

TOSHIBA Intelligent Power Module Silicon N Channel IGBT

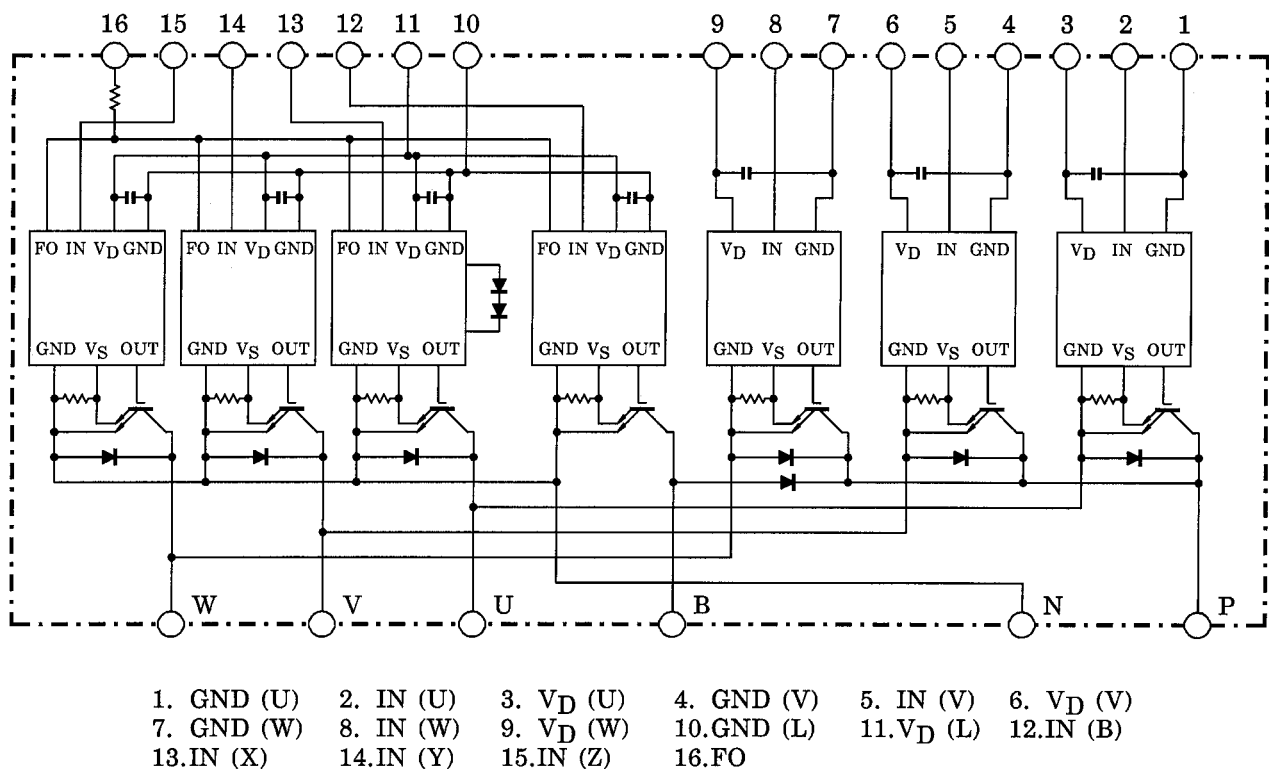
MIG75J201H

High Power Switching Applications

Motor Control Applications

- Integrates inverter, brake power circuits & control circuits (IGBT drive units, protection units for over-current, under-voltage & over-temperature) in one package.
- The electrodes are isolated from case.
- High speed type IGBT : $V_{CE(sat)} = 2.5 \text{ V (Max)}$
 $t_{off} = 3.0 \mu\text{s (Max)}$
 $t_{rr} = 0.30 \mu\text{s (Max)}$
- Package dimensions : TOSHIBA 2-110A1A
- Weight : 520 g

Equivalent Circuit



Maximum Ratings ($T_j = 25^\circ\text{C}$)

Stage	Characteristic	Condition	Symbol	Ratings	Unit
Inverter	Supply voltage	P-N power terminal	V_{CC}	450	V
	Collector-emitter voltage	—	V_{CES}	600	V
	Collector current	$T_c = 25^\circ\text{C}$, DC	I_C	75	A
	Forward current	$T_c = 25^\circ\text{C}$, DC	I_F	75	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	P_C	195	W
	Junction temperature	—	T_j	150	$^\circ\text{C}$
Brake	Supply voltage	P-N power terminal	V_{CC}	450	V
	Collector-emitter voltage	—	V_{CES}	600	V
	Collector current	$T_c = 25^\circ\text{C}$, DC	I_C	30	A
	Reverse voltage	—	V_R	600	V
	Forward current	$T_c = 25^\circ\text{C}$, DC	I_F	30	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	P_C	80	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 (L) 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 ($T_j = 25^\circ\text{C}$)

a. Inverter Stage

Characteristic	Symbol	Test Condition		Min	Typ.	Max	Unit
Collector cut-off current	I_{CEX}	$V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	20	
Collector-emitter saturation voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 75\text{A}$ $V_{IN} = 15\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	—	2.0	—	
Forward voltage	V_F	$I_F = 75\text{A}$		—	2.1	3.0	V
Switching time	t_{on}	$V_{CC} = 300\text{V}$, $I_C = 75\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)		—	1.0	2.0	μs
	t_{off}			—	1.2	3.0	
	t_f			—	0.2	0.5	
	t_{rr}			—	0.1	0.3	

b. Brake Stage

Characteristic	Symbol	Test Condition		Min	Typ.	Max	Unit
Collector cut-off current	I _{CEX}	V _{CE} = 600V	T _J = 25°C	—	—	1	mA
			T _J = 125°C	—	—	20	
Collector-emitter saturation voltage	V _{CE} (sat)	V _D = 15 V, I _C = 30 A V _{IN} = 15 V → 0 V	T _J = 25°C	—	1.7	2.7	V
			T _J = 125°C	—	1.6	—	
Reverse current	I _R	V _R = 600 V	T _J = 25°C	—	—	1	mA
			T _J = 125°C	—	—	20	
Forward voltage	V _F	I _F = 30A		—	2.0	2.5	V
Switching time	t _{on}	V _{CC} = 300 V, I _C = 30 A V _D = 15 V, V _{IN} = 15 V ↔ 0 V Inductive load (Note 1)		—	0.9	2.0	μs
	t _{off}			—	1.7	3.0	
	t _f			—	0.25	0.5	
	t _{rr}			—	0.15	0.3	

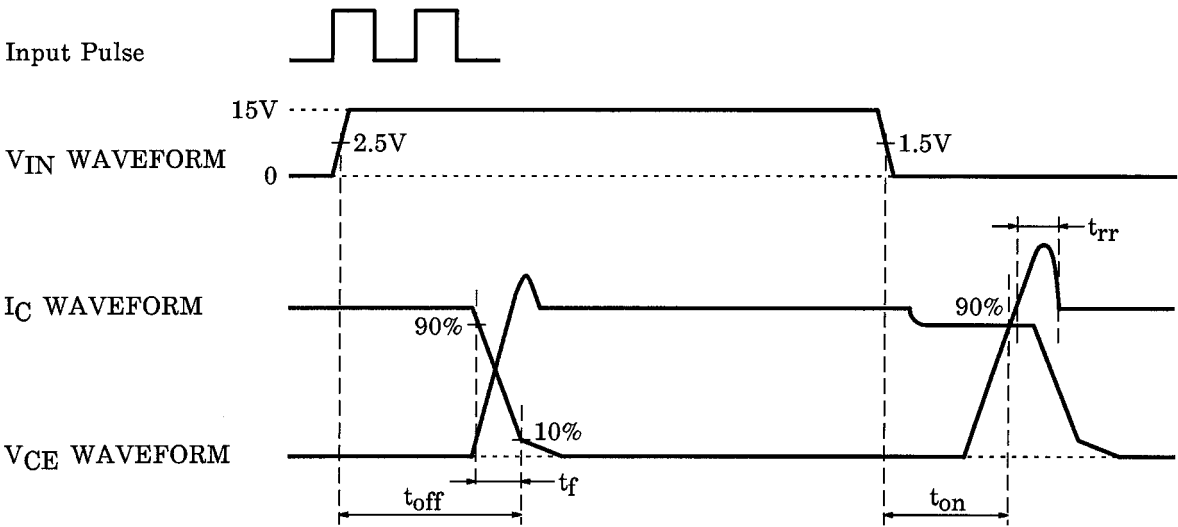
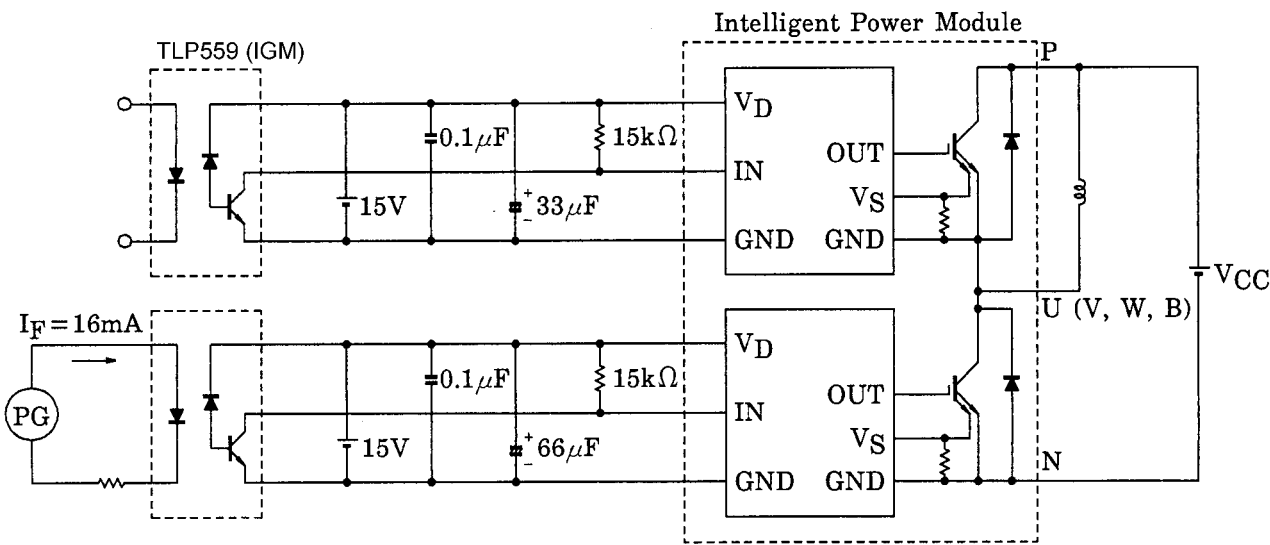
c. Control Stage ($T_J = 25^{\circ}C$)

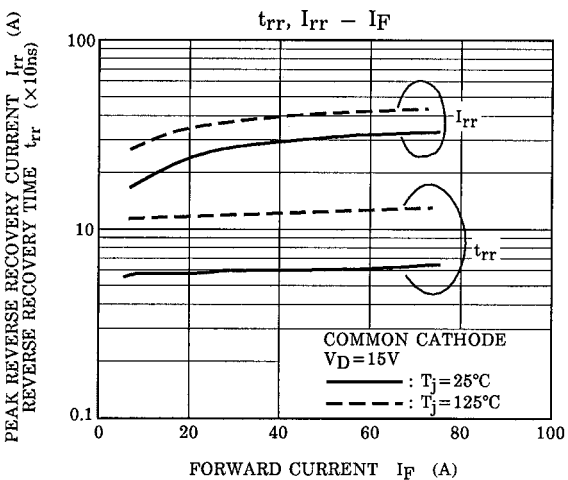
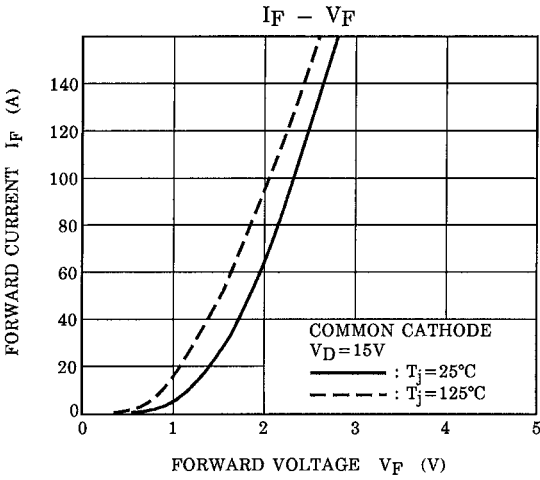
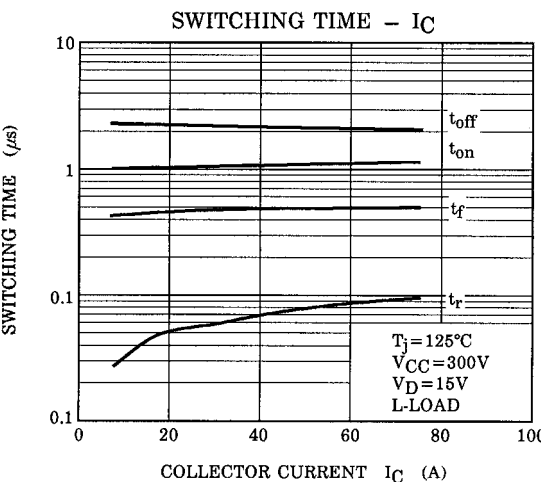
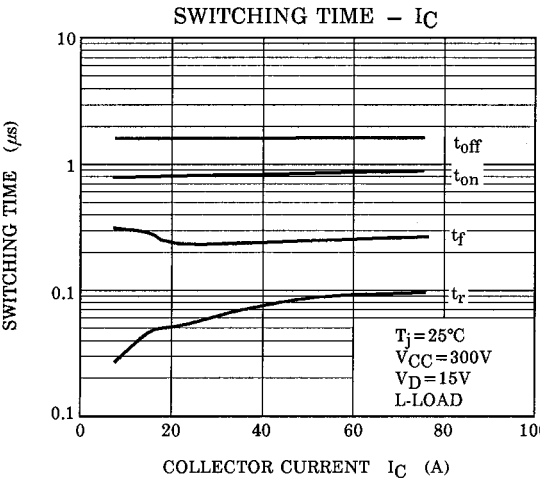
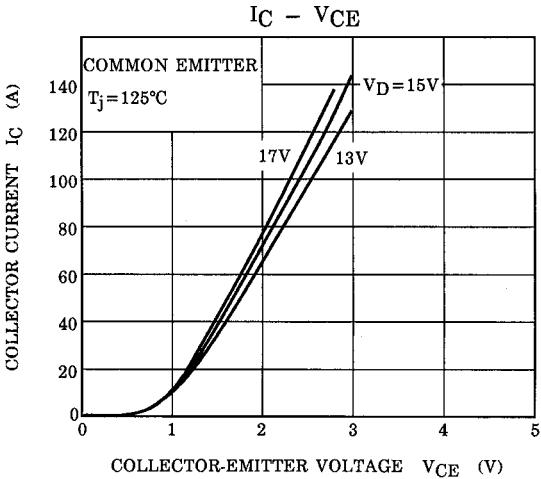
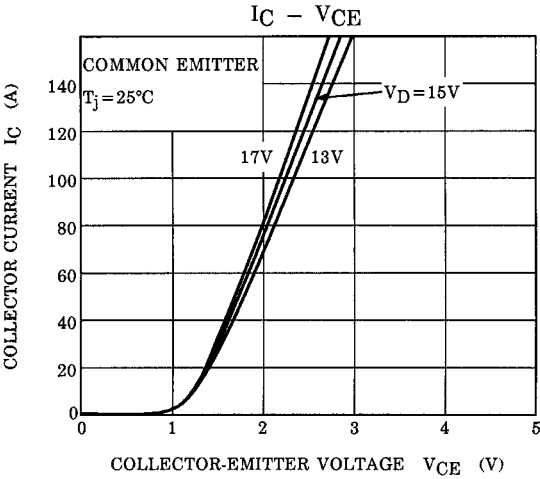
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current	High side $I_D(H)$	$V_D = 15V$	—	8	—	mA
	Low side $I_D(L)$		—	32	—	
Input-on signal voltage	$V_{IN(on)}$	$V_D = 15V, I_C = 75mA$	1.3	1.5	1.7	V
Input-off signal voltage	$V_{IN(off)}$	$V_D = 15V, I_C = 75mA$	2.2	2.5	2.8	V
Fault output current	Protection $I_{FO(on)}$	$V_D = 15V$	8	10	12	mA
	Normal $I_{FO(off)}$		—	—	1	
Over current protection trip level	Inverter OC	$V_D = 15V, T_J = 125^{\circ}C$	105	150	—	A
	Brake		40	—	—	
Short circuit protection trip level	Inverter SC	$V_D = 15V, T_J = 125^{\circ}C$	157	225	—	A
	Brake		60	—	—	
Over current cut-off time	$t_{off(OC)}$	$V_D = 15V$	—	5	—	μs
Over temperature protection	Trip level OT	Case temperature	110	118	125	$^{\circ}C$
	Reset level OTr		—	98	—	
Control supply under voltage protection	Trip level UV	—	11.0	12.0	12.5	V
	Reset level UVr		—	12.5	—	
Fault output pulse width	t_{FO}	$V_D = 15V$	1	2	3	ms

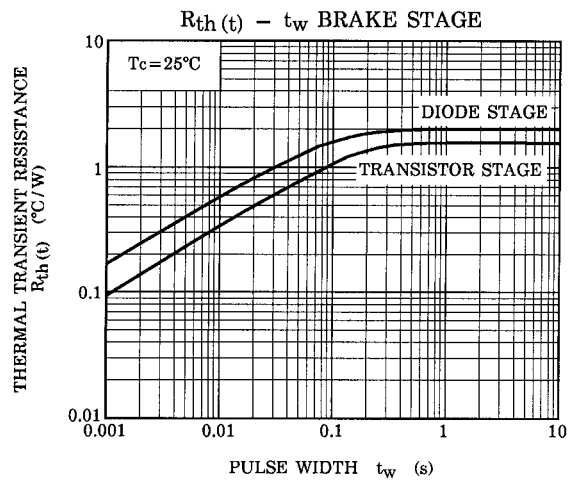
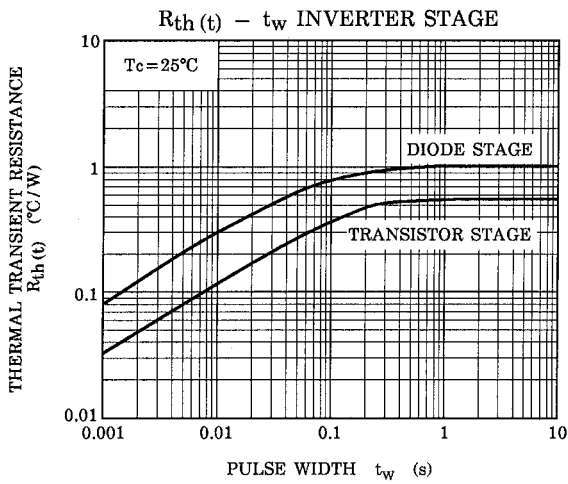
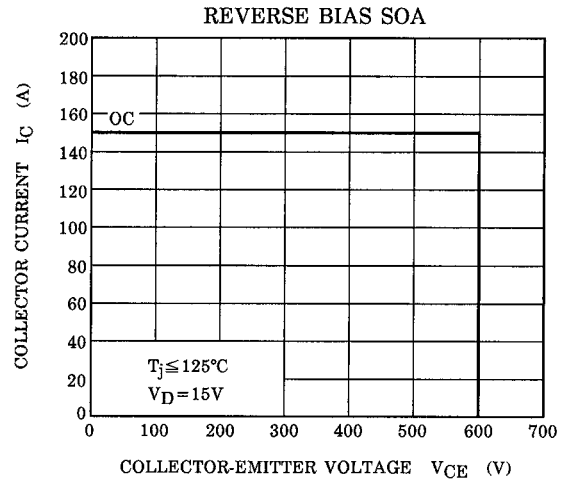
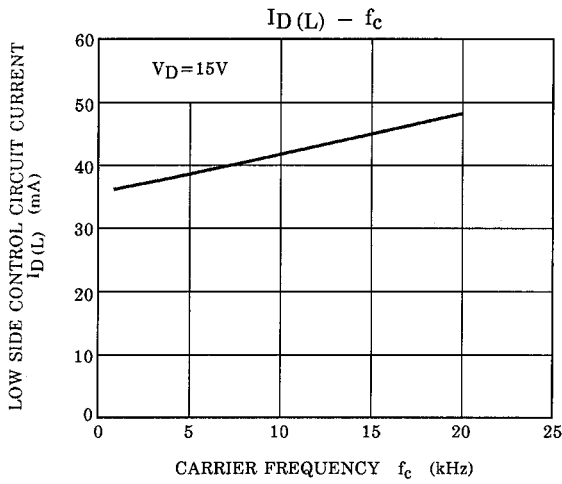
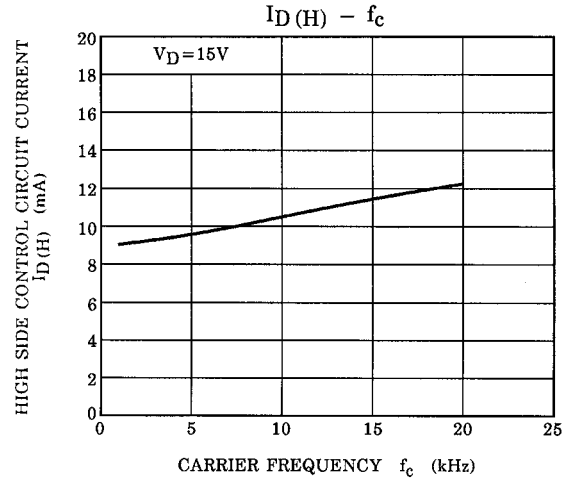
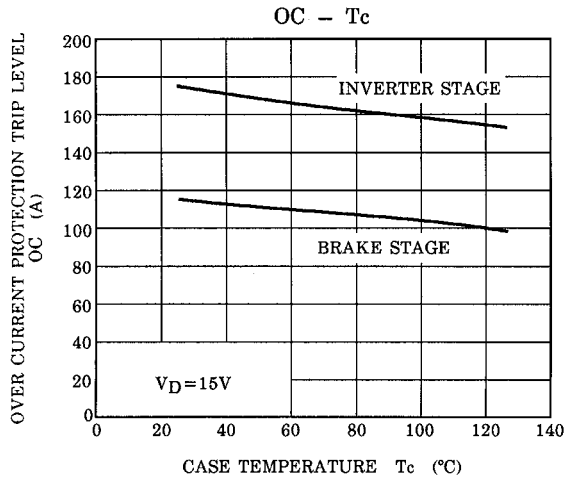
d. Thermal Resistance (T_j = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	R _{th (j-c)}	Inverter IGBT stage	—	—	0.553	°C / W
		Inverter FRD stage	—	—	1.000	
		Brake IGBT stage	—	—	1.562	
		Brake FRD stage	—	—	2.000	
Case to fin thermal resistance	R _{th (c-f)}	Compound is applied	—	0.05	—	°C / W

Note 1: Switching time test circuit & timing chart







Unit: mm



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