

MITSUBISHI IGBT Module

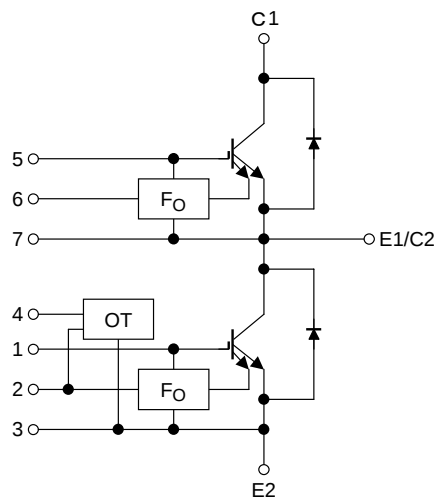
MG400Q2YS60A

High Power Switching Applications

Motor Control Applications

- Integrates a complete half bridge power circuit and fault-signal output circuit in one package.
(short circuit and over temperature)
- The electrodes are isolated from case.
- Low thermal resistance.
- $V_{CE(sat)} = 2.4 \text{ V (typ.)}$

Equivalent Circuit



Signal terminal

1.	G (L)	2.	FO (L)	3.	E (L)	4.	V _D
5.	G (H)	6.	FO (H)	7.	E (H)	8.	Open

Maximum Ratings (Ta = 25°C)

Stage	Characteristics		Symbol	Rating	Unit
Inverter	Collector-emitter voltage		V_{CES}	1200	V
	Gate-emitter voltage		V_{GES}	± 20	V
	Collector current	DC	I_C	400	A
		1 ms	I_{CP}	800	
	Forward current	DC	I_F	400	A
		1 ms	I_{FM}	800	
	Collector power dissipation (Tc = 25°C)		P_C	3750	W
Control	Control voltage (OT)		V_D	20	V
	Fault input voltage		V_{FO}	20	V
	Fault input current		I_{FO}	20	mA
Module	Junction temperature		T_j	150	°C
	Storage temperature range		T_{stg}	-40~125	°C
	Operation temperature range		T_{ope}	-20~100	°C
	Isolation voltage		V_{isol}	2500 (AC 1 min)	V
	Screw torque		—	3 (M5)	N·m

Electrical Characteristics (Tj = 25°C)**1. Inverter stage**

Characteristics		Symbol	Test Condition		Min	Typ.	Max	Unit
Gate leakage current		I _{GES}	V _{GE} = ±20 V, V _{CE} = 0		—	—	+3/−4	mA
			V _{GE} = +10 V, V _{CE} = 0		—	—	100	nA
Collector cut-off current		I _{CES}	V _{CE} = 1200 V, V _{GE} = 0		—	—	1.0	mA
Gate-emitter cut-off voltage		V _{GE (off)}	V _{CE} = 5 V, I _C = 400 mA		6.0	7.0	8.0	V
Collector-emitter saturation voltage		V _{CE (sat)}	V _{GE} = 15 V, I _C = 400 A	T _J = 25°C	—	2.4	2.8	V
				T _J = 125°C	—	—	3.2	
Input capacitance		C _{ies}	V _{CE} = 10 V, V _{GE} = 0, f = 1 MHz		—	31000	—	pF
Switching time	Turn-on delay time	t _{d (on)}	V _{CC} = 600 V, I _C = 400 A V _{GE} = ±15 V, R _G = 5.1 Ω (Note 1) (See page 4)		0.10	—	1.00	μs
	Turn-off time	t _{off}			—	—	2.00	
	Fall time	t _f			—	—	0.50	
Reverse recovery time		t _{rr}			—	—	0.50	
Forward voltage		V _F	I _F = 400 A		—	2.4	2.8	V

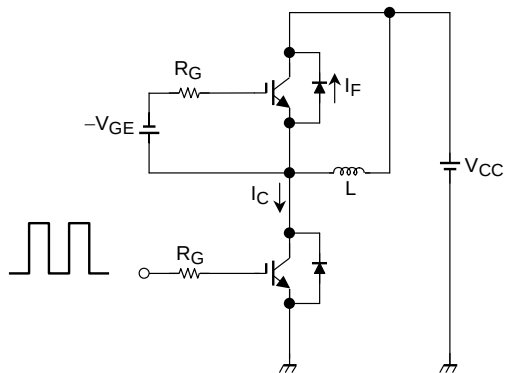
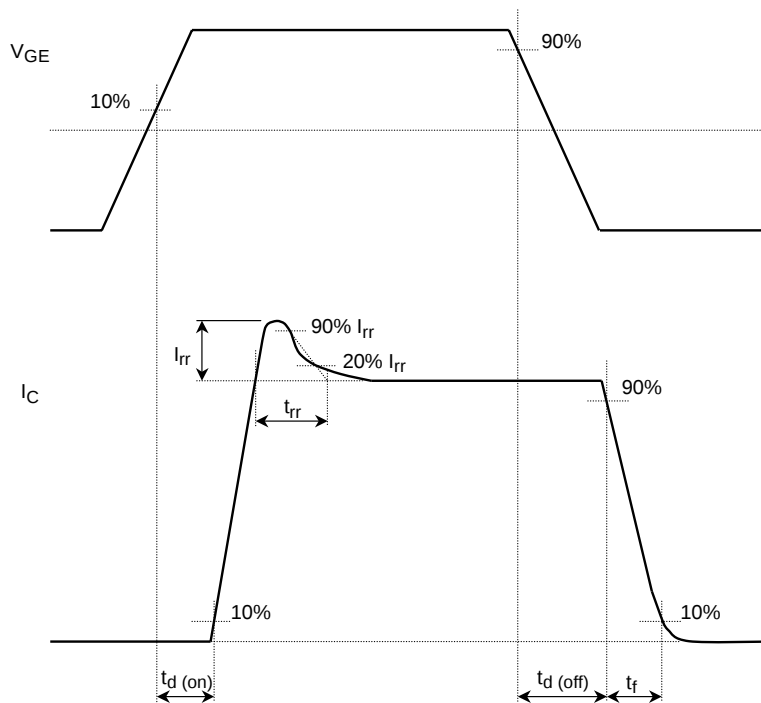
Note 1: Switching time test circuit & timing chart

2. Control (Tc = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Fault output current	OC	$V_{GE} = 15 \text{ V}$	480	—	—	A
Over temperature	OT	—	100	—	125	°C
Fault output delay time	$t_d \text{ (Fo)}$	$V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$	—	—	8	μs

3. Module ($T_c = 25^\circ\text{C}$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th(j-c)}$	Inverter IGBT stage	—	—	0.033	$^\circ\text{C/W}$
		Inverter FRD stage	—	—	0.068	
Case to fin thermal resistance	$R_{th(c-f)}$	With silicon compound	—	0.013	—	$^\circ\text{C/W}$

Switching Time Test Circuit**Timing Chart**

Remark**<Short circuit capability condition >**

- Short circuit capability is 6 μ s after fault output signal.
Please keep following condition to use fault output signal.
 - $V_{CC} \leq 750$ V
 - 14.8 V $\leq V_{GE} \leq 17.0$ V
 - $R_G \geq 5.1$ Ω
 - $T_j \leq 125^\circ\text{C}$

<Gate voltage >

- To use this product, V_{GE} must be provided higher than 14.8 V
In case V_{GE} is less than 14.8 V, fault signal FO may not be output even under error conditions.

<Recommended conditions for application>

Characteristics	Symbol	Min	Typ.	Max	Unit
P-N power terminal supply voltage	V_{CC}	—	600	750	V
Gate voltage	V_{GE}	14.8	15	17	V
Gate resistance	R_G	5.1	—	—	Ω
Switching frequency	fc	—	—	20	kHz

<For parallel use>

- For parallel use of this product, please use the same rank for both $V_{CE(sat)}$ and V_F among IGBT in parallel without fail.

$V_{CE(sat)}$	V_F	Min	Max
24	E	2.1	2.4
26	F	2.3	2.6
28	G	2.5	2.8

