MITSUBISHI IGBT MODULES

MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

MG400V1US51A

FEATURE

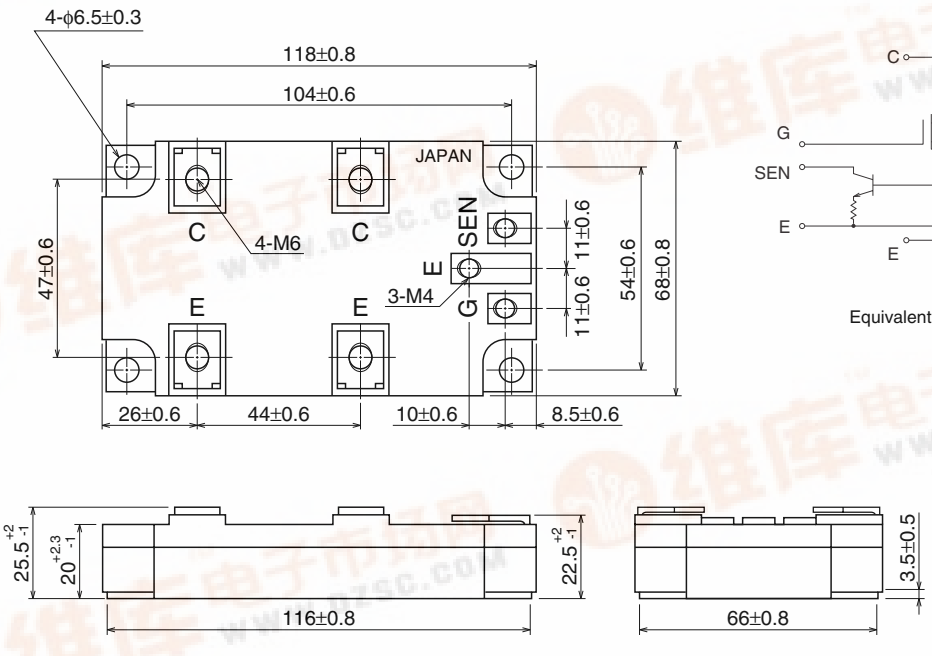
- The electrodes are isolated from case.
- Enhancement-mode
- Integrates fault-signal output circuit in package. (Short-Circuit and Over-Current)
- UL Recognized Yellow Card No.E80276
  File No.E80271

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)

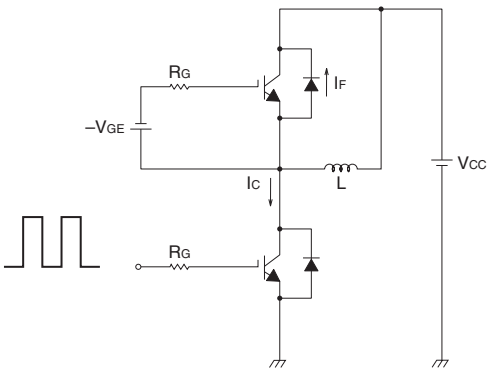
Symbol	Parameter		Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage			1700	V
V_{GES}	Gate-emitter voltage			±20	V
V_{SES}	Sense-emitter voltage			40	V
I_C	Collector current	DC		400	A
I_{CP}		1ms		800	
I_F	Forward current	DC		400	A
I_{FM}		1ms		800	
P_C	Collector power dissipation		T_C = 25°C	2750	W
T_j	Junction temperature			150	°C
T_{stg}	Storage temperature range			–40 ~ 125	°C
V_{Isol}	Isolation voltage			4000 (AC 1 minute)	V
—	Screw torque	Terminal (M4/M6)		2/3	N • m
—		Mounting		3	

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

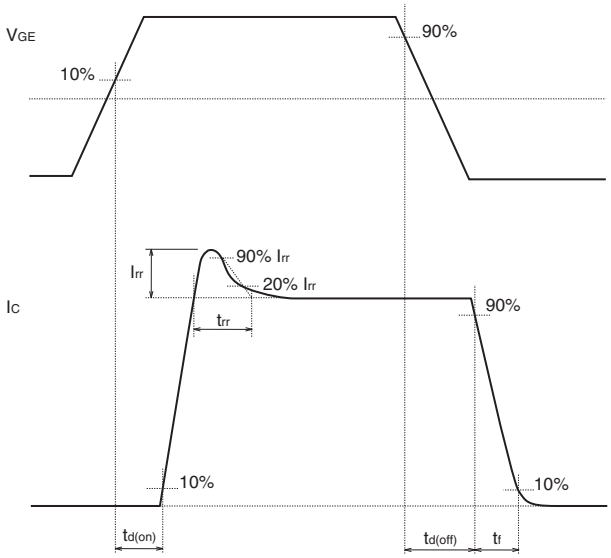
Symbol	Parameter		Test conditions	Limits			Unit
				Min.	Typ.	Max.	
I_{GES}	Gate leakage current		V_{GE} = ±20V, V_{CE} = 0	—	—	±500	nA
I_{CES}	Collector cut-off current		V_{CE} = 1700V, V_{GE} = 0	—	—	4.0	mA
$V_{GE(off)}$	Gate-emitter cut-off voltage		I_C = 400mA, V_{CE} = 5V	4.0	—	8.0	V
$V_{CE(sat)}$	Collector-emitter saturation voltage		I_C = 400A, T_j = 25°C	—	3.2	4.5	V
C_{ies}	Input capacitance		V_{CE} = 10V, V_{GE} = 0, f = 1MHz	—	51200	—	pF
$t_{d(on)}$	Switching time	Turn-on delay time	Inductive load V_{CC} = 900V I_C = 400A V_{GE} = ±15V R_G = 2Ω	—	0.14	—	μs
t_r		Rise time		—	0.07	—	
t_{on}		Turn-on time		—	0.21	—	
$t_{d(off)}$		Turn-off delay time		—	0.49	—	
t_f		Fall time		—	0.28	1.0	
t_{off}		Turn-off time	(Note 1)	—	0.77	—	
V_F	Forward voltage		I_F = 400A, V_{GE} = 0	—	4.0	5.5	V
t_{rr}	Reverse recovery time		I_F = 400A, V_{GE} = –15V, di/dt = 1500A/μs (Note 1)	—	0.3	0.6	μs
I_{SES}	Sense	Sense leakage current	V_{SEN} – E = 40V, V_{CE} = 0, V_{GE} = 0	—	—	200	nA
$I_{C(SEN-START)}$		Sense start current	V_{GE} = 15V, V_{SE} = 14.8V (Note 2)	1050	—	—	A
V_{SEN}		Sense voltage	V_{GE} = 15V, I_C = 2400A (Note 2)	—	—	13.2	V
$R_{th(j-c)}$	Thermal resistance		Transistor stage	—	—	0.045	°C/W
			Diode stage	—	—	0.125	

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

Switching time test circuit



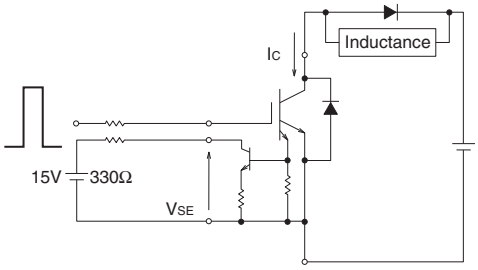
Timing chart



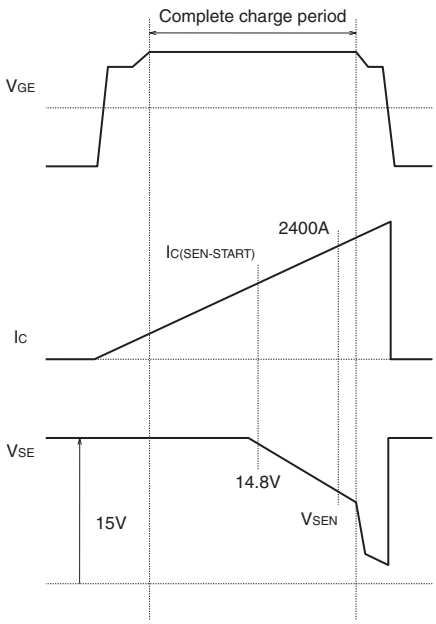
Note 2: Sense start current and sense voltage test circuit

Test circuit

*Measurement in the complete charge period.



Timing chart



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<$V_{CE(sat)}$ Rank>

$V_{CE(sat)}$

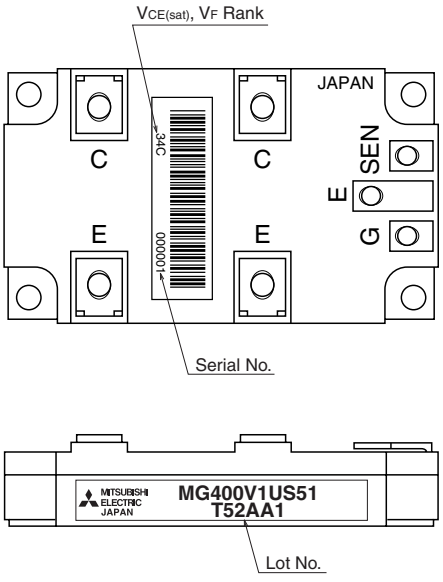
Rank symbol	MIN.	MAX.
27	2.4	2.7
28	2.5	2.8
29	2.6	2.9
30	2.7	3.0
31	2.8	3.1
32	2.9	3.2
33	3.0	3.3
34	3.1	3.4
35	3.2	3.5
36	3.3	3.6
37	3.4	3.7
38	3.5	3.8
39	3.6	3.9
40	3.7	4.0
41	3.8	4.1
42	3.9	4.2
43	4.0	4.3
44	4.1	4.4
45	4.2	4.5

<V_F Rank>

V_F

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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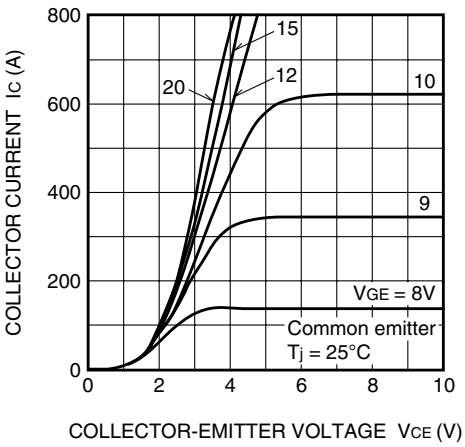
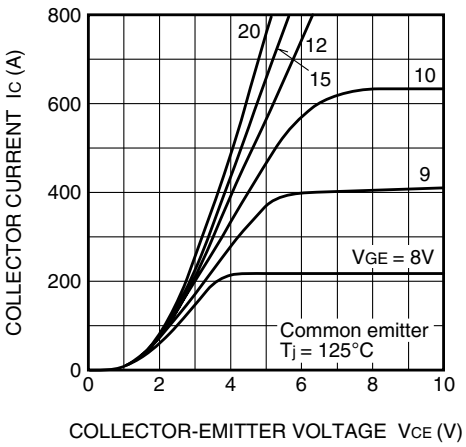
PERFORMANCE CURVES

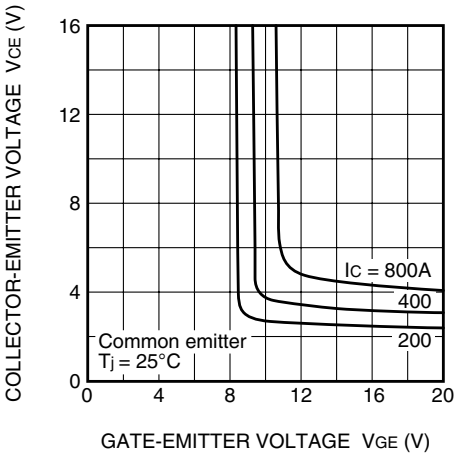
IC - VCE



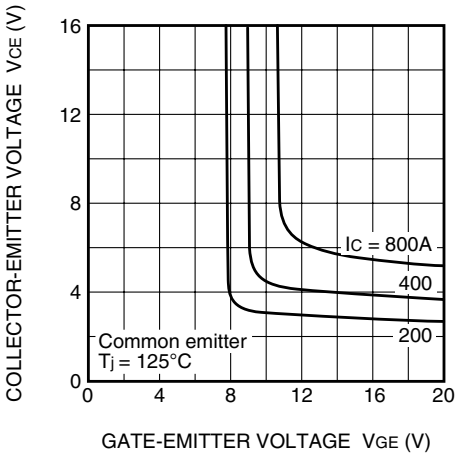
IC - VCE



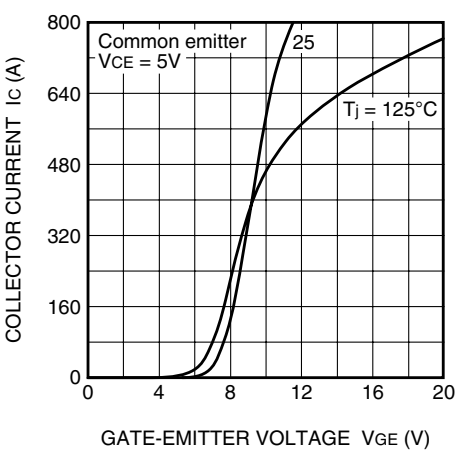
VCE - VGE



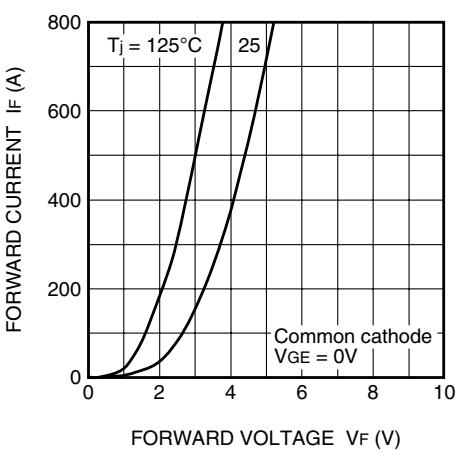
VCE - VGE



IC - VGE



IF - VF



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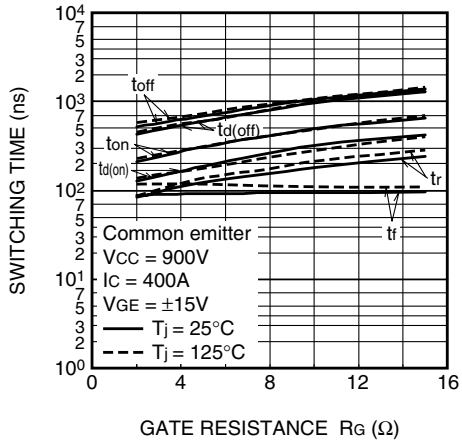
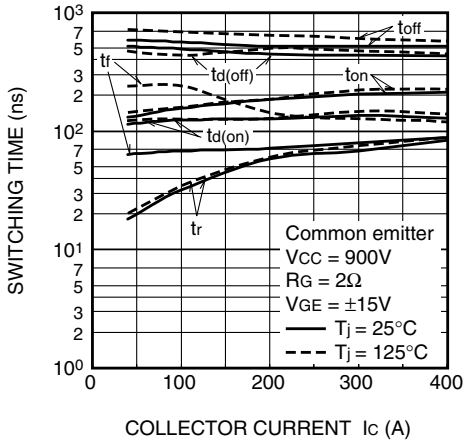
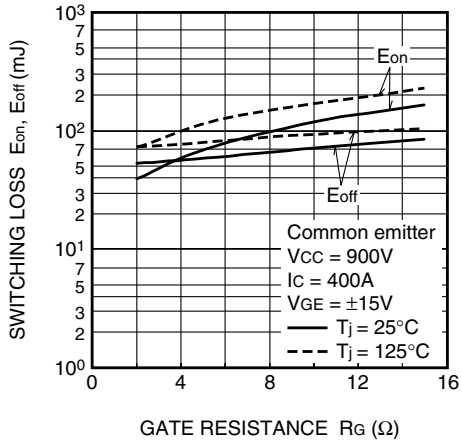
SW time - RG



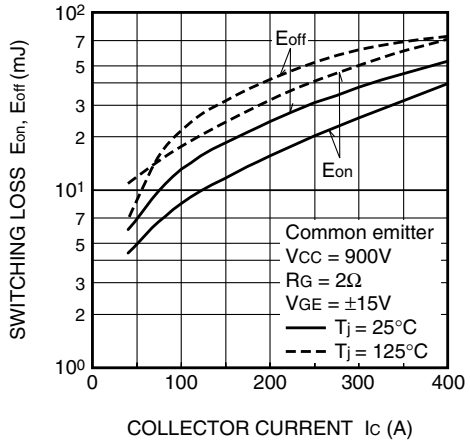
SW time - IC



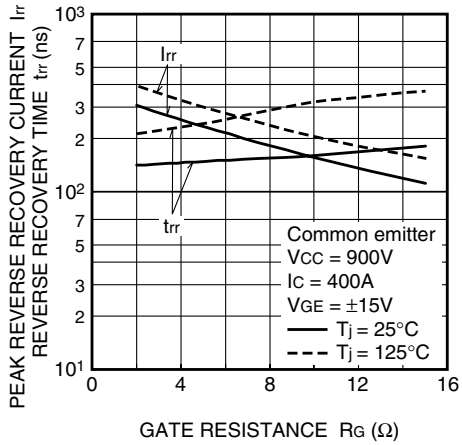
SW loss - RG



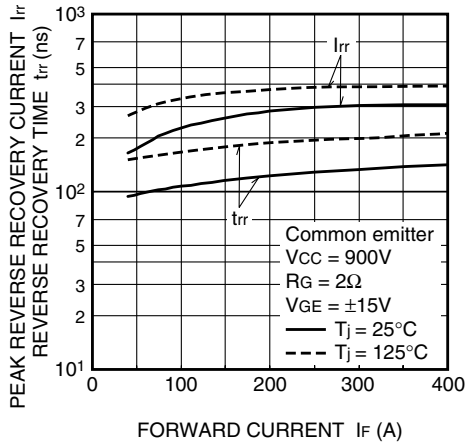
SW loss - IC



Irr, trr - RG



Irr, trr - IF



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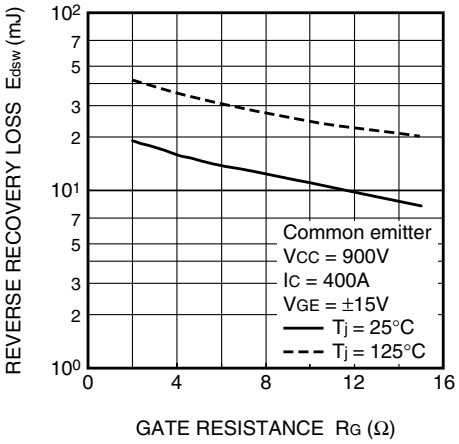
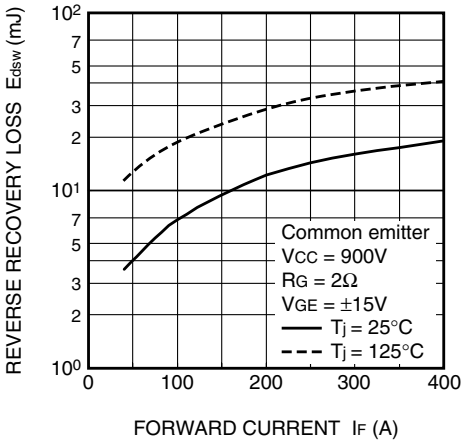
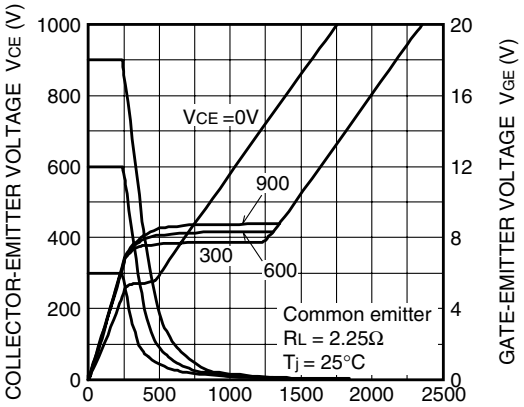
Edsw - RG



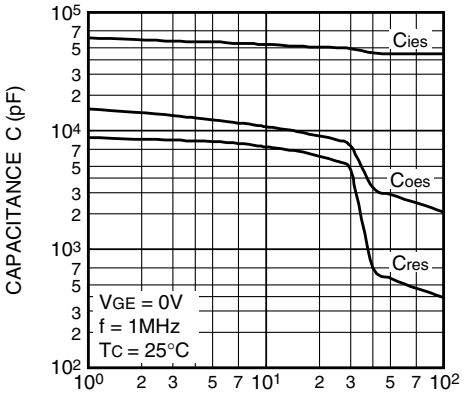
Edsw - IF



VCE, VGE - QG



C - VCE



Rth - tw