

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

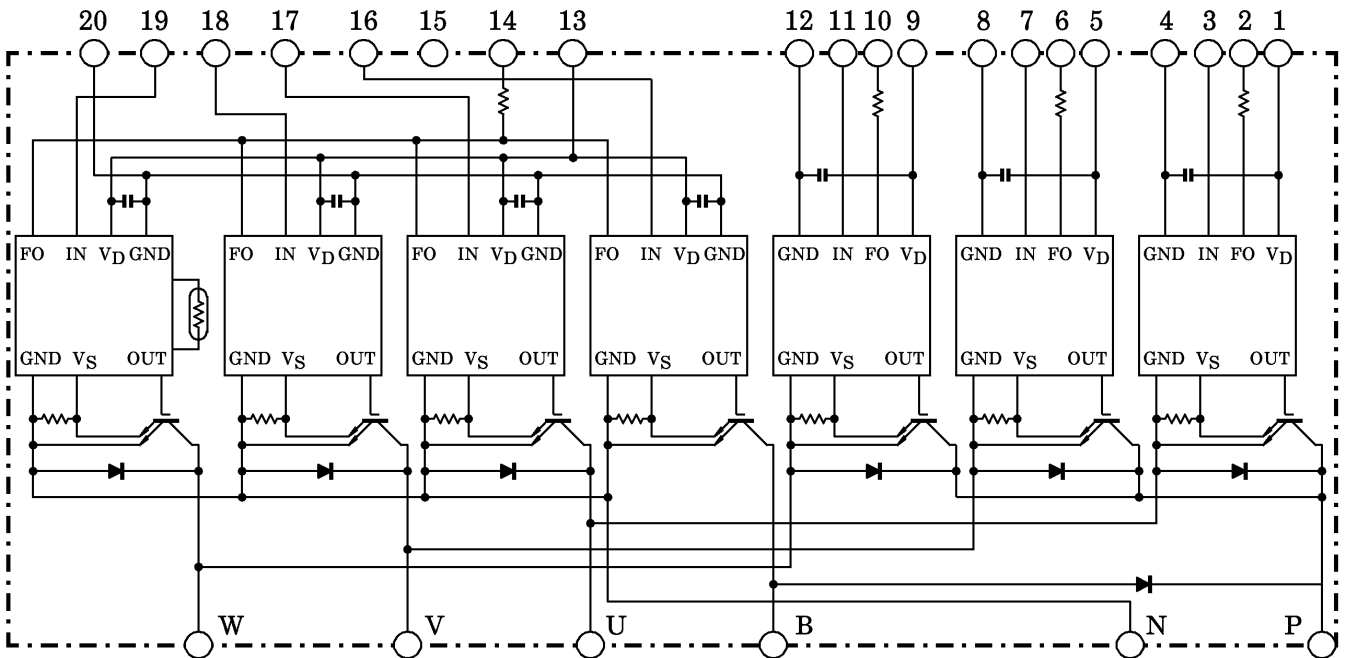
MIG50Q7CSA0X (1200V / 50A 7in1)

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Brake Power Circuits & Control Circuits (IGBT drive unit, Protection units for Short-Current, Over-Current, Under-Voltage & Over Temperature) in One Package.
- The Electrodes are Isolated from Case.
- $V_{CE(sat)} = 2.2\text{ V (Typ.)}$

EQUIVALENT CIRCUIT



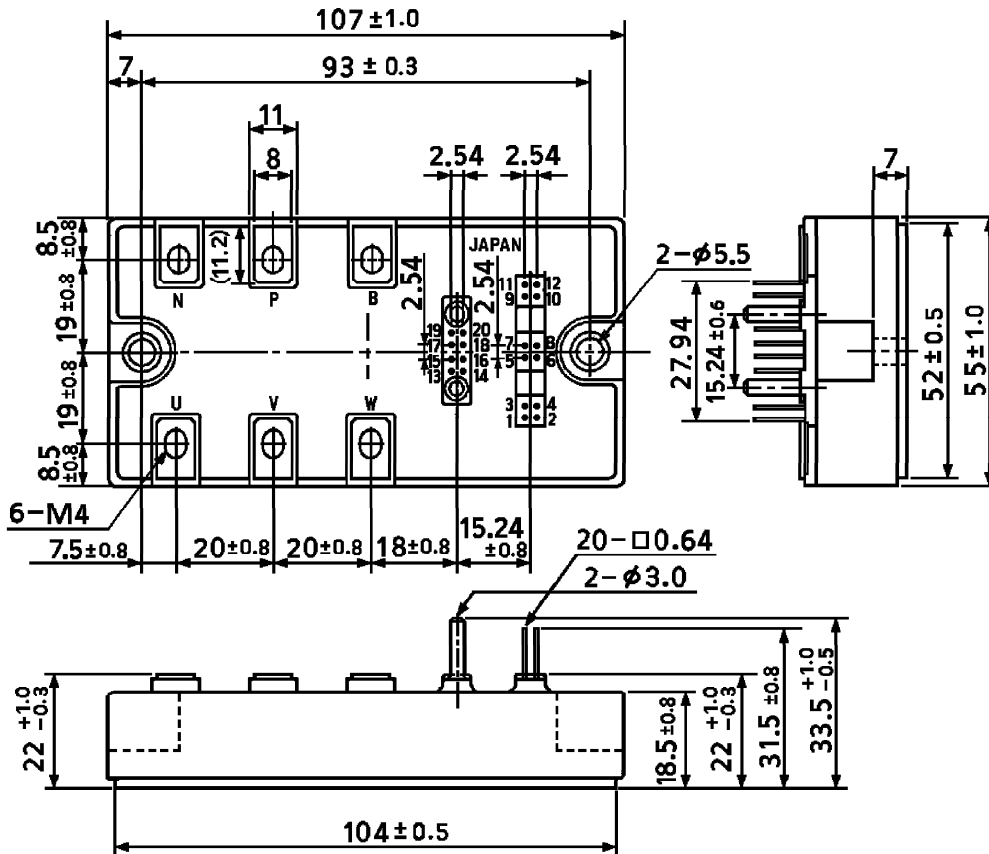
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|-------------|-------------|-----------|-----------|-------------|--------------|-----------|
| 1. $V_D(U)$ | 2. FO(U) | 3. IN(U) | 4. GND(U) | 5. $V_D(V)$ | 6. FO(V) | 7. IN(V) |
| 8. GND(V) | 9. $V_D(W)$ | 10. FO(W) | 11. IN(W) | 12. GND(W) | 13.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

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OUTLINE : TOSHIBA 2-108G1A

Unit : mm

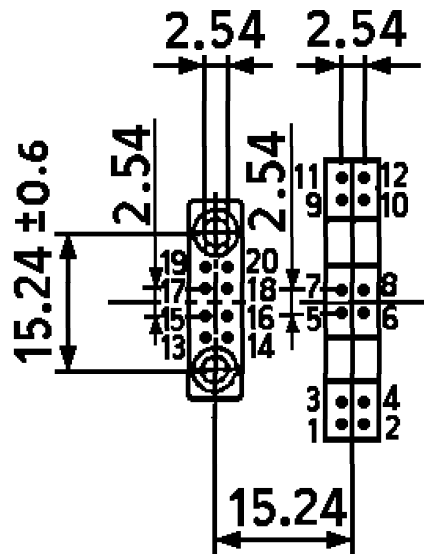


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|------------------------|-------------|-----------------------|------------|-----------------------|-------------|
| 1. V _D (U) | 2. FO (U) | 3. IN (U) | 4. GND (U) | 5. V _D (V) | 6. FO (V) |
| 7. IN (V) | 8. GND (V) | 9. V _D (W) | 10. FO (W) |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

Weight : 278 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. IN(B) | 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°C, DC	I _C	50	A
	Forward Current	T _c = 25°C, DC	I _F	50	A
	Collector Power Dissipation	T _c = 25°C	P _C	350	W
	Junction Temperature	—	T _j	150	°C
Brake	Supply Voltage	P-N Power Terminal	V _{CC}	900	V
	Collector-Emitter Voltage	—	V _{CES}	1200	V
	Collector Current	T _c = 25°C, DC	I _C	25	A
	Reverse Voltage	—	V _R	1200	V
	Forward Current	T _c = 25°C, DC	I _F	25	A
	Collector Power Dissipation	T _c = 25°C	P _C	200	W
	Junction Temperature	—	T _j	150	°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~+100	°C
	Storage Temperature Range	—	T _{stg}	-40~+125	°C
	Isolation Voltage	AC 1 min	V _{ISO}	2500	V
	Screw Torque (Terminal)	M4	—	2	Nm
	Screw Torque (Mounting)	M5	—	3	Nm

ELECTRICAL CHARACTERISTICS

a. Inverter Stage (T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-Off Current	I _{CEX}	V _{CE} = 1200 V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	10	
Collector-Emitter Saturation Voltage	V _{CE (sat)}	V _D = 15 V, I _C = 50 A, V _{IN} = 15 V → 0 V	T _j = 25°C	—	2.2	2.6	V
			T _j = 125°C	—	—	3.0	
Forward Voltage	V _F	I _F = 50 A	—	2.5	3.1	V	
Switching Time	t _{on}	V _{CC} = 600 V, I _C = 50 A V _D = 15 V, V _{IN} = 15 V ↔ 0 V Inductive Load (Note 1)	—	1.0	2.0	μs	
	t _{c (on)}		—	0.6	1.2		
	t _{rr}		—	0.3	0.6		
	t _{off}		—	2.0	3.0		
	t _{c (off)}		—	0.4	0.8		

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-Off Current	ICEX	V _{CE} = 1200 V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	10	
Collector-Emitter Saturation Voltage	V _{CE (sat)}	V _D = 15 V, I _C = 25 A, V _{IN} = 15 V → 0 V	T _j = 25°C	—	2.2	2.6	V
			T _j = 125°C	—	—	3.0	
Reverse Current	I _R	V _R = 1200 V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	10	
Forward Voltage	V _F	I _F = 25 A	—	1.7	2.5	V	
Switching Time	t _{on}	V _{CC} = 600 V, I _C = 25 A V _D = 15 V, V _{IN} = 15 V ↔ 0 V Inductive Load (Note 1)	—	1.0	2.0	μs	
	t _{c (on)}		—	0.6	1.2		
	t _{rr}		—	0.5	1.0		
	t _{off}		—	2.0	3.0		
	t _{c (off)}		—	0.3	0.8		

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	V _D = 15 V	—	8	12	mA
	Low Side			42	60	
Input On Signal Voltage	V _{IN (on)}	—	1.4	1.6	1.8	V
Input Off Signal Voltage	V _{IN (off)}	—	2.2	2.5	2.8	V
Fault Output Current	Protection	V _D = 15 V	8	10	12	mA
	Normal			—	0.1	
Over Current Protection Trip Level	Inverter	V _D = 15 V, T _j ≤ 125°C	80	—	—	A
	Brake			40	—	
Short Circuit Protection Trip Level	Inverter	V _D = 15 V, T _j ≤ 125°C	100	—	—	A
	Brake			50	—	
Over Current Cut-Off Time	t _{off (OC)}	V _D = 15 V	—	5	—	μs
Over Temperature Protection	Trip Level	Case Temperature	110	118	125	°C
	Reset Level			—	98	
Control Supply Under Voltage Protection	Trip Level	—	11.0	12.0	12.5	V
	Reset Level			12.0	12.5	
Fault Output Pulse Width	t _{FO}	V _D = 15 V	1	2	3	ms

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT Stage	—	—	0.36	$^\circ\text{C/W}$
		Inverter FRD Stage	—	—	0.84	
		Brake IGBT Stage	—	—	0.6	
		Brake FRD Stage	—	—	1.5	

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

