

MITSUBISHI IGBT MODULES
MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
 MOTOR CONTROL APPLICATIONS

MG400V1US51A



FEATURE

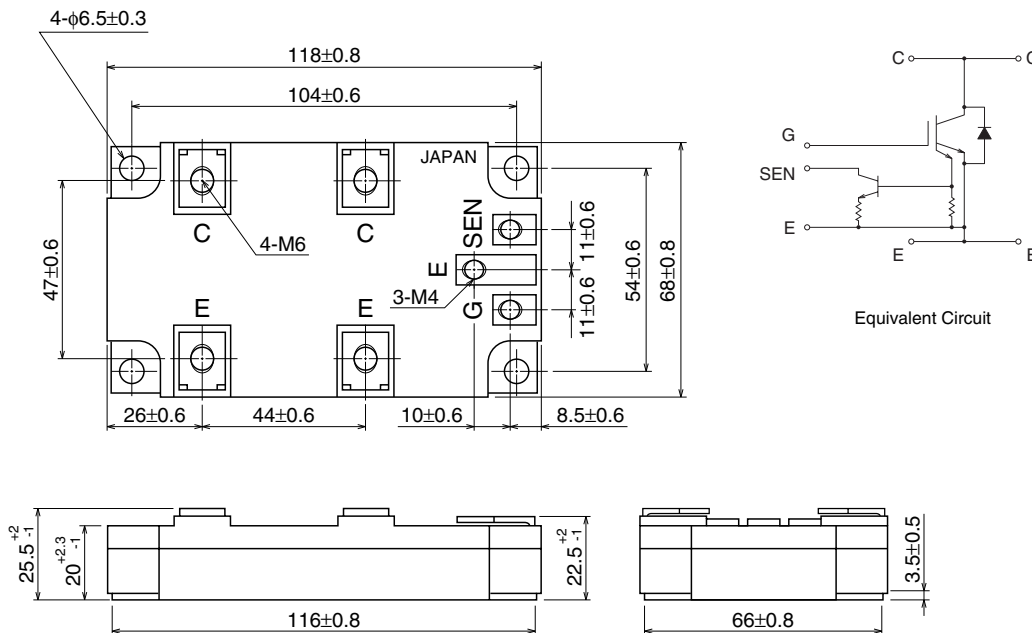
- The electrodes are isolated from case.
- Enhancement-mode
- Integrates fault-signal output circuit in package. (Short-Circuit and Over-Current)
- UL Recognized Yellow Card No.E80276
File No.E80271

APPLICATION

General purpose inverters, servo drives and motor controls

OUTLINE DRAWING & EQUIVALENT CIRCUIT

Dimensions in mm



Weight: 420g

MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

MAXIMUM RATINGS (Ta = 25°C)

| Symbol | Parameter | | Conditions | Ratings | Unit |
|-------------------|-----------------------------|------------------|-----------------------|--------------------|-------|
| V _{CE} S | Collector-emitter voltage | | | 1700 | V |
| V _{GE} S | Gate-emitter voltage | | | ±20 | V |
| V _{SE} S | 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)

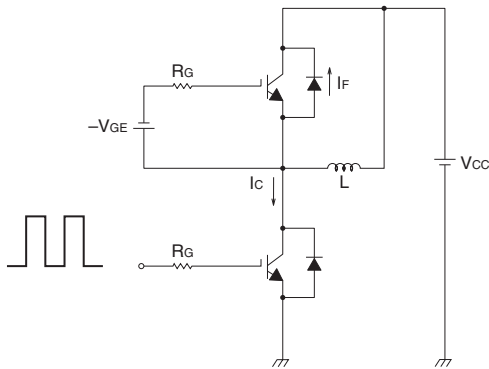
| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|---------------------------|--------------------------------------|--|--|-------|-------|------|-----|
| | | | Min. | Typ. | Max. | | |
| I _{GES} | Gate leakage current | V _{GE} = ±20V, V _{CE} = 0 | — | — | ±500 | nA | |
| I _{CES} | 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 | — | 0.14 | — | μs | |
| t _r | | Rise time | Inductive load | — | 0.07 | | — |
| t _{on} | | Turn-on time | V _{CC} = 900V | — | 0.21 | | — |
| t _{d(off)} | | Turn-off delay time | I _C = 400A | — | 0.49 | | — |
| t _f | | Fall time | V _{GE} = ±15V | — | 0.28 | | 1.0 |
| t _{off} | | Turn-off time | R _G = 2Ω (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 | | |

MG400V1US51A

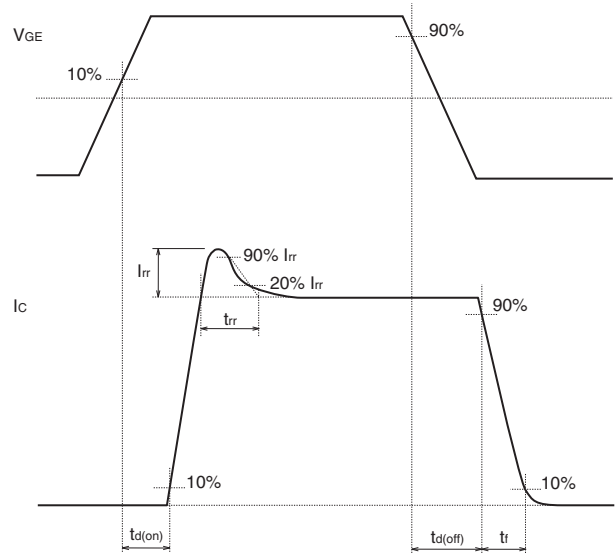
HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

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

Switching time test circuit



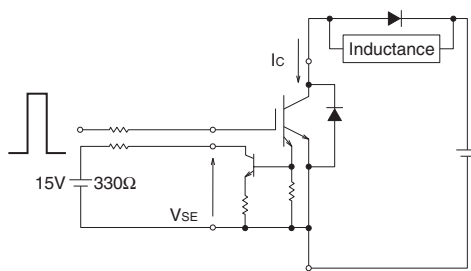
Timing chart



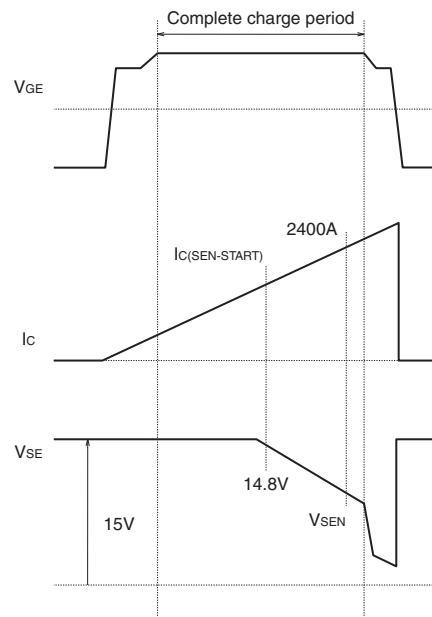
Note 2: Sense start current and sense voltage test circuit

Test circuit

*Measurement in the complete charge period.



Timing chart



MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

<VCE(sat) Rank>

VCE(sat)

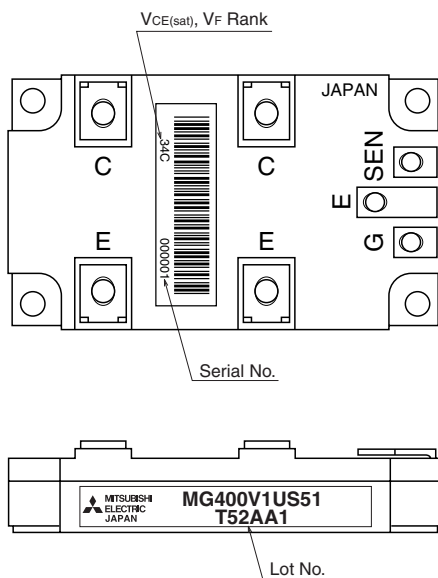
| Rank symbol | MIN. | MAX. |
|-------------|------|------|
| 27 | 2.4 | 2.7 |
| 28 | 2.5 | 2.8 |
| 29 | 2.6 | 2.9 |
| 30 | 2.7 | 3.0 |
| 31 | 2.8 | 3.1 |
| 32 | 2.9 | 3.2 |
| 33 | 3.0 | 3.3 |
| 34 | 3.1 | 3.4 |
| 35 | 3.2 | 3.5 |
| 36 | 3.3 | 3.6 |
| 37 | 3.4 | 3.7 |
| 38 | 3.5 | 3.8 |
| 39 | 3.6 | 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 |

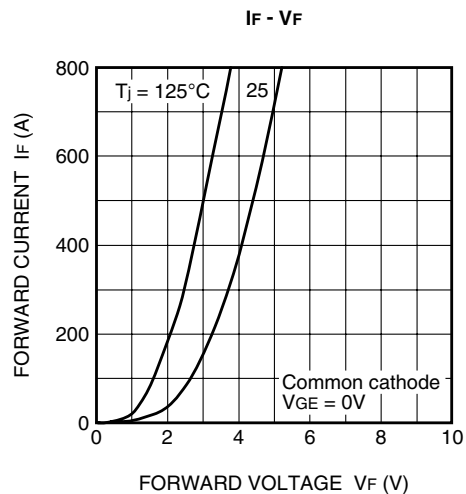
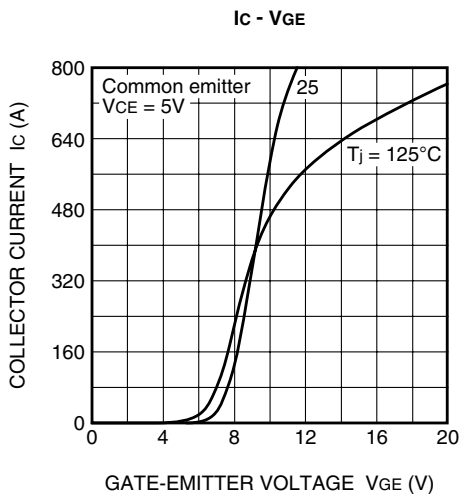
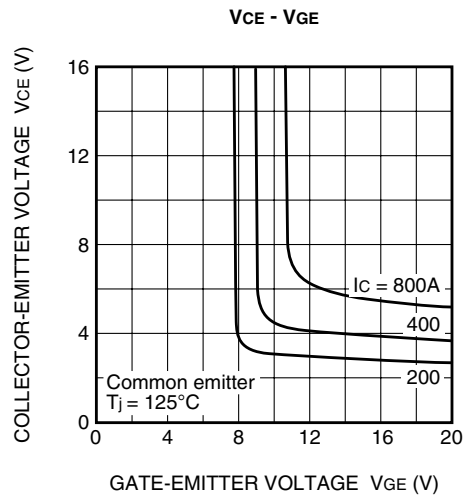
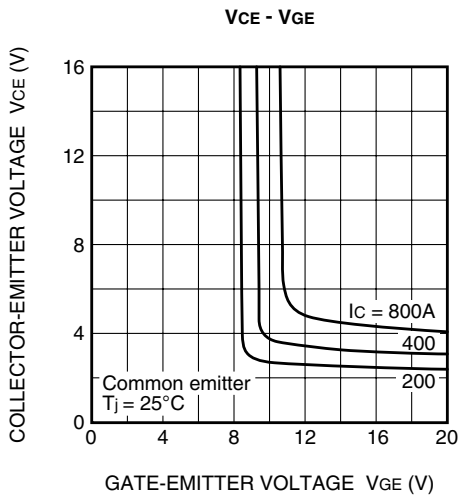
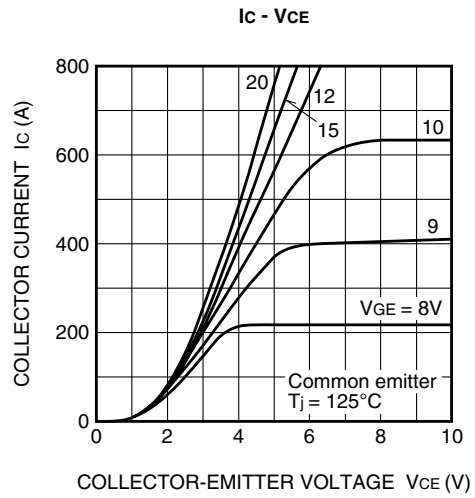
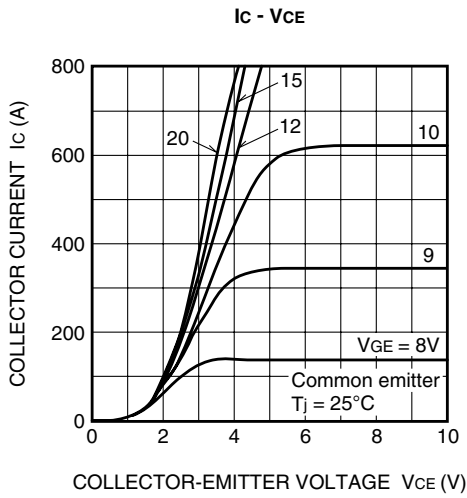
<Mark position>



MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

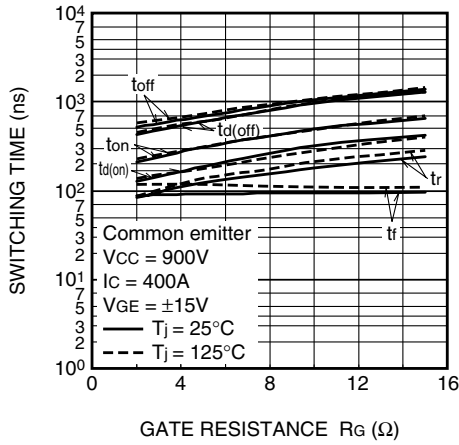
PERFORMANCE CURVES



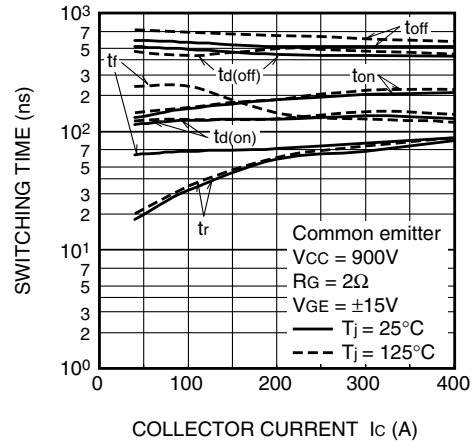
MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

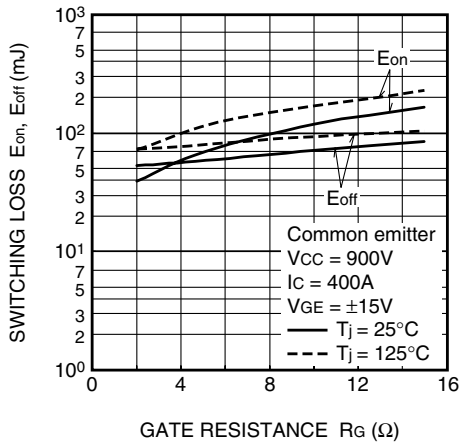
SW time - R_G



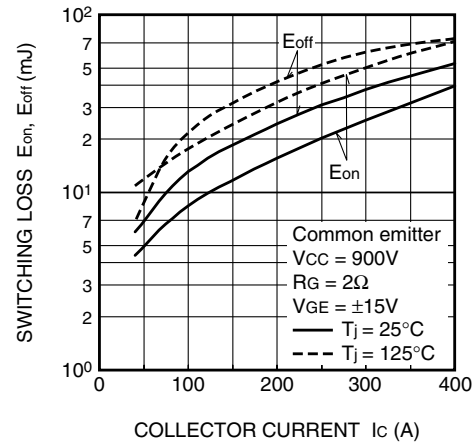
SW time - I_C



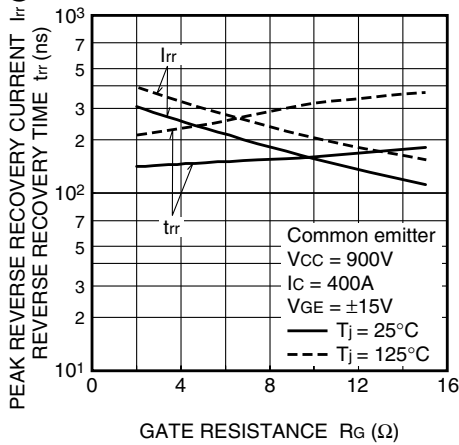
SW loss - R_G



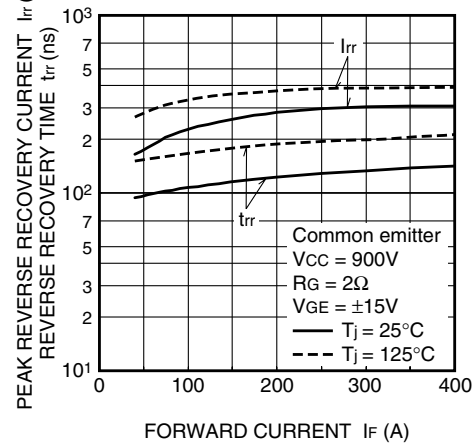
SW loss - I_C



I_{rr}, t_{rr} - R_G



I_{rr}, t_{rr} - I_F



MG400V1US51A

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

