Fig 1. Typical Output Characteristics

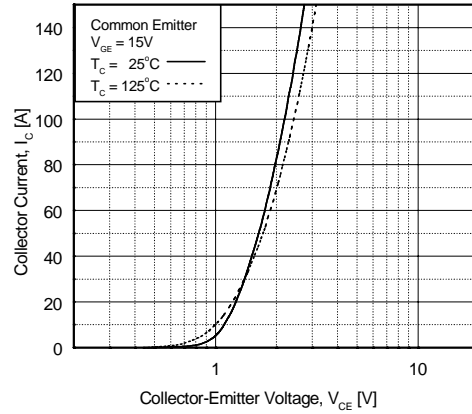


Fig 2. Typical Saturation Voltage Characteristics

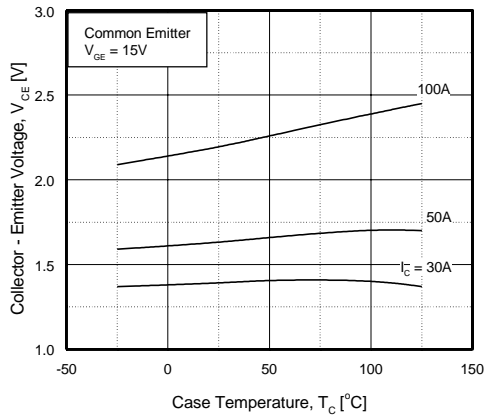


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

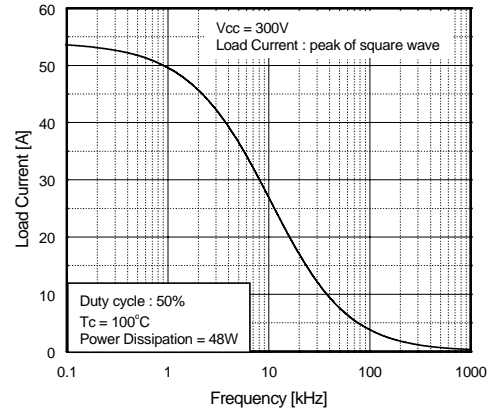


Fig 4. Load Current vs. Frequency

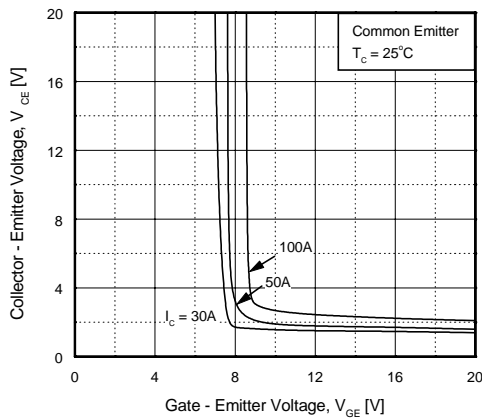


Fig 5. Saturation Voltage vs. V_{GE}

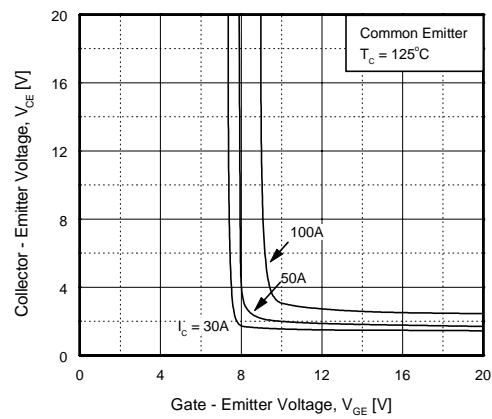


Fig 6. Saturation Voltage vs. V_{GE}

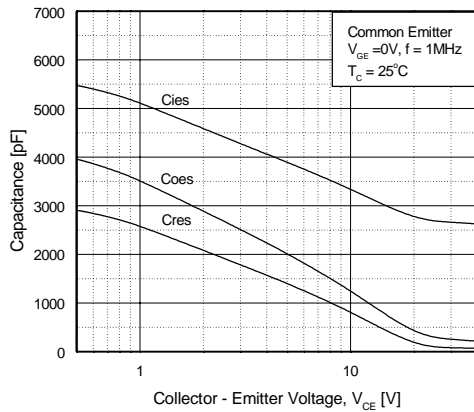


Fig 7. Capacitance Characteristics

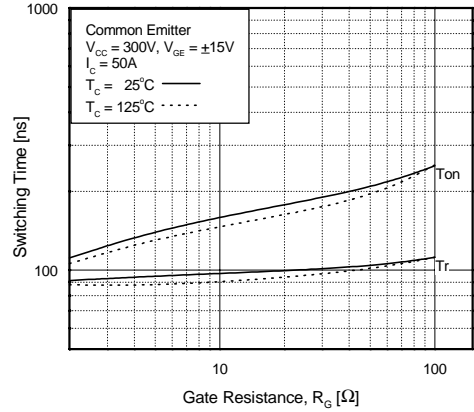


Fig 8. Turn-On Characteristics vs. Gate Resistance

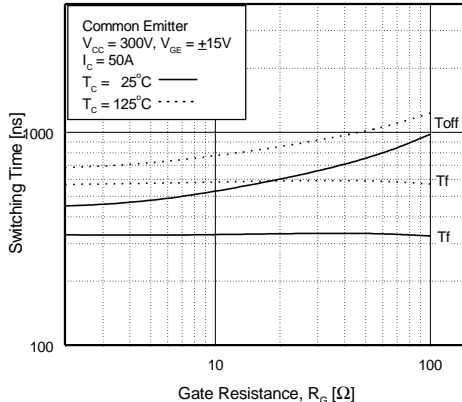


Fig 9. Turn-Off Characteristics vs. Gate Resistance

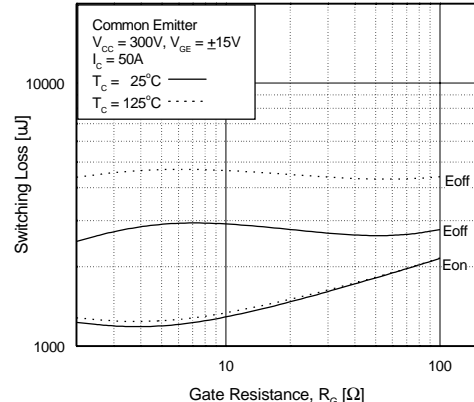


Fig 10. Switching Loss vs. Gate Resistance

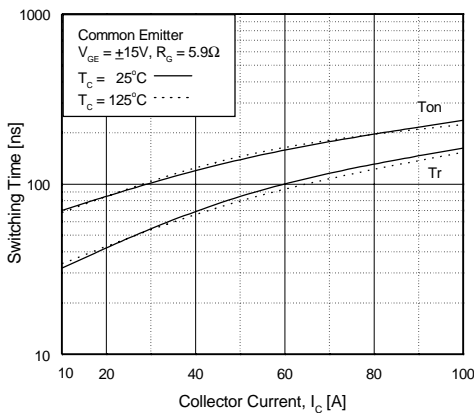


Fig 11. Turn-On Characteristics vs. Collector Current

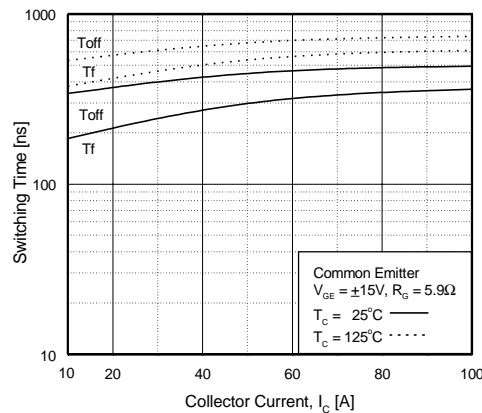


Fig 12. Turn-Off Characteristics vs. Collector Current

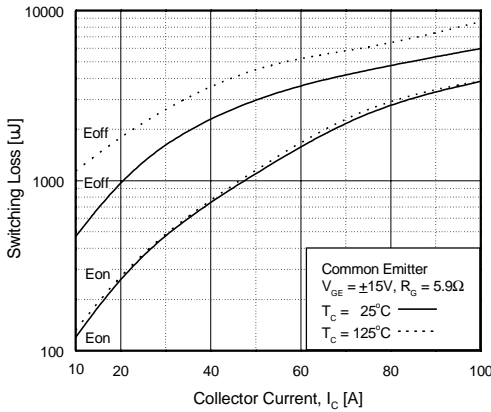


Fig 13. Switching Loss vs. Collector Current

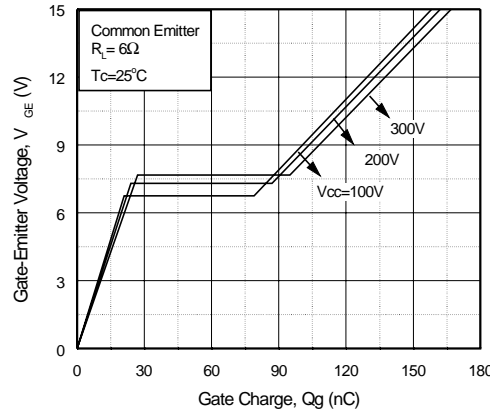


Fig 14. Gate Charge Characteristics

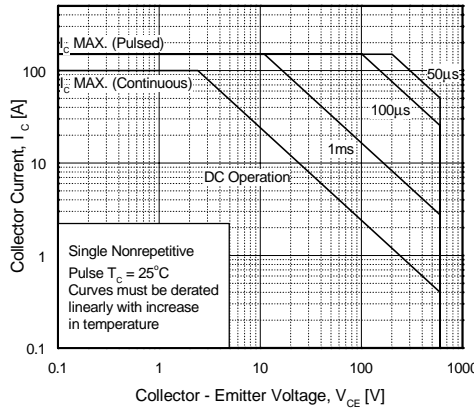


Fig 15. SOA Characteristics

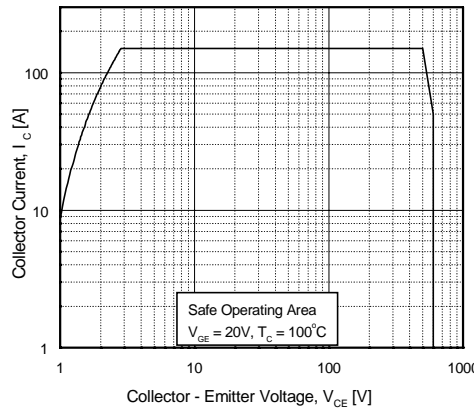


Fig 16. Turn-Off SOA

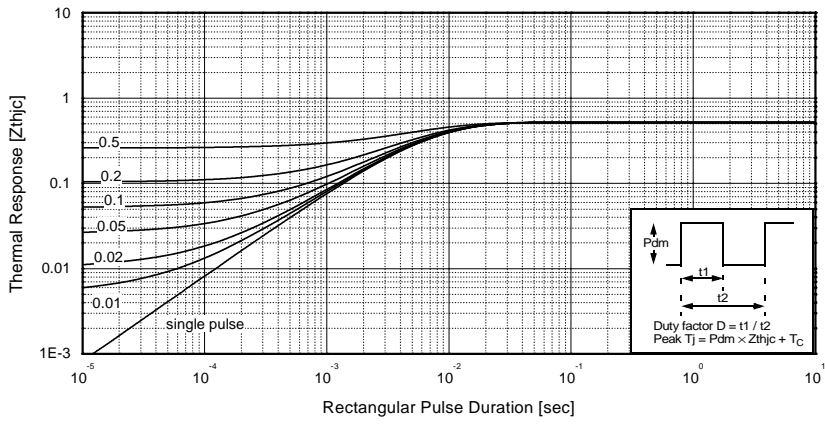
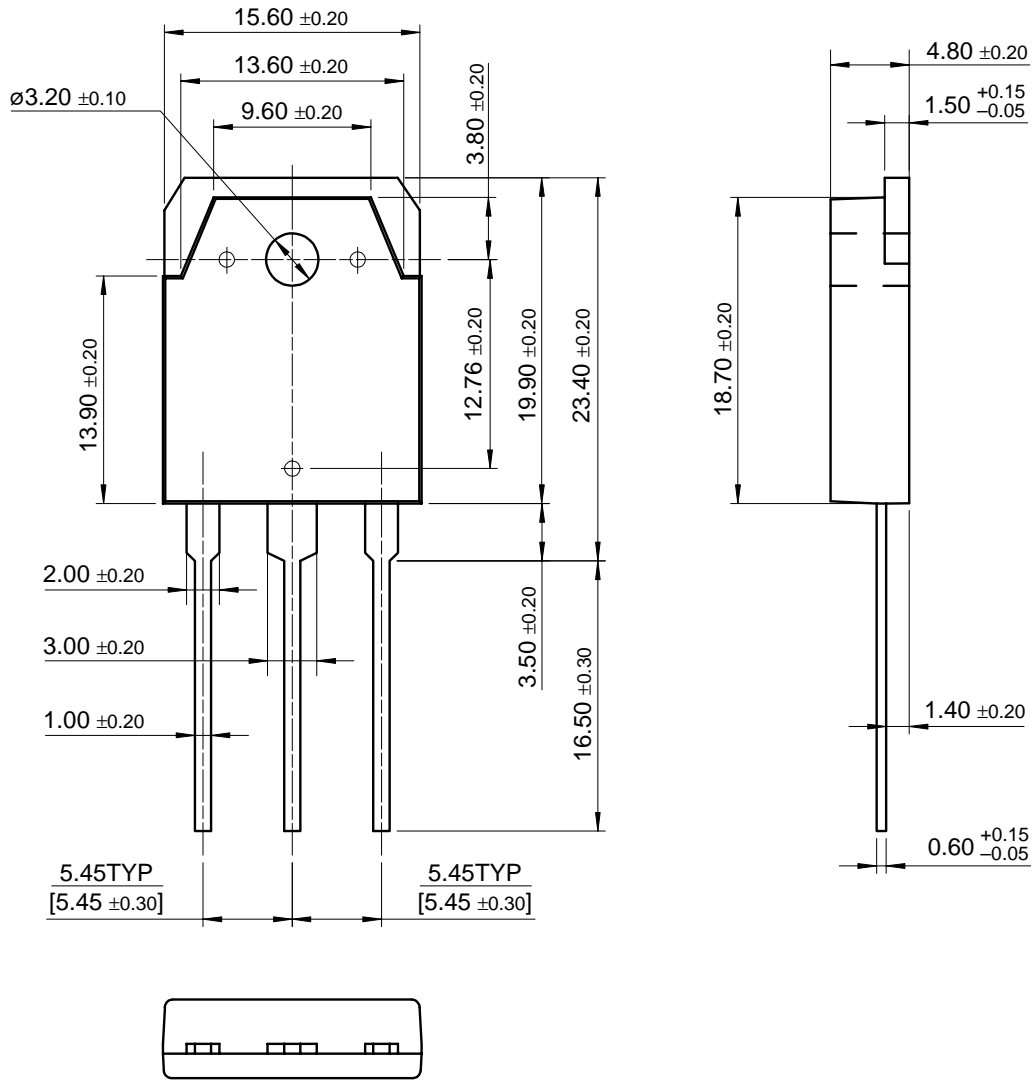


Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-3P



FGA50N60LS

Dimensions in Millimeters

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