

Features

- High speed switching
- Tight parameters distribution
- Safe paralleling
- 6 μ s short-circuit withstand time
- Ultrafast soft recovery antiparallel diode

Applications

- Motor control

Description

This device is an IGBT developed using an advanced proprietary trench gate and field stop structure. This IGBT series offers the optimum compromise between conduction and switching losses, maximizing the efficiency of very high frequency converters. Furthermore, a positive $V_{CE(sat)}$ temperature coefficient and very tight parameter distribution result in easier paralleling operation.

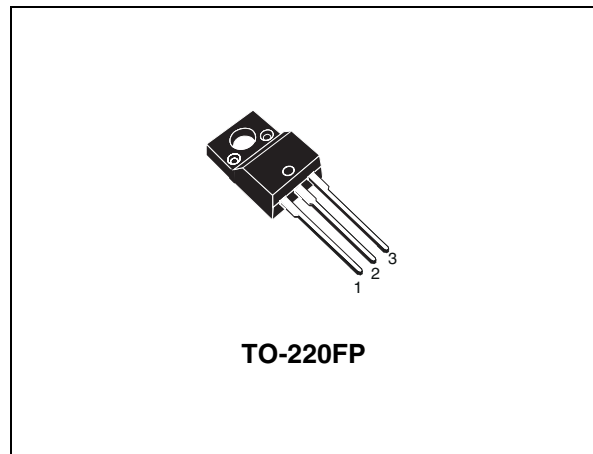


Figure 1. Internal schematic diagram

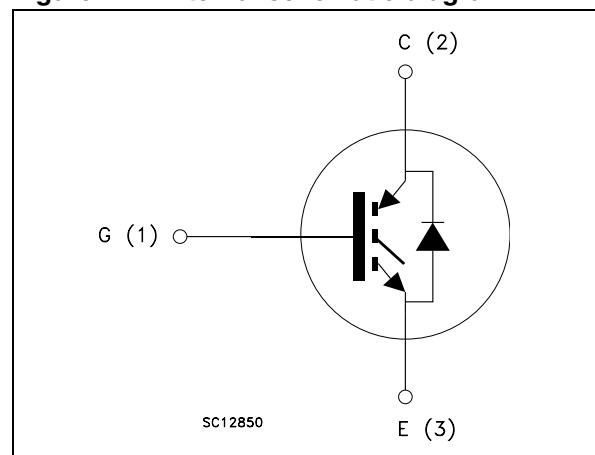


Table 1. Device summary

Order code	Marking	Package	Packaging
STGF30H60DF	GF30H60DF	TO-220FP	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$)	600	V
I_C	Continuous collector current at $T_C = 25\text{ °C}$	34	A
I_C	Continuous collector current at $T_C = 100\text{ °C}$	17	A
$I_{CP}^{(1)}$	Pulsed collector current	68	A
V_{GE}	Gate-emitter voltage	± 20	V
I_F	Diode RMS forward current at $T_C = 25\text{ °C}$	30	A
I_{FSM}	Surge not repetitive forward current $t_p = 10\text{ ms}$ sinusoidal	90	A
P_{TOT}	Total dissipation at $T_C = 25\text{ °C}$	31	W
t_{SC}	Short-circuit withstand time at $V_{CC} = 400\text{ V}$, $V_{GE} = 15\text{ V}$	6	μs
T_{STG}	Storage temperature range	- 55 to 150	$^{\circ}\text{C}$
T_J	Operating junction temperature		

1. Pulse width limited by maximum junction temperature and turn-off within RBSOA

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	4	$^{\circ}\text{C/W}$
R_{thJC}	Thermal resistance junction-case diode	5.6	$^{\circ}\text{C/W}$
R_{thJA}	Thermal resistance junction-ambient	62.5	$^{\circ}\text{C/W}$

2 Electrical characteristics

$T_J = 25\text{ °C}$ unless otherwise specified.

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ($V_{GE} = 0$)	$I_C = 2\text{ mA}$	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$		1.9		V
		$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $T_J = 150\text{ °C}$		2.2		
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 0.5\text{ mA}$		6.0		V
I_{CES}	Collector cut-off current ($V_{GE} = 0$)	$V_{CE} = 600\text{ V}$			25	μA
I_{GES}	Gate-emitter leakage current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{ V}$			250	nA

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GE} = 0$		4200		pF
C_{oes}	Output capacitance		-	120	-	pF
C_{res}	Reverse transfer capacitance				75	
Q_g	Total gate charge	$V_{CC} = 400\text{ V}, I_C = 30\text{ A},$ $V_{GE} = 15\text{ V}$	-	115	-	nC
Q_{ge}	Gate-emitter charge		-	TBD	-	nC
Q_{gc}	Gate-collector charge		-	TBD	-	nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time	$V_{CE} = 400\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$	-	TBD	-	ns
	Current rise time		-	TBD	-	ns
	Turn-on current slope		-	TBD	-	A/ μs
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time	$V_{CE} = 400\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_J = 150\text{ °C}$	-	TBD	-	ns
	Current rise time		-	TBD	-	ns
	Turn-on current slope		-	TBD	-	A/ μs
$t_r(V_{off})$ $t_{d(off)}$ t_f	Off voltage rise time	$V_{CE} = 400\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$	-	TBD	-	ns
	Turn-off delay time		-	TBD	-	ns
	Current fall time		-	TBD	-	ns
$t_r(V_{off})$ $t_{d(off)}$ t_f	Off voltage rise time	$V_{CE} = 400\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_J = 150\text{ °C}$	-	TBD	-	ns
	Turn-off delay time		-	TBD	-	ns
	Current fall time		-	TBD	-	ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CE} = 400\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$	-	TBD	-	mJ
$E_{off}^{(2)}$	Turn-off switching losses					mJ
E_{ts}	Total switching losses					mJ
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CE} = 400\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$	-	TBD	-	mJ
$E_{off}^{(2)}$	Turn-off switching losses					mJ
E_{ts}	Total switching losses					mJ

1. Energy losses include reverse recovery of the diode.
2. Turn-off losses include also the tail of the collector current.

Table 8. Collector-emitter diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_F	Forward on-voltage	$I_F = 30\text{ A}$ $I_F = 30\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	2.0	2.3 1.95	V V
t_{rr}	Reverse recovery time	$I_F = 30\text{ A}, V_R = 400\text{ V},$ $di/dt = 100\text{ A}/\mu\text{s}$	-	TBD	-	ns
Q_{rr}	Reverse recovery charge					nC
I_{rrm}	Reverse recovery current					A
t_{rr}	Reverse recovery time	$I_F = 30\text{ A}, V_R = 400\text{ V},$ $di/dt = 100\text{ A}/\mu\text{s}, T_J = 150\text{ }^\circ\text{C}$	-	TBD	-	ns
Q_{rr}	Reverse recovery charge					nC
I_{rrm}	Reverse recovery current					A

3 Test circuits

Figure 2. Test circuit for inductive load switching

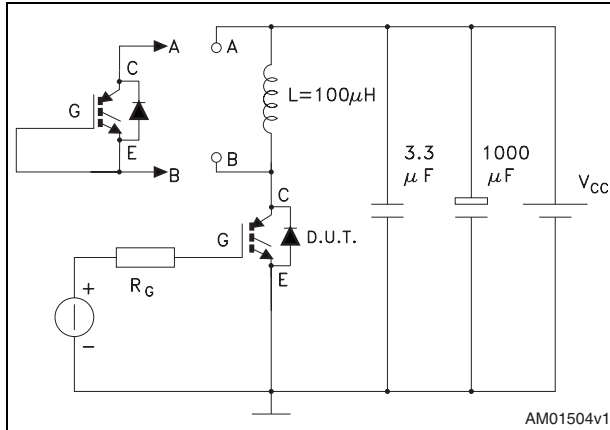


Figure 3. Gate charge test circuit

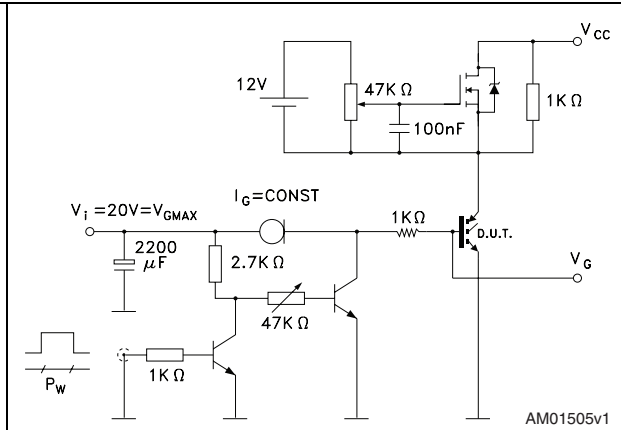


Figure 4. Switching waveform

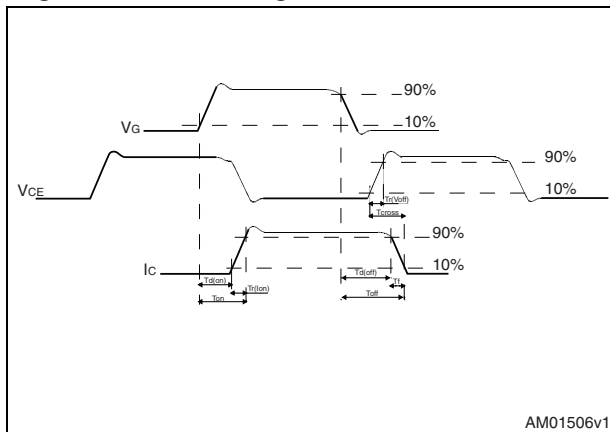
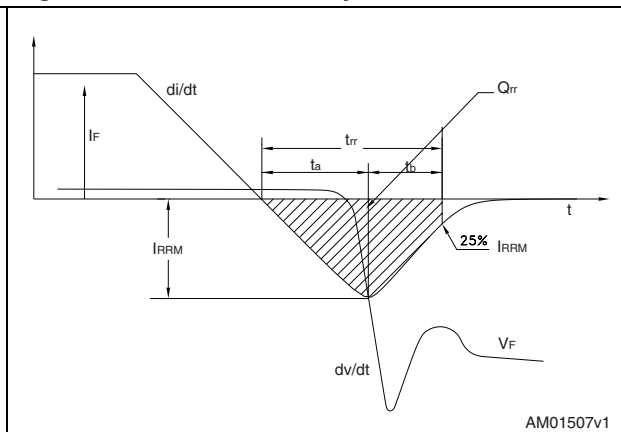


Figure 5. Diode recovery time waveform



4 Package mechanical data

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Table 9. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
16-Oct-2012	1	Initial release.

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