

MITSUBISHI IGBT MODULES  
**MG400V1US51A**

HIGH POWER SWITCHING APPLICATIONS  
 MOTOR CONTROL APPLICATIONS

**MG400V1US51A**



**FEATURE**

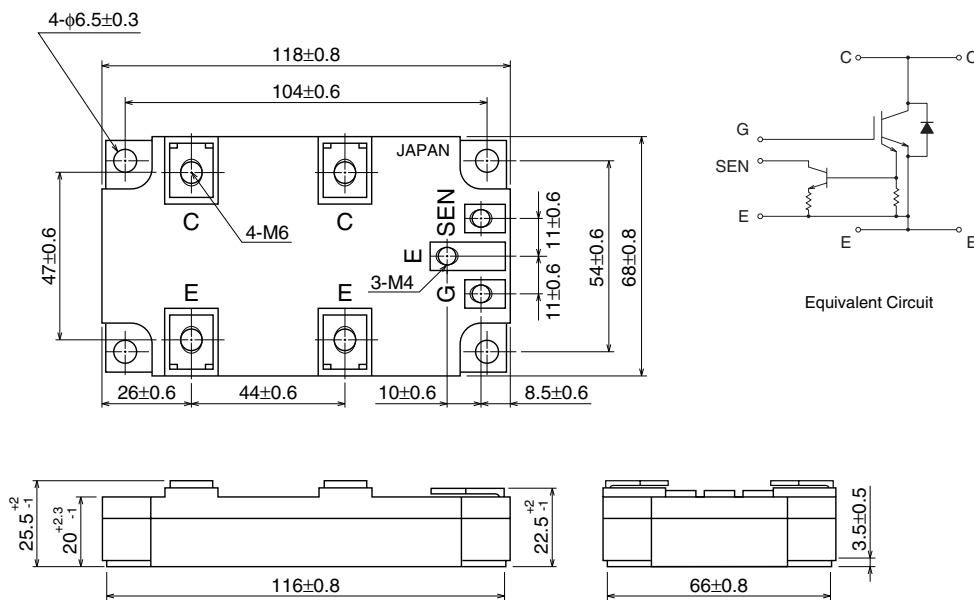
- The electrodes are isolated from case.
- Enhancement-mode
- Integrates fault-signal output circuit in package. (Short-Circuit and Over-Current)
- UL Recognized Yellow Card No.E80276  
File No.E80271

**APPLICATION**

General purpose inverters, servo drives and motor controls

**OUTLINE DRAWING & EQUIVALENT CIRCUIT**

Dimensions in mm



Weight: 420g

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## MAXIMUM RATINGS (Ta = 25°C)

Symbol	Parameter		Conditions	Ratings	Unit
VCES	Collector-emitter voltage			1700	V
VGES	Gate-emitter voltage			±20	V
VSES	Sense-emitter voltage			40	V
IC	Collector current	DC		400	A
ICP		1ms		800	
IF	Forward current	DC		400	A
IFM		1ms		800	
PC	Collector power dissipation		Tc = 25°C	2750	W
Tj	Junction temperature			150	°C
Tstg	Storage temperature range			-40 ~ 125	°C
Vsol	Isolation voltage			4000 (AC 1 minute)	V
—	Screw torque	Terminal (M4/M6)		2/3	N • m
—		Mounting		3	

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

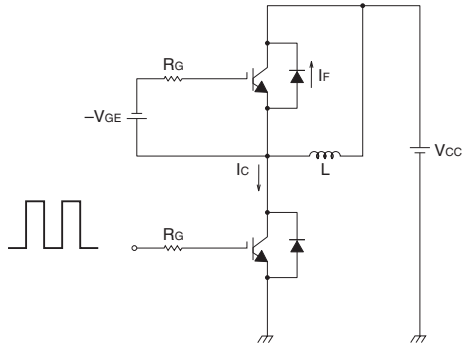
Symbol	Parameter	Test conditions	Limits			Unit	
			Min.	Typ.	Max.		
IGES	Gate leakage current	VGE = ±20V, VCE = 0	—	—	±500	nA	
ICES	Collector cut-off current	VCE = 1700V, VGE = 0	—	—	4.0	mA	
VGE(off)	Gate-emitter cut-off voltage	IC = 400mA, VCE = 5V	4.0	—	8.0	V	
VCE(sat)	Collector-emitter saturation voltage	IC = 400A, Tj = 25°C	—	3.2	4.5	V	
Cies	Input capacitance	VCE = 10V, VGE = 0, f = 1MHz	—	51200	—	pF	
td(on)	Switching time	Turn-on delay time	—	0.14	—	μs	
tr		Rise time	Inductive load VCC = 900V	—	0.07		—
ton		Turn-on time	IC = 400A	—	0.21		—
td(off)		Turn-off delay time	VGE = ±15V	—	0.49		—
tf		Fall time	RG = 2Ω	—	0.28		1.0
toff		Turn-off time	(Note 1)	—	0.77		—
VF	Forward voltage	IF = 400A, VGE = 0	—	4.0	5.5	V	
trr	Reverse recovery time	IF = 400A, VGE = -15V, di/dt = 1500A/μs (Note 1)	—	0.3	0.6	μs	
ISES	Sense	Sense leakage current	VSEN - E = 40V, VCE = 0, VGE = 0	—	—	200	nA
IC(SEN-START)		Sense start current	VGE = 15V, VSE = 14.8V (Note 2)	1050	—	—	A
VSEN		Sense voltage	VGE = 15V, IC = 2400A (Note 2)	—	—	13.2	V
Rth(j-c)	Thermal resistance	Transistor stage	—	—	0.045	°C/W	
		Diode stage	—	—	0.125		

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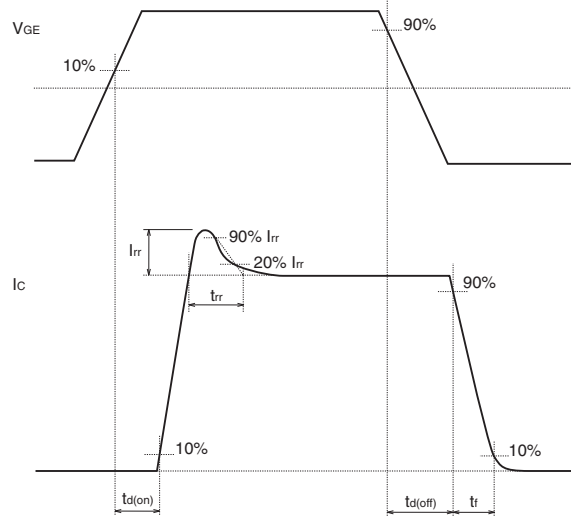
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## Note 1: Switching time and reverse recovery time test circuit and timing chart

Switching time test circuit



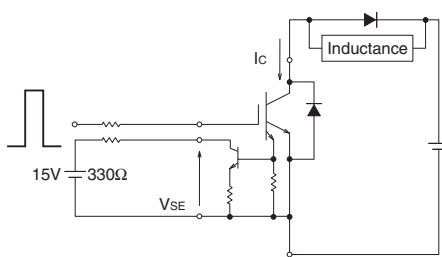
Timing chart



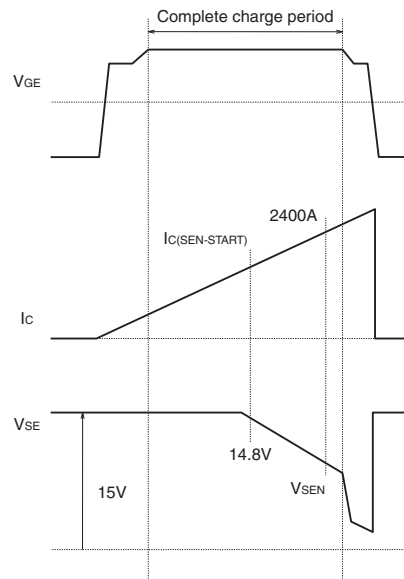
## Note 2: Sense start current and sense voltage test circuit

Test circuit

\*Measurement in the complete charge period.



Timing chart



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### <VCE(sat) Rank>

#### VCE(sat)

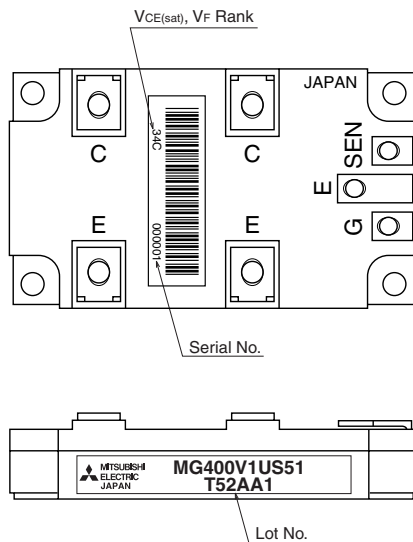
Rank symbol	MIN.	MAX.
27	2.4	2.7
28	2.5	2.8
29	2.6	2.9
30	2.7	3.0
31	2.8	3.1
32	2.9	3.2
33	3.0	3.3
34	3.1	3.4
35	3.2	3.5
36	3.3	3.6
37	3.4	3.7
38	3.5	3.8
39	3.6	3.9
40	3.7	4.0
41	3.8	4.1
42	3.9	4.2
43	4.0	4.3
44	4.1	4.4
45	4.2	4.5

### <VF Rank>

#### VF

Rank symbol	MIN.	MAX.
A	4.5	5.5
B	4.0	4.7
C	3.5	4.2
D	3.0	3.7
E	2.5	3.2

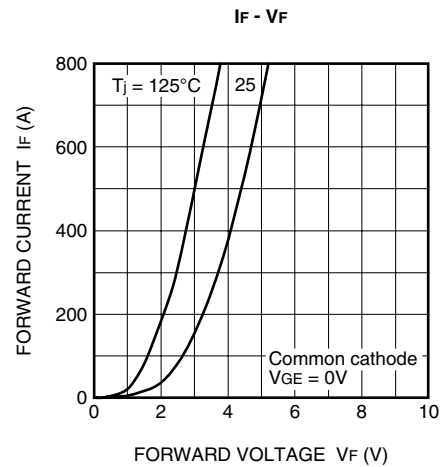
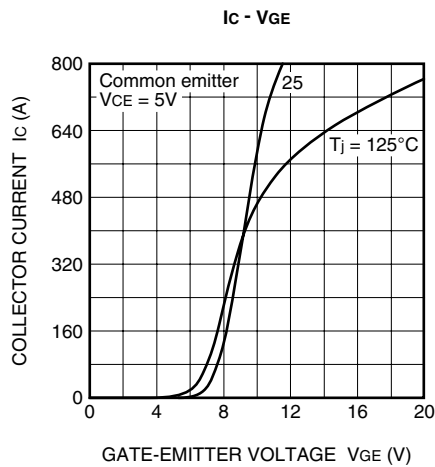
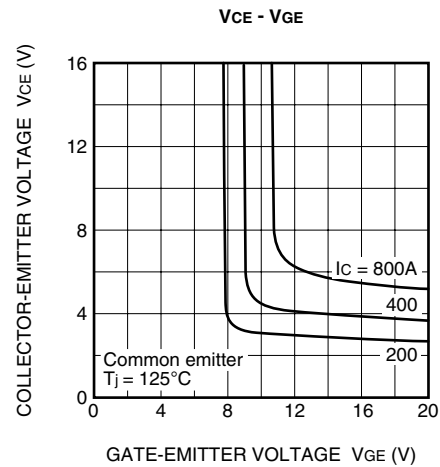
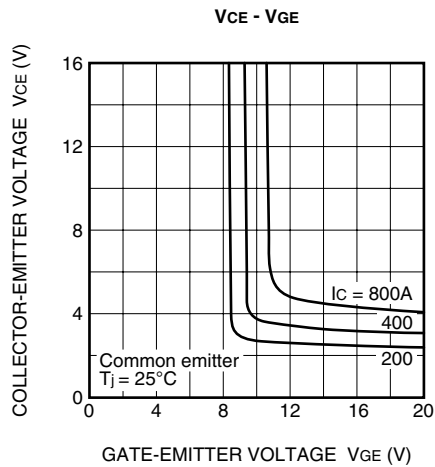
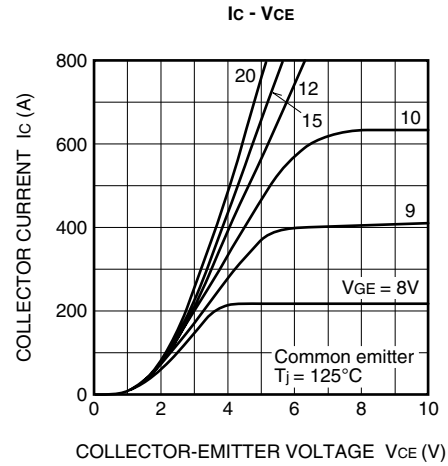
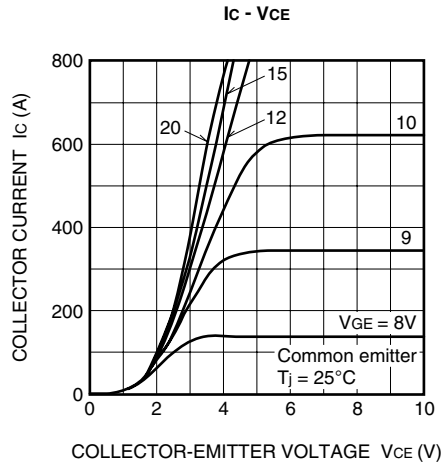
### <Mark position>



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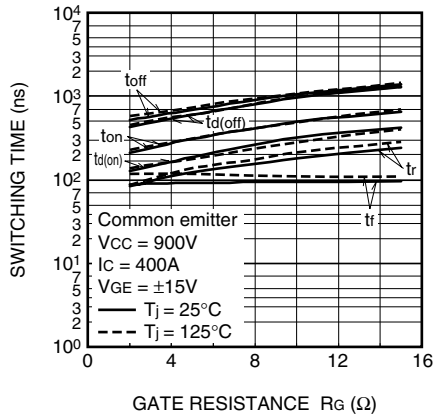
## PERFORMANCE CURVES



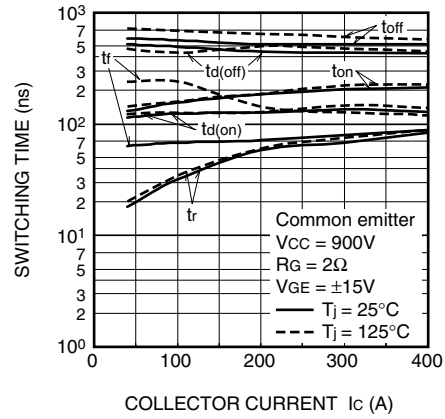
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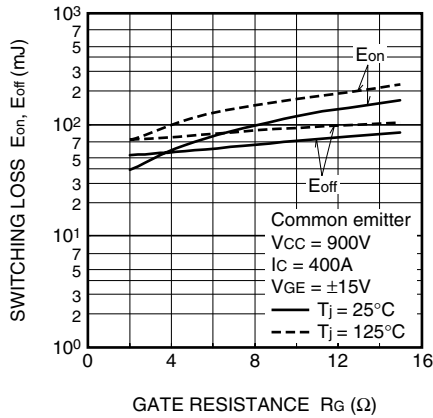
SW time - R<sub>G</sub>



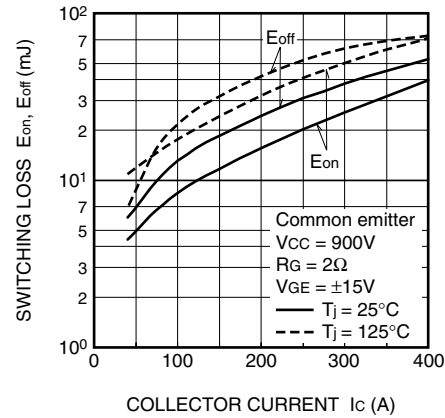
SW time - I<sub>C</sub>



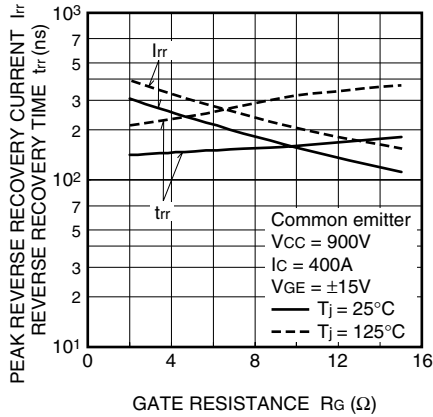
SW loss - R<sub>G</sub>



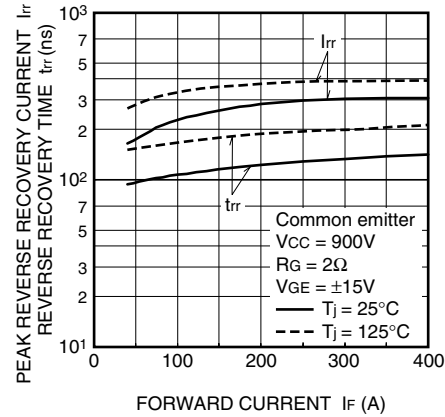
SW loss - I<sub>C</sub>



I<sub>rr</sub>, t<sub>rr</sub> - R<sub>G</sub>



I<sub>rr</sub>, t<sub>rr</sub> - I<sub>F</sub>



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