M61558FP

PRELIMINARY

Notice ; This is not a final specification.
Some parametric limits are subject to change.

DIGITAL POWER AMPLIFIER

DESCRIPTION

The M61558FP is a 30Wx1ch Audio Power Driver.
This device consists of pre-driver block and power Nch MOS-FETs, a 30W Digital Amplifier can be realized.

FEATURES

- Built-in Power Nch-MOS FETs.
- High Speed Switching
- Built-in Bootstrap Diode
- Built-in Protection Circuits
  - VDD Low voltage protection
  - Over temperature protection
  - Over current protection

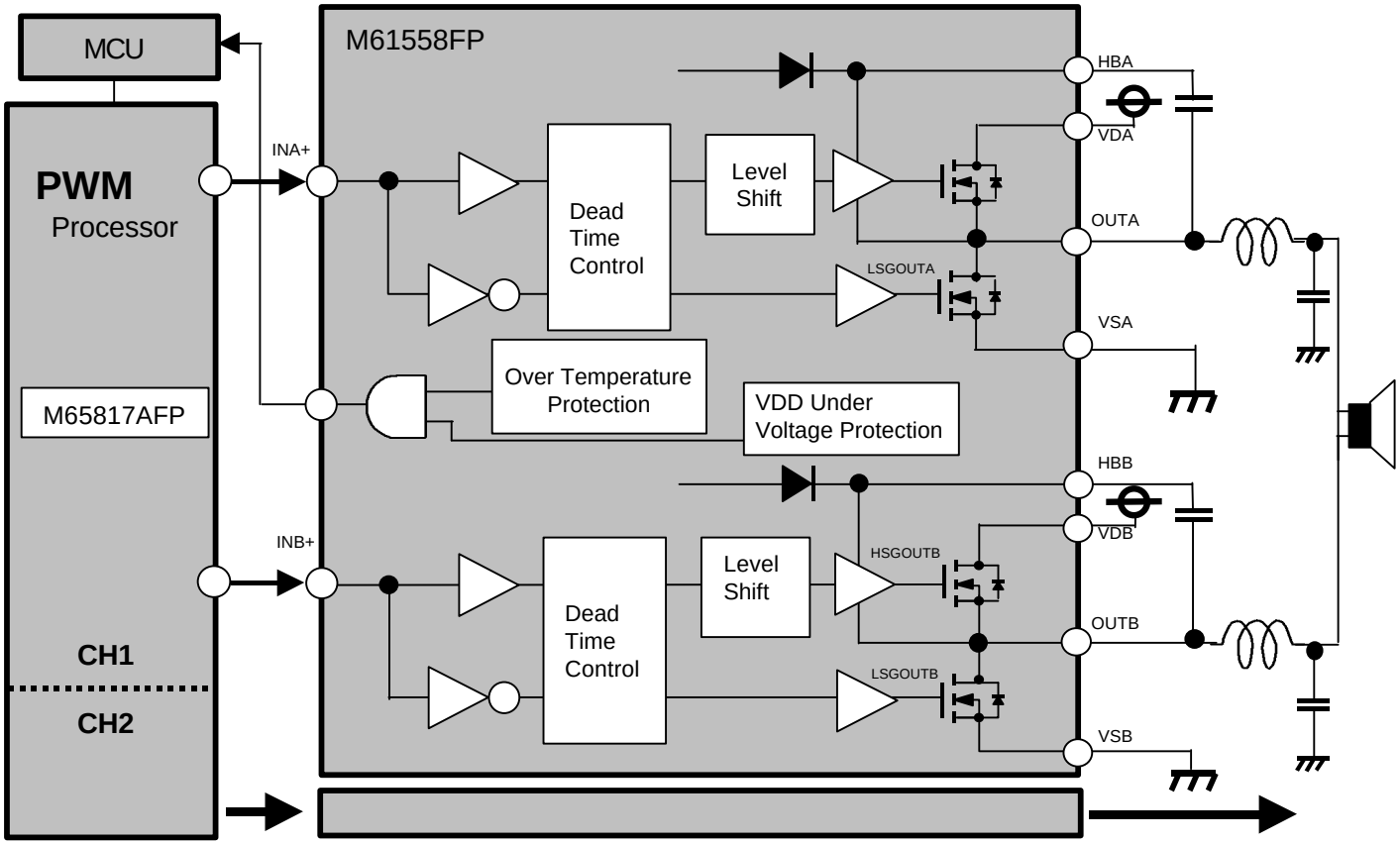
APPLICATION

- TV, VTR

RECOMMENDED OPERATING CONDITIONS

- VDD (Pre-driver block) : 12V typ VD (Power Tr block) : 21V typ,24V max

SYSTEM BLOCK DIAGRAM



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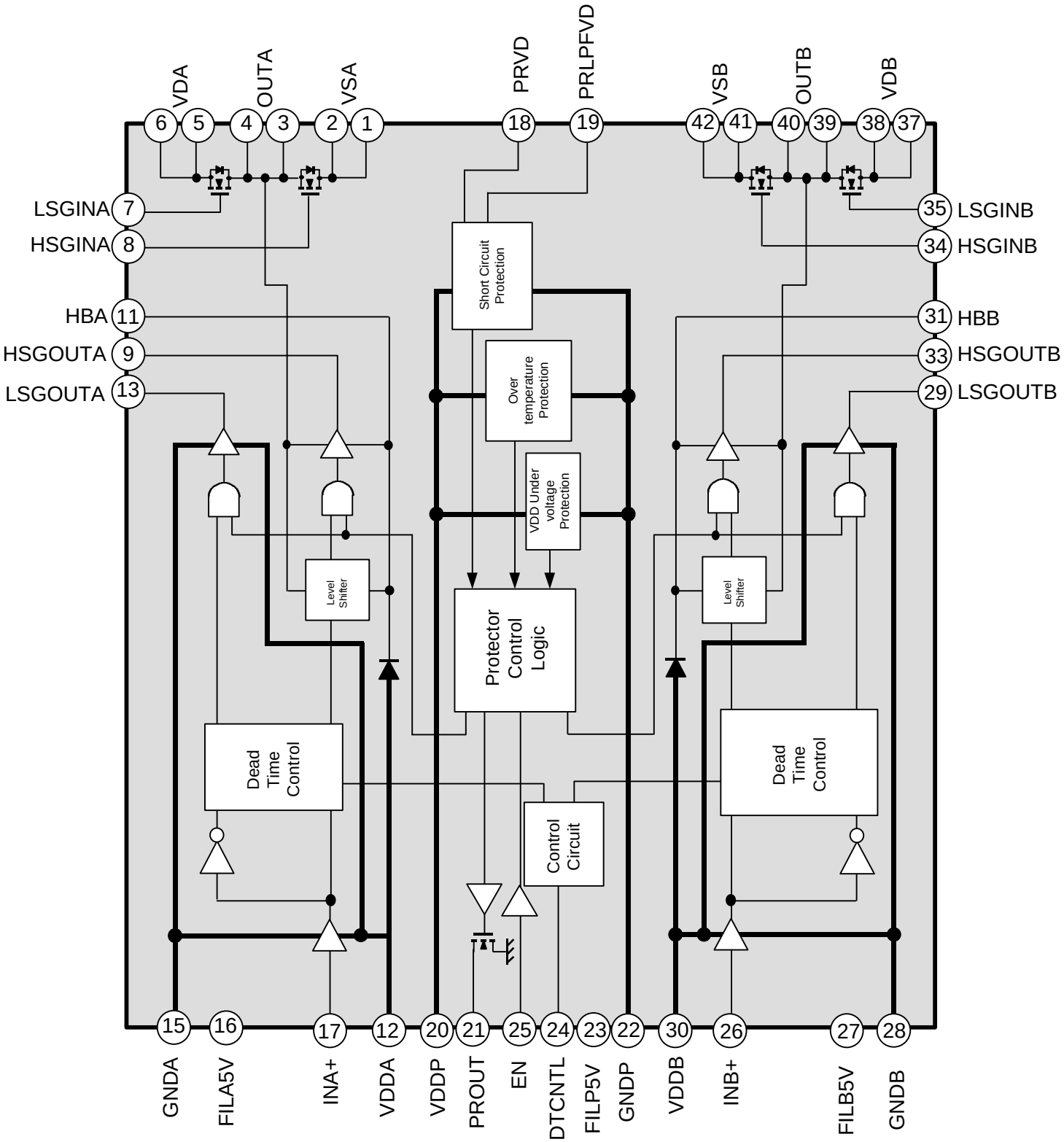
BLOCK DIAGRAM



TERMINAL FUNCTIONS

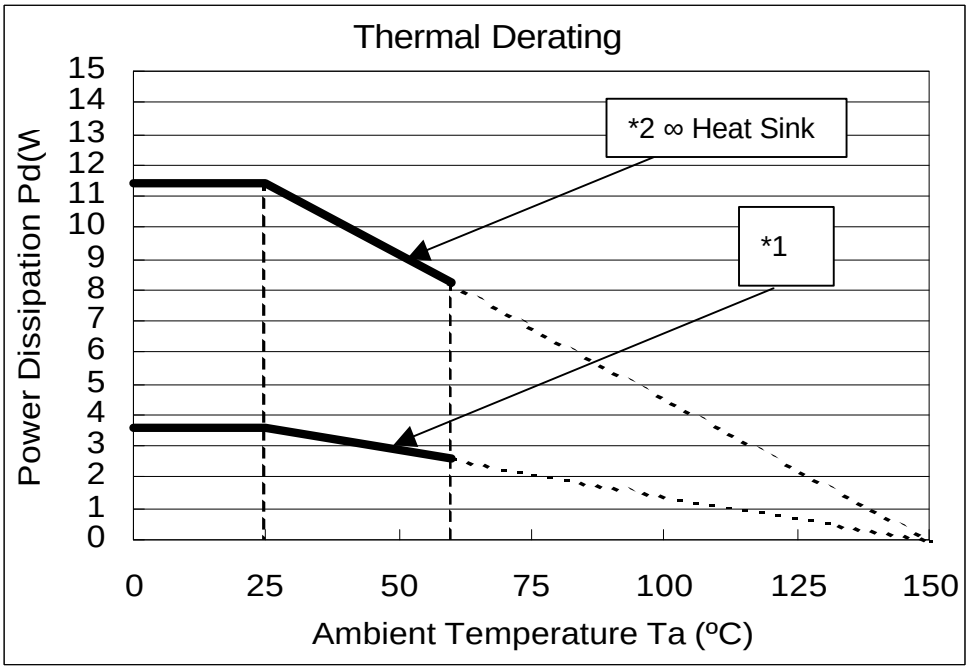
	Terminal No.	Terminal Name	Description
A Block Power part	1,2	VSA	A block ground of output Tr.
	3,4	OUTA	A block H-bridge output
	5,6	VDA	A block power
	7	LSGINA	A block L side input of output Tr.
	8	HSGINA	A block H side input of output Tr.
A block pre-driver part	9	HSGOUTA	A block H side pre-driver output
	10	SUB (GND)	Connected to GND for heat sink
	11	HBA	A block H side Bootstrap capacitor pin
	12	VDDA	A block power supply for heat sink
	13	LSGOUTA	A block L side pre-driver output
	14	SUB (GND)	Connected to GND for heat sink
	15	GNDA	A block ground for pre-driver A
	16	FILA5V	A block filter pin for internal driver A
	17	NA+	A block PWM + input pin
A/B Protector part	18	PRVD	Power supply for short circuit protection
	19	PRLPFVD	Filter pin for short circuit protection
	20	VDDP	Power supply for protector part
	21	PROUT	In case protector mode,output level is "L" (Open drain)
	22	GNDA	Ground for protctor part
	23	FILP5V	Protector part filter pin for internal 5V
	24	DTCNTL	Resister pin for dead time control
	25	EN	Enable pin for protector part
B block pre-driver part	26	NB+	B block PWM + input pin
	27	FILB5V	B block filter pin for internal 5V
	28	GNDB	B block ground for pre-driver A
	29	LSGOUTB	B block L side pre-driver output
	30	VDDB	B block power supply for pre-driver
	31	HBB	B block H side Bootstrap capacitor pin
	32	SUB (GND)	Connected to GND for heat sink
	33	HSGOUTB	B block H side pre-driver output
B block Power part	34	LSGINB	B block H side input of output Tr.
	35	LSGINB	B block L side input of output Tr.
	36	SUB (GND)	Connected to GND for heat sink
	37,38	VDB	B block H-bridge output Tr.
	39,40	OUTB	B block H-bridge output
	41,42	VSB	B block ground of output Tr.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
HBA•HBB	HBA•HBB Maximum voltage	HBA•HBB pin Voltage	36	V
VDA•VDB	VDA•VDB Maximum voltage	VDA•VDB pin Voltage	25	V
VDD	Maximum voltage	VDD pin Voltage	16	V
Vin	Input voltage range		from -0.3 to 5.5	V
Pd	Power dissipation	Ta=25ºC(*1)	28.8	mW / ºC
Kθ	Thermal de-rating	(*1)	3.6	W
Tj	Junction temperature		150	ºC
Ta	Oparating temperature		from -20 to +60	ºC
Tstg	Storage temperature		from -40 to +125	ºC

*1. Regarding to the pattern example,please refer to the page 11

*2. Max.Pd=11.4W at Ta=25ºC with ∞ heat sink



RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Limits			Unit
			MIN	TYP	MAX	
VDA / VDB	VDA • VDB voltage	VDA(pin 1,2), VDB(pin 41, 42)	–	21	24	V
VDD	Pre-driver / Protector Voltage	VDDA(pin12), VDDB,(pin 30), VDDP(pin 20)	10.8	12.0	13.2	V
VH	Input Voltage "H" level	INA + (pin 17), INB+(pin 62)	4.2	–	5.3	V
VL	Input Voltage "L" level		-0.3	–	1	V

ELECTRICAL CHARACTERISTICS

(Unless otherwise noted, Ta=25ºC,VDDP,VDDA•B=12V,VDA•B=21V)

Symbol	Parameter	Conditions	Limits			Unit
			MIN	TYP	MAX	
Circuit current						
IDD(A,B)	VDD Circuit current	No signal	–	5	–	mA
IDDF(A,B)		f=768kHz,Duty=50%	–	25	–	mA
IDDP		No signal	–	5	–	mA
Input voltage						
VIH	Input Voltage ”H” level		2.3	–	–	V
VIL	Input Voltage ”L” level		–	–	1	V
ILeak	Leak current	VIH=4V,VIL=1.0V	-10	–	10	µA
Under voltage protection						
VDDR	VDD detection level		–	7	–	V
VDDH	VDD hysteresis	Detection→Normal mode	–	0.5	–	V
Bootstrap diode						
VFL	Forward voltage 1	I HB =100µA	–	0.75	–	V
VFH	Forward voltage 2	I HB = 100mA	–	1	–	V
RDON	Dynamic resistance	I HB = 100mA	–	0.7	–	Ω
L side gate driver						
VOL	L level output voltage	ILO=100mA	–	0.5	–	V
VOH	H level output voltage	ILO=-100mA	–	0.75	–	V
			–		–	
H side gate driver						
VOL	L level output voltage	ILO=100mA	–	0.5	–	V
VOH	H level output voltage	ILO=-100mA	–	0.75	–	V
			–		–	
Output Tr.						
BV_{ds}	Breakdown Voltage	Ileak=1mA	30	–	–	V
rDS(ON)	ON resister(Drain-Source	Id=100mA	–	0.2	–	Ω
Input / output timing						
1 / tpf	Reference frequency	Bootstrap C=0.022µF	–	768	–	kHz
tpw	Minimum pulse width	f=768kHz	40	–	–	ns
Dead time setting						
VDTC	Voltage pin24	Connected resister=6kW	–	1.35	–	V

AC SIGNAL CHARACTERISTICS BY USING THE EVALUATION BOARD (with 20kHz pre-LPF)

(Conditions : Ta=25ºC,VDDP,VDDA•B=12V,VDA•B=21V)

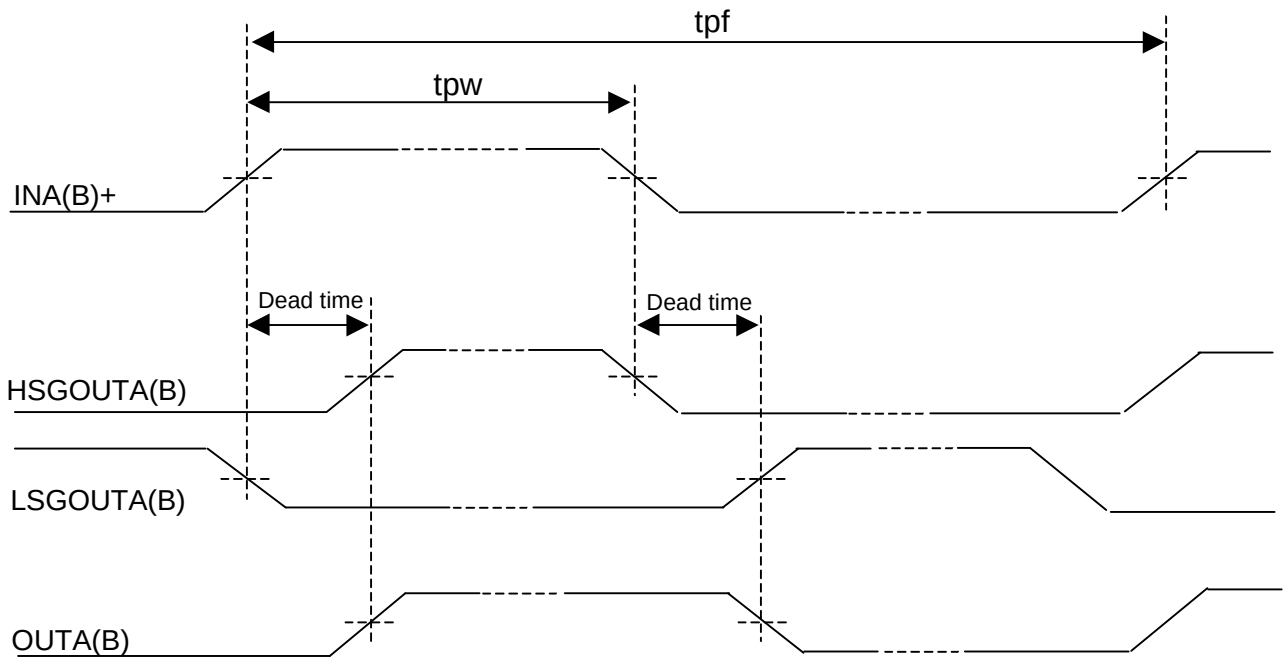
Symbol	Paramerter	Input signal	Conditions	Limit			UNIT
				MIN	TYP	MAX	
Po1	Output Power	Sin.1kHz FS	THD+N=1%, RL=6Ω, VDA • VDB=24V LPF=20kHz , HPF=400Hz	–	30	–	W
Po2	Output Power	Sin.1kHz FS	THD+N=10%,RL=8Ω VDA • VDB=24V LPF=20kHz , HPF=400Hz	–	30	–	W
THD	Total harmonic distortion	Sin.1kHz FS	Po=3.46W, RL=4Ω, LPF=20kHz , HPF=400Hz	–	0.04	–	%
Vno	Noise	MUTE signal Input	A-Weighted filter • LPF=20kHz	–	150	–	µV
Eff	Effciency	Sin.1kHz FS	THD+N=1%, RL=4Ω, Po=30W	–	85	–	%

(note)

The M61558FP can output a 10W signal continuously without a heat sink (refer to the example at the page 11).

The M61558FP needs a heat sink for continuous over-10W output.

INPUT/OUTPUT TIMING



DEAD TIME CONTROL

To prevent pass-through current, M61558FP has a dead time control circuit.

The dead time is set by an external resistor (between pin24 and GND).

PROTECTION CIRCUIT

<1. VDD Low voltage protection>

VDD Low voltage protection is built-in to prevent abnormal function when VDD voltage goes down. Incase of Low voltage , H-bridge outputs is set OPEN. Regarding to this Low voltage mode, PROUT (pin 21) does not indicate “L” level alarm, because M61558FP can recover by itself.

* VDD Low voltage circuit is connected to VDDP (pin 20) terminal.
Please connect VDDP (pin 20) with VDDA/VDDB (pin 12/pin 30).

<2. Over temperature protection>

Over temperature protection is built-in to prevent thermal run away.

Incase of over temperature , H-bridge outputs are set OPEN and PROUT (pin 21) indicates “L” level alarm.

<3. Over current protection>

When H-bridge outputs is connected GND, the over current protection works.

Incase of over current; H-bridge outputs is set OPEN and PROUT (pin 21)indicates “L” level alarm.

However if EN (pin 25) is set “L”, over current protection is not available.

(*) PROUT (pin 21), OUTA(pin 3/4) and OUTB(pin 39/40) conditions are shown as the table.

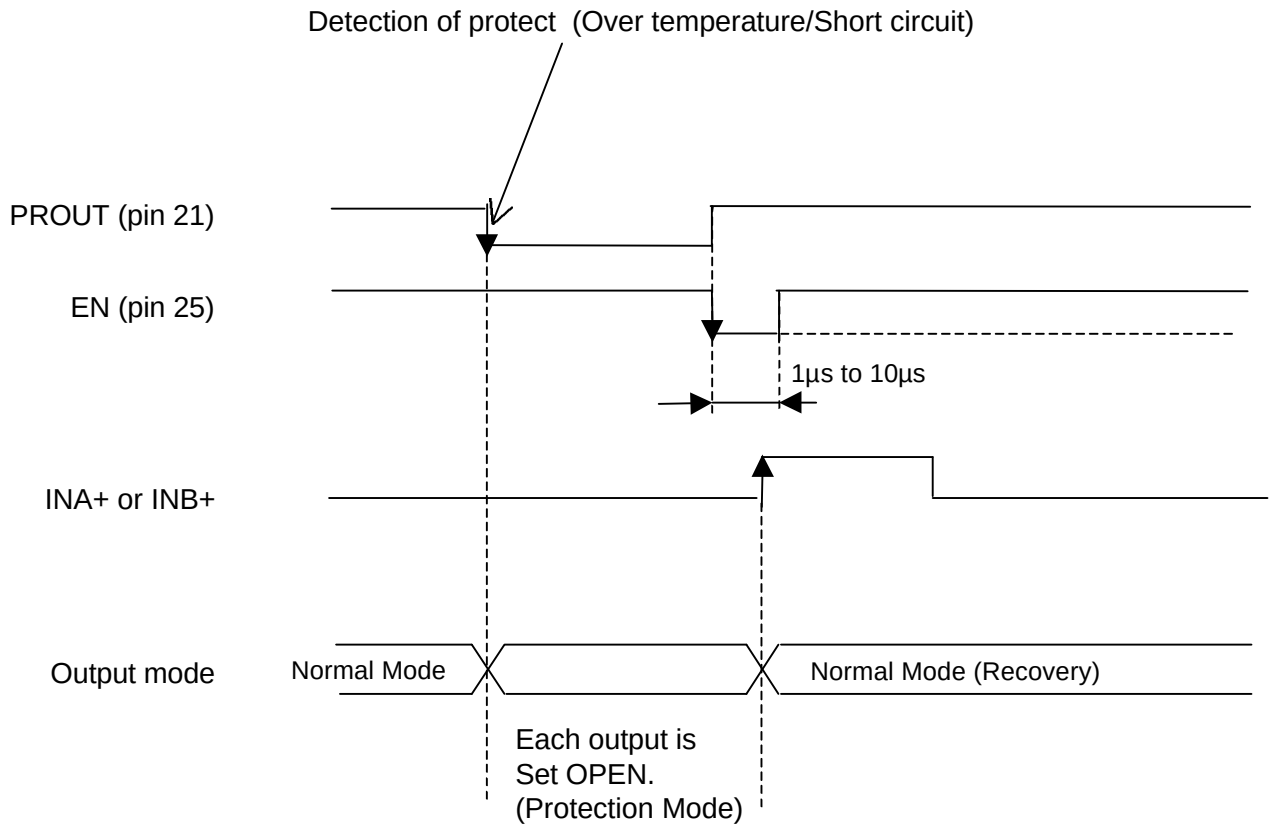
	PROUT (pin21)	OUTA (pin 3/4)	OUTA (pin 39/40)	OUTA Tr.		OUTB Tr.	
				H side	L side	H side	L side
VDD under voltage	No change	OPEN	OPEN	OFF	OFF	OFF	OFF
Over temperature & Over current	“L”						

Recovery from protection mode the recovery condition is shown as the table.

Recovery condition from protection mode

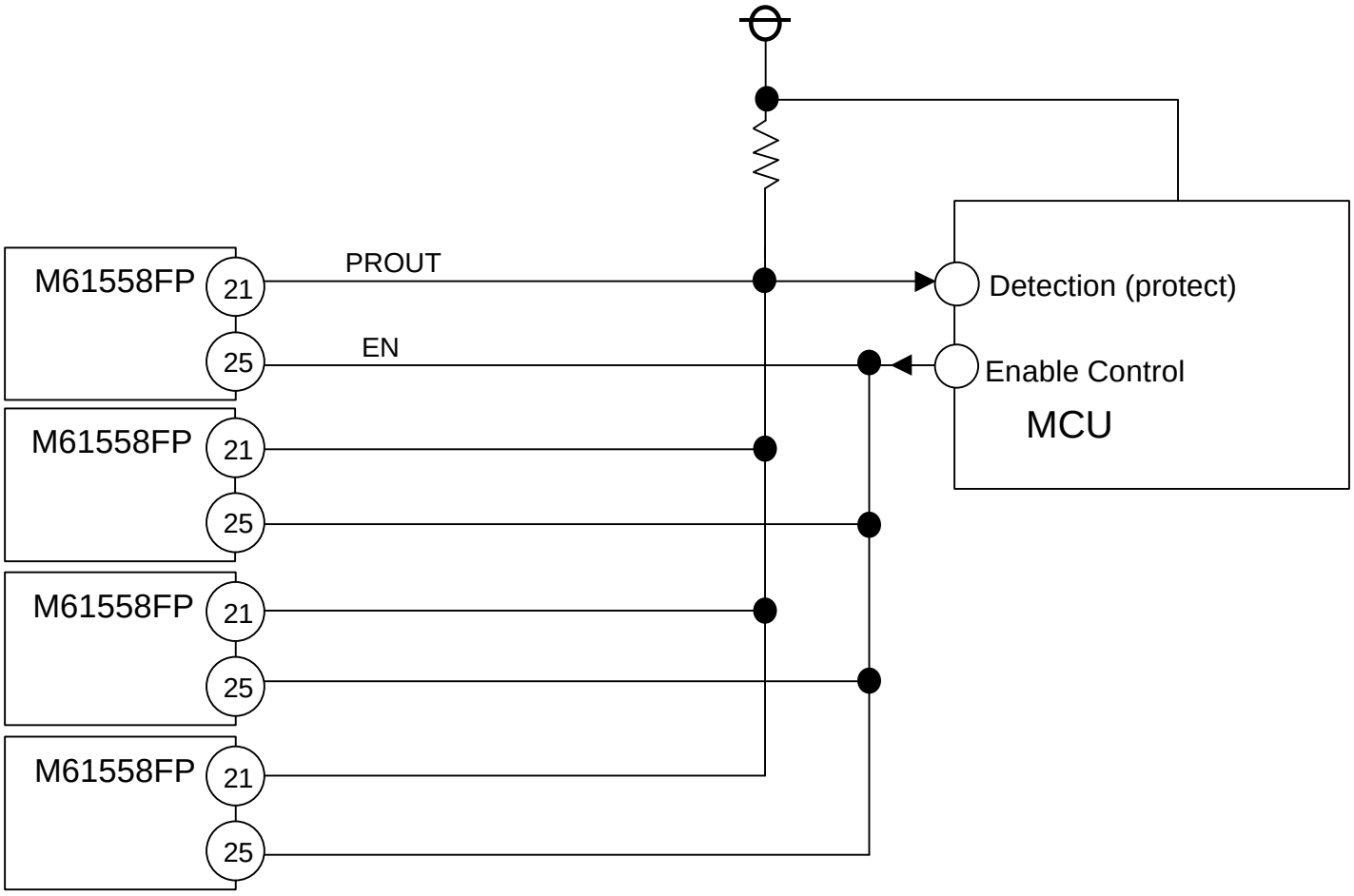
Protection	Recovery condition
VDD under voltage	• VDD voltage becomes normal • PWM input signal is given
Over temperature	• Temperature becomes normal • "L" pulse to EN (pin 25) • PWM input signal is given
Short circuit	• H-bridge output is not connected to GND • "L" pulse to EN (pin 25) • PWM input signal is given

Timing chart of PROUT (pin 21) and EN (pin 25)

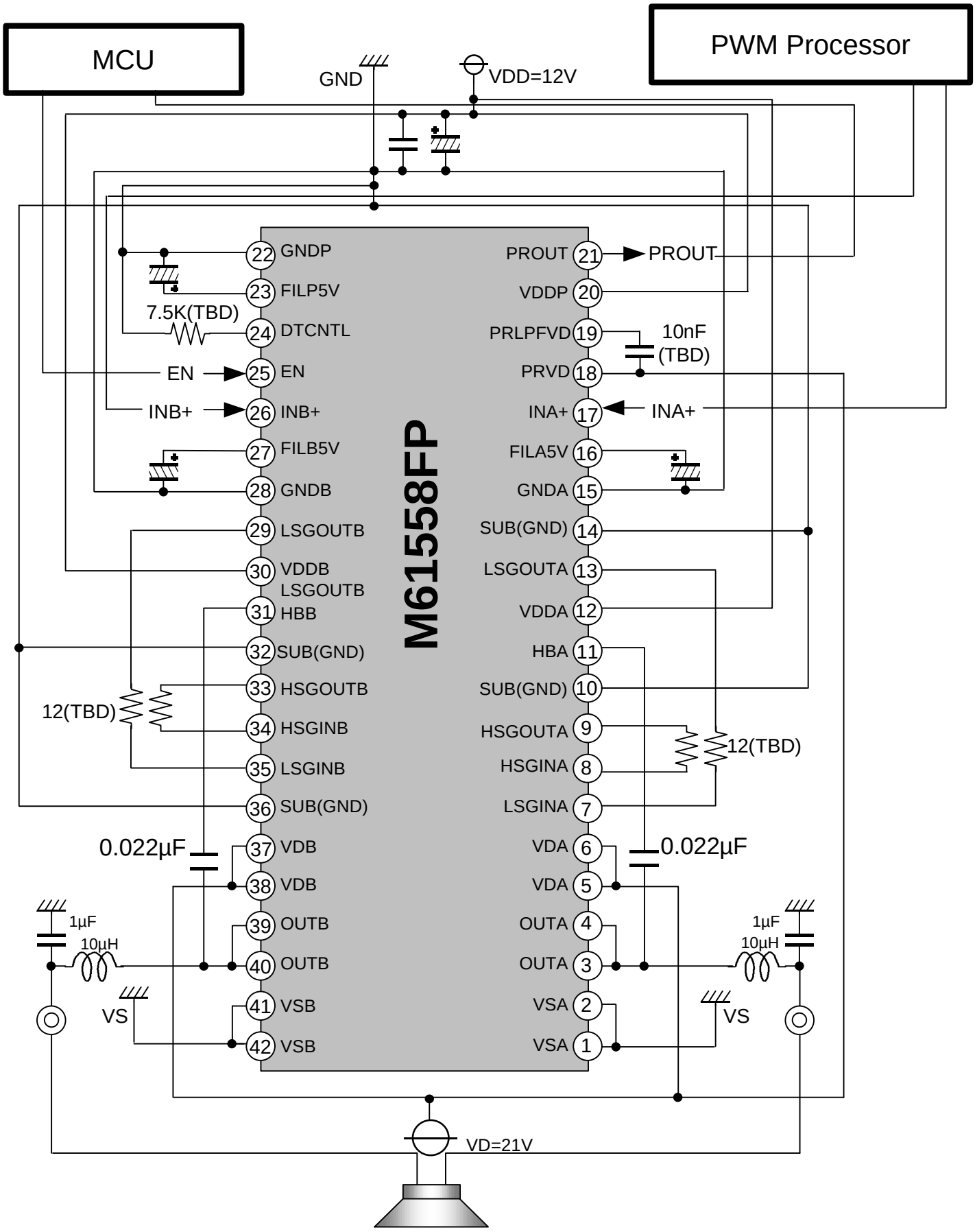


APPLICATION CIRCUIT FOR MULTI-CHANNEL USE

For multi-channel use, the application circuit is shown as below.



APPLICATION CIRCUIT

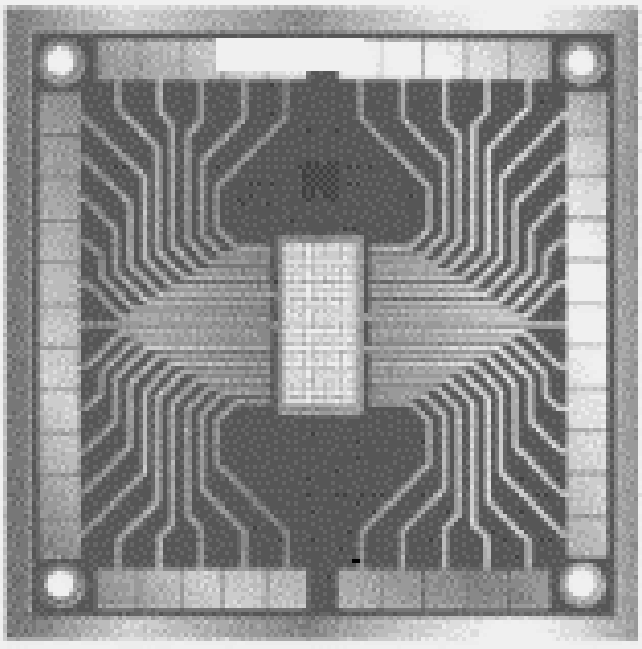


BOARD (EXAMPLE FOR THERMAL DE-RATING)

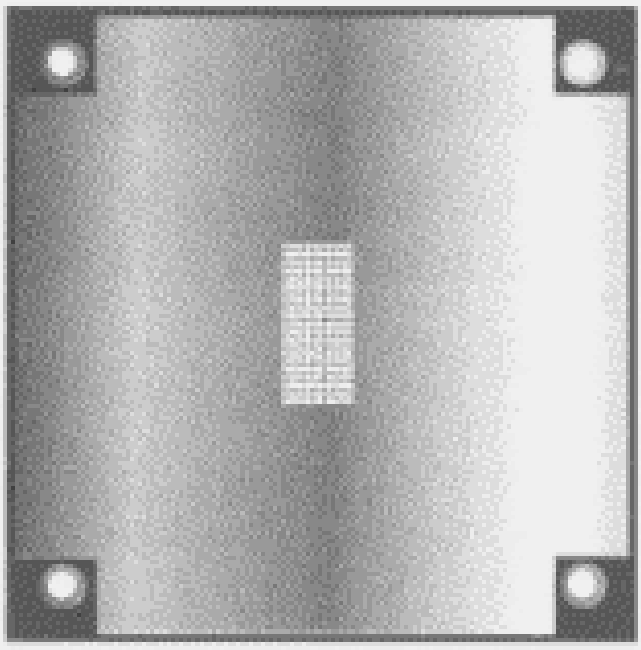
(Board specification)
- Material : Glass epoxy FR-4
- Size : 70 × 70 mm
- Thickness : t = 1.6 mm

(Wiring specification of 1/2 layer)
- Material : Copper
- Thickness : t = 18 µm

1st layer (Top View)



2nd layer (Back View)



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