

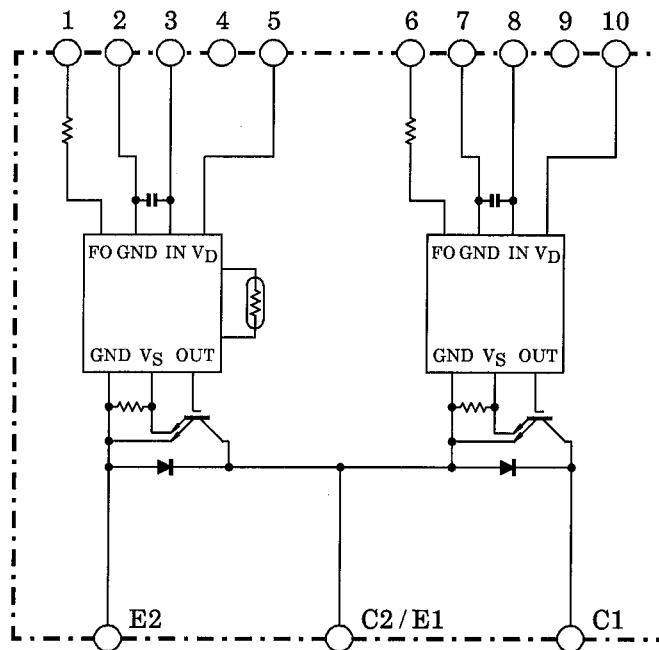
TOSHIBA Intelligent Power Module Silicon N Channel IGBT

MIG300J101H

High Power Switching Applications
 Motor Control Applications

- Integrates inverter 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 : $V_{CE(sat)} = 2.5V$ (max)
 $t_{off} = 2.6\mu s$ (max)
 $t_{rr} = 0.15\mu s$ (max)
- Package dimensions : TOSHIBA 2-121A1A
- Weight : 520g

Equivalent Circuit



- | | | | | |
|-----------|------------|-----------|---------|---------------|
| 1. FO (L) | 2. GND (L) | 3. IN (L) | 4. Open | 5. V_D (L) |
| 6. FO (H) | 7. GND (H) | 8. IN (H) | 9. Open | 10. V_D (H) |

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	300	A
	Forward current	$T_c = 25^\circ\text{C}$, DC	I_F	300	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	P_C	1200	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~+100	$^\circ\text{C}$
	Storage temperature range	—	T_{stg}	-40~+125	$^\circ\text{C}$
	Isolation voltage	AC 1 minute,	V_{ISO}	2500	V
	Screw torque	M6	—	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}	$V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	—	2	mA
			$T_j = 125^\circ\text{C}$	—	—	40	
Collector-emitter saturation voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 300\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	—	2.0	—	
Forward voltage	V_F	$I_F = 300\text{A}$	—	2.1	2.7	V	
Switching time	t_{on}	$V_{CC} = 300\text{V}$, $I_C = 300\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)	1.1	1.8	2.5	μs	
	$t_c(\text{on})$		—	0.8	1.2		
	t_{rr}		—	0.08	0.15		
	t_{off}		—	1.9	2.6		
	$t_c(\text{off})$		—	0.3	0.6		

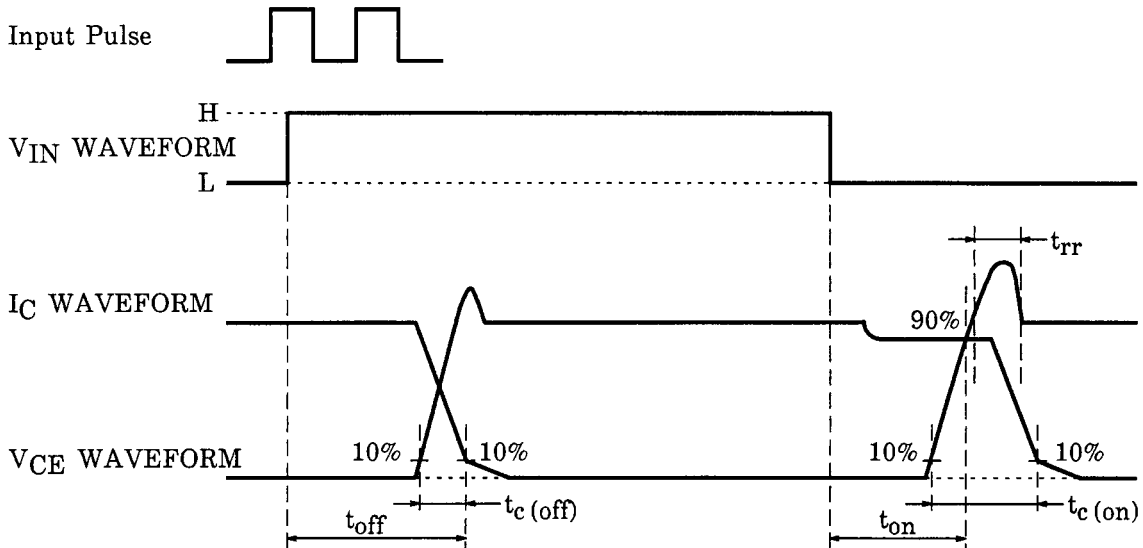
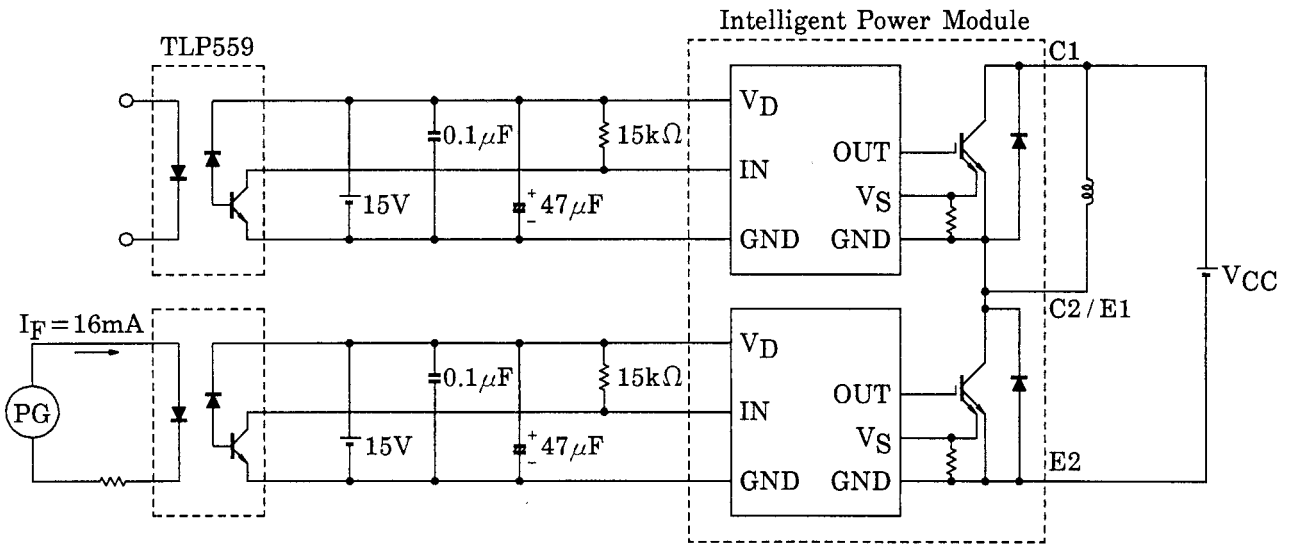
b. Control Stage

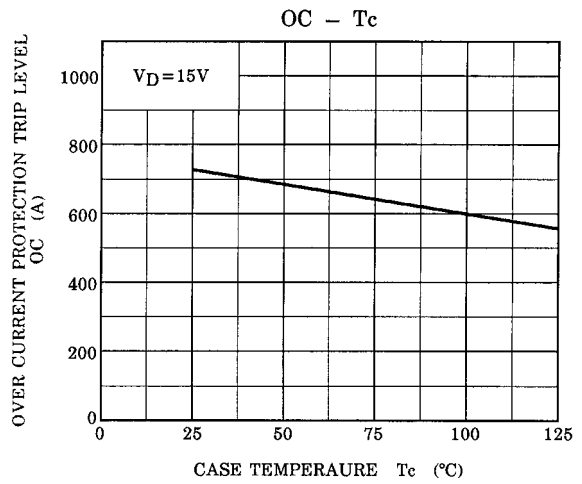
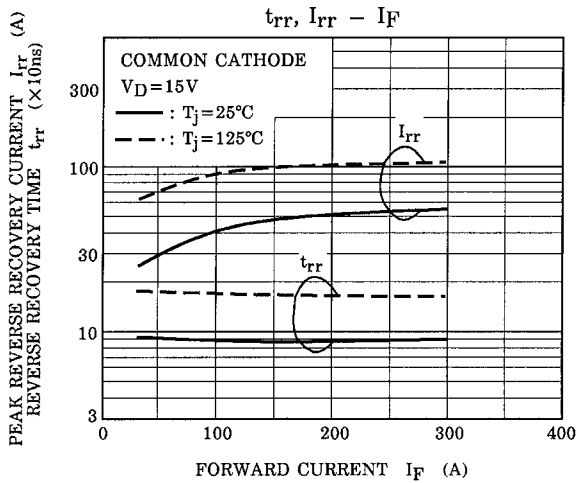
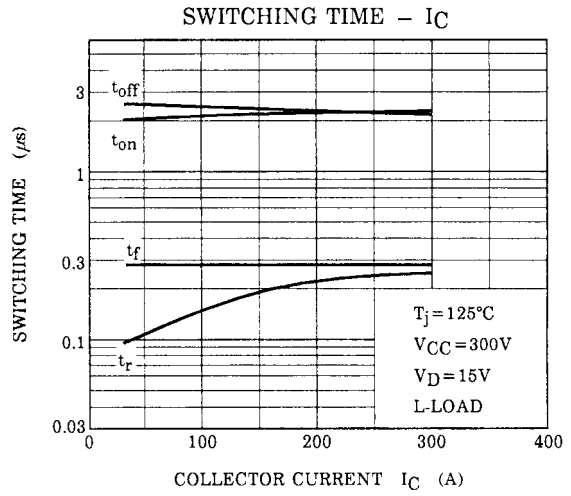
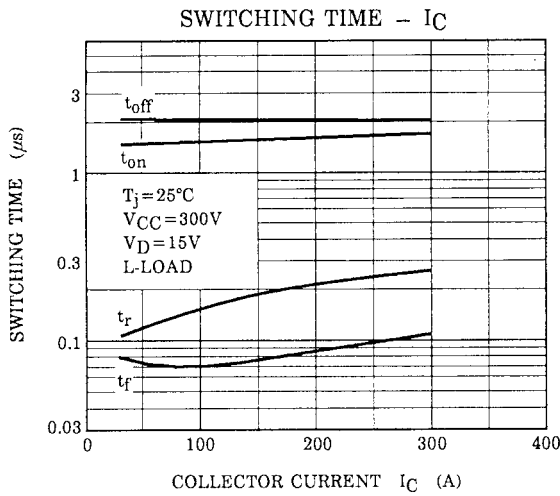
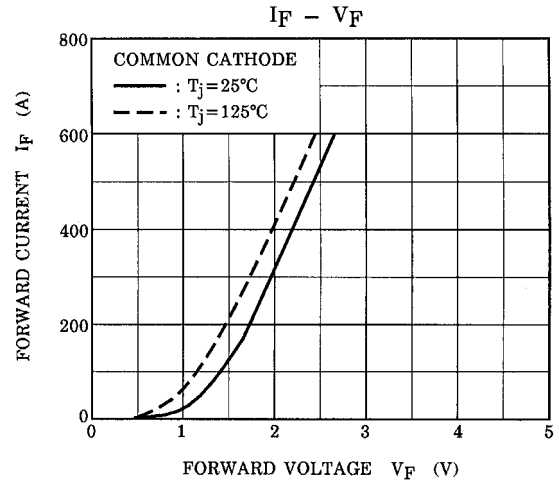
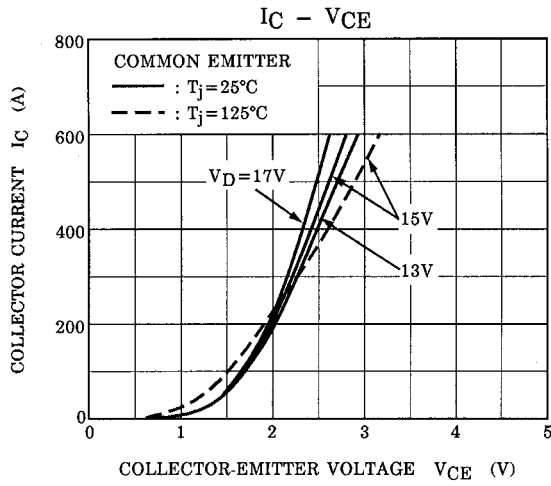
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current		I_D	$V_D = 15V$	—	20	30	mA
Input on signal voltage		$V_{IN (on)}$	$V_D = 15V, I_C = 300mA$	0.9	1.1	1.3	V
Fault output current	Protection	$I_{FO (on)}$	$V_D = 15V$	8	10	12	mA
	Normal	$I_{FO (off)}$		—	—	1	
Over current protection trip level		OC	$V_D = 15V, T_j = 125^\circ C$	420	540	—	A
Short circuit protection trip level		SC	$V_D = 15V, T_j = 125^\circ C$	630	810	—	A
Over current cut-off time		$t_{off (OC)}$	$V_D = 15V$	—	10	—	μs
Over temperature protection	Trip level	OT	Case temperature	111	118	125	$^\circ C$
	Reset level	OTr		93	100	107	
Control supply under voltage protection	Trip level	UV	—	11.3	12.0	12.7	V
	Reset level	UVr		11.8	12.5	13.2	
Fault output pulse width		t_{FO}	$V_D = 15V$	1	2	3	ms

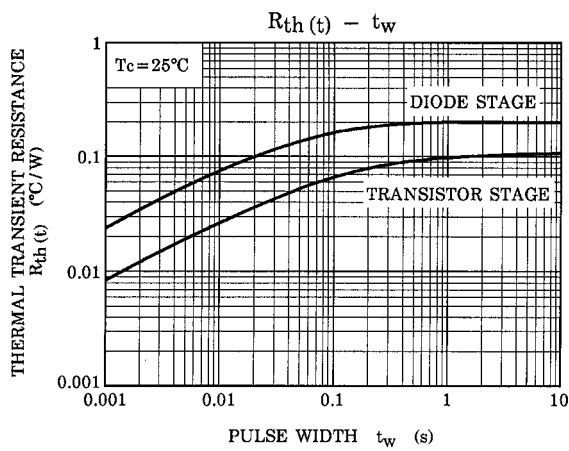
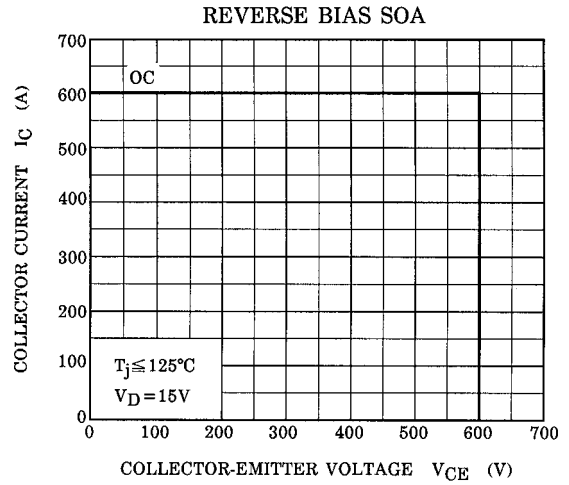
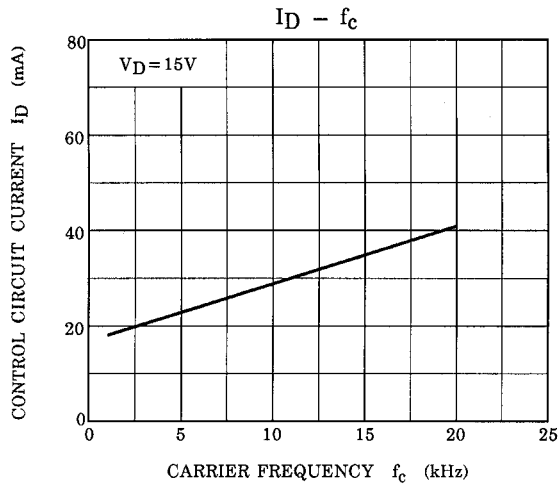
c. Thermal Resistance ($T_j = 25^\circ C$)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	$R_{th (j-c)}$	IGBT	—	—	0.104	$^\circ C / W$
		FRD	—	—	0.208	
Case to fin thermal resistance	$R_{th (c-f)}$	Compound is applied	—	0.05	—	$^\circ C / W$

Note 1: Switching time test circuit & timing chart







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