

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

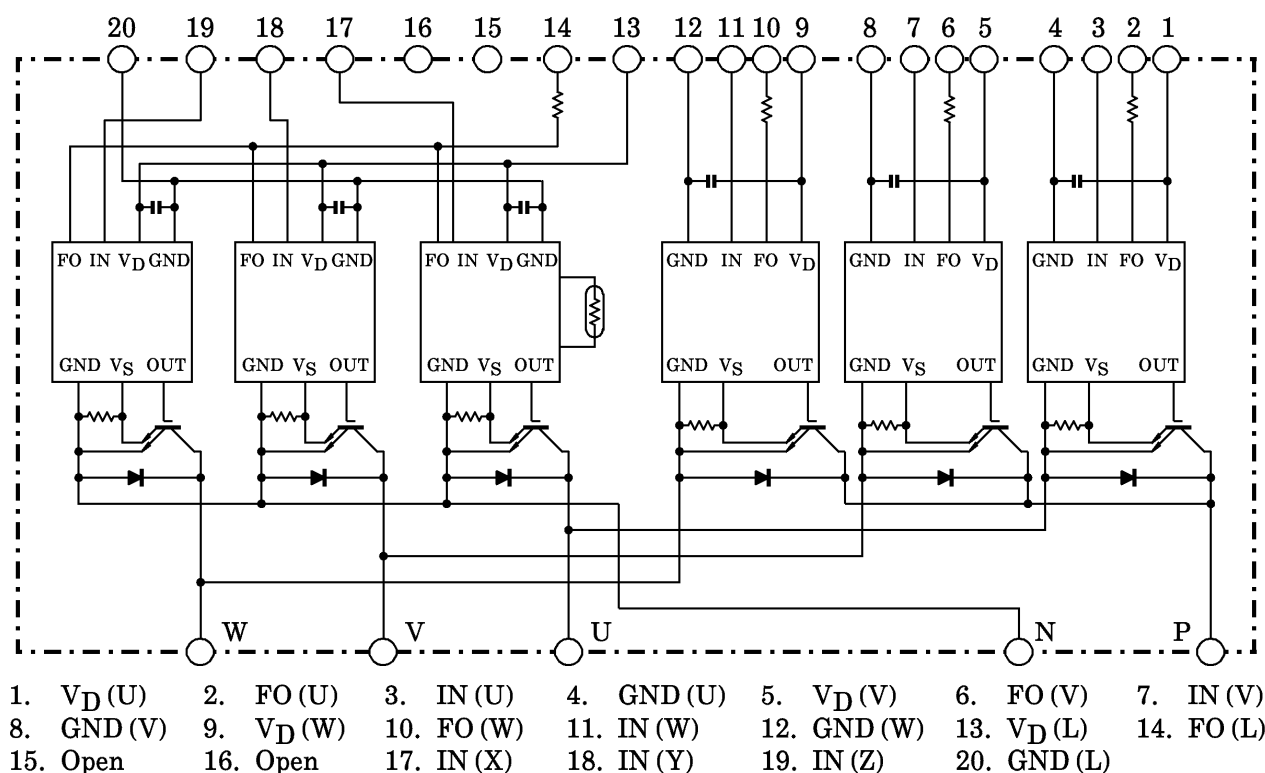
MIG100Q6CMA0X (1200V / 100A 6in1)

HIGH POWER SWITCHING APPLICATION

MOTOR CONTROL APPLICATION

- Integrates Inverter Power Circuits & Control Circuits (IGBT drive units, Protection units for Short-Current, Over-Current, Under-Voltage & Over Temperature) in One Package.
- The Electrode are Isolated from Case.
- $V_{CE(sat)} = 2.4 \text{ V (Typ.)}$

EQUIVALENT CIRCUIT

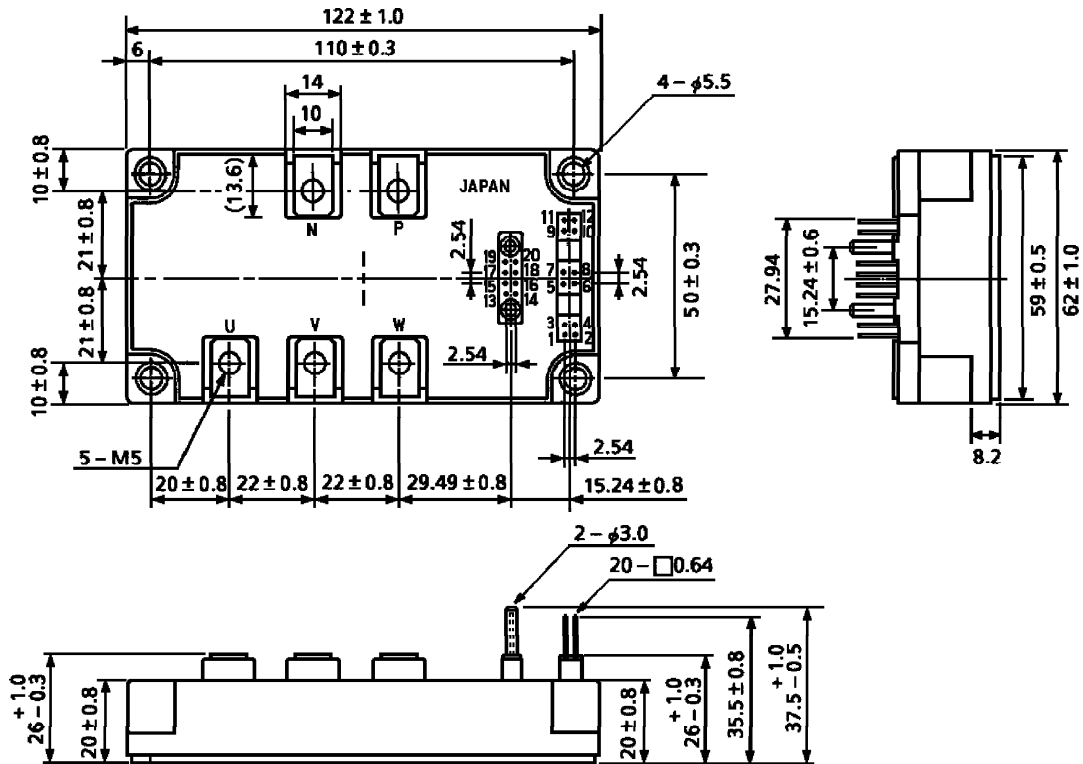


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OUTLINE : TOSHIBA 2-123A1A

Unit : mm

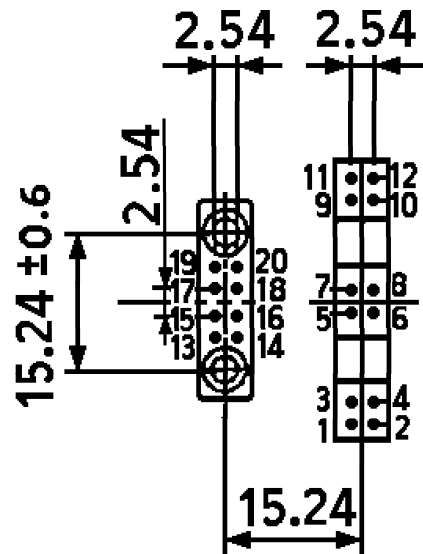


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|---------------|-------------|--------------|------------|--------------|-------------|
| 1. V_D (U) | 2. FO (U) | 3. IN (U) | 4. GND (U) | 5. V_D (V) | 6. FO (V) |
| 7. IN (V) | 8. GND (V) | 9. V_D (W) | 10. FO (W) | 11. IN (W) | 12. GND (W) |
| 13. V_D (L) | 14. FO (L) | 15. Open | 16. Open | 17. IN (X) | 18. IN (Y) |
| 19. IN (Z) | 20. GND (L) | | | | |

Weight : 375 g (Typ.)

SIGNAL TERMINAL LAYOUT

Unit : mm



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|---------------|-------------|--------------|------------|--------------|-------------|
| 1. V_D (U) | 2. FO (U) | 3. IN (U) | 4. GND (U) | 5. V_D (V) | 6. FO (V) |
| 7. IN (V) | 8. GND (V) | 9. V_D (W) | 10. FO (W) | 11. IN (W) | 12. GND (W) |
| 13. V_D (L) | 14. FO (L) | 15. Open | 16. Open | 17. IN (X) | 18. IN (Y) |
| 19. IN (Z) | 20. GND (L) | | | | |

MAXIMUM RATINGS

STAGE	CHARACTERISTIC	CONDITION	SYMBOL	RATING	UNIT
Inverter	Supply Voltage	P-N Power Terminal	V_{CC}	900	V
	Collector-Emitter Voltage	—	V_{CES}	1200	V
	Collector Current	$T_c = 25^\circ\text{C}$, DC	I_C	100	A
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	100	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	P_C	600	W
	Junction Temperature	—	T_j	150	$^\circ\text{C}$
Control	Control Supply Voltage	V_D -GND Terminal	V_D	20	V
	Input Voltage	IN-GND Terminal	V_{IN}	20	V
	Fault Output Voltage	FO-GND Terminal	V_{FO}	20	V
	Fault Output Current	FO Sink Current	I_{FO}	14	mA
Module	Operating Temperature	—	T_c	$-20 \sim +100$	$^\circ\text{C}$
	Storage Temperature Range	—	T_{stg}	$-40 \sim +125$	$^\circ\text{C}$
	Isolation Voltage	AC 1 minute	V_{ISO}	2500	V
	Screw Torque	M5	—	3	Nm

ELECTRICAL CHARACTERISTICS

a. Inverter Stage ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	$V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	10	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{ V}$, $I_C = 100\text{ A}$, $V_{IN} = 15\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	2.4	2.8	V
			$T_j = 125^\circ\text{C}$	—	—	3.2	
Forward Voltage	V_F	$I_F = 100\text{ A}$		—	2.5	3.1	V
Switching Time	t_{on}	$V_{CC} = 600\text{ V}$, $I_C = 100\text{ A}$ $V_D = 15\text{ V}$, $V_{IN} = 15\text{ V} \leftrightarrow 0\text{ V}$ Inductive Load (Note 1)		—	1.0	2.0	μs
	$t_c(\text{on})$			—	0.6	1.2	
	t_{rr}			—	0.3	0.6	
	t_{off}			—	2.0	3.0	
	$t_c(\text{off})$			—	0.3	0.7	

b. Control Stage ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_D(H)$	$V_D = 15\text{ V}$	—	8	12	mA
	Low Side	$I_D(L)$		—	34	50	
Input On Signal Voltage		$V_{IN(on)}$	$V_D = 15\text{ V}$	1.4	1.6	1.8	V
Input Off Signal Voltage		$V_{IN(off)}$	—	2.2	2.5	2.8	
Fault Output Current	Protection	$I_{FO(on)}$	$V_D = 15\text{ V}$	—	10	12	mA
	Normal	$I_{FO(off)}$		—	—	0.1	
Over Current Protection Trip Level	Inverter	OC	$V_D = 15\text{ V}, T_j \leq 125^\circ\text{C}$	160	—	—	A
Short Circuit Protection Trip Level	Inverter	SC	$V_D = 15\text{ V}, T_j \leq 125^\circ\text{C}$	200	—	—	A
Over Current Cut-Off Time		$t_{off(OC)}$	$V_D = 15\text{ V}$	—	5	—	μs
Over Temperature Protection	Trip Level	OT	Case Temperature	110	118	125	$^\circ\text{C}$
	Reset Level	OTr		—	98	—	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.0	12.0	12.5	V
	Reset Level	UVr		12.0	12.5	13.0	
Fault Output Pulse Width		t_{FO}	$V_D = 15\text{ V}$	1	2	3	ms

c. Thermal Resistance ($T_c = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	IGBT	—	—	0.208	$^\circ\text{C} / \text{W}$
		FRD	—	—	0.50	

(Note 1) : Switching time test circuit & timing chart

