MIP5520MD

Silicon MOS FET type integrated circuit

■ Features
- Worldwide input voltage, 80 VAC to 280 VAC
- Typical LED peak current: 1.0 A
  (Peak current can be adjusted in two-stage corresponding to the input voltage.)
- Dimmer control function: EX-pin voltage range, 0 V to 3 V
- Function to set input voltage that can be driven: L-pin voltage range
- Over temperature protection for IPD (Auto-restart)

■ Applications
- LED-lighting, HB-LED drive circuit

■ Package
- Code
  TO220-IPD7-A2
- Pin Name

1. EX	5. VIN
2. L	6. N.C.
3. VDD	7. DRAIN
4. SOURCE	

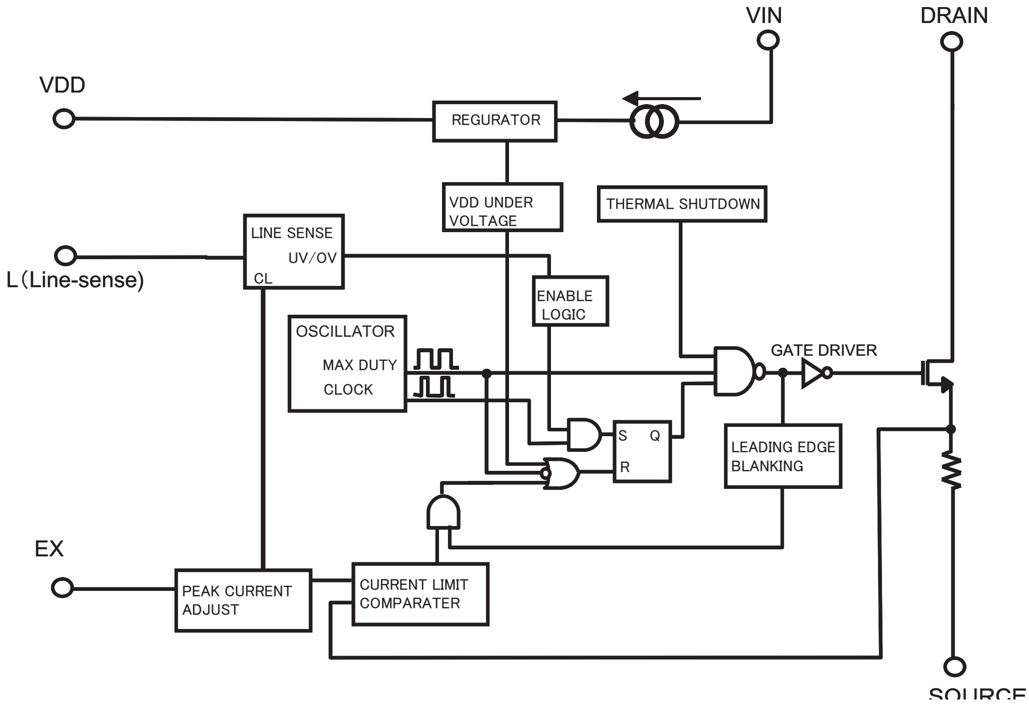
■ Marking Symbol: MIP552MD

■ Absolute Maximum Ratings $T_a = 25°C \pm 3°C$

Parameter	Symbol	Rating	Unit
DRAIN voltage	VD	– 0.3 to +700	V
VIN voltage	VIN	– 0.3 to +440	V
Input DC supply voltage	VINDC	440	V
VDD voltage	VDD	– 0.3 to +7.0	V
LINE SENSE Pin voltage	VL	– 0.3 to +6.0	V
External dimmer control pin voltage	VEX	– 0.3 to +6.0	V
Output peak current *	IDP	2.1	A
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C
Operating ambient temperature	Top	–40 to +80	°C

Note) *: Leading edge blanking delay: ton(BLK) + Peak current limit delay: td(OCL)

■ Block Diagram



■ Electrical Characteristics $T_a = 25°C±3°C$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions						
Output frequency	fosc	VDD = VDD(ON) + 0.2 V, VD = 5 V, VL = 1.5 V, VEX = 0 V	35.2	44	52.8	kHz
Skip mode output frequency *	fskip	VDD = VDD(ON) + 0.2 V, VL = 1.5 V, PW(on) < 350 ns	0.4 × fosc	0.5 × fosc	0.625 × fosc	kHz
Maximum duty cycle	MAXDC	VDD = VDD(ON) + 0.2 V, VD = 5 V, VL = 1.5 V, VEX = 0 V	46	52	58	%
VDD pin voltage	VDD(ON)	VD = 5 V , VL = 1.5 V, VEX = 0 V	5.3	5.8	6.4	V
VDD under voltage lockout threshold	VUV	VD = 5 V , VL = 1.5 V, VEX = 0 V	4.6	5.1	5.7	V
Operating current under non-switching	IDD(OFF)	VDD = VDD(ON) + 0.2 V, VD = 5 V, VL = 0 V, VEX = 0 V	0.3	0.6	0.85	mA
Operating current under switching	IDD(ON)	VDD = VDD(ON) + 0.2 V, VD = 5 V, VL = 1.5 V, VEX = 0 V	0.4	0.8	1.2	mA
VDD pin charge current	Ich1	VDD = 0 V, VIN = 40 V, VL = 0 V, VEX = 0 V	2.3	3.2	4.2	mA
	Ich2	VDD = 4 V, VIN = 40 V, VL = 0 V, VEX = 0 V	1.0	1.9	2.6	mA
L pin line-under voltage threshold	VL(uv)	VDD = VDD(ON) + 0.2V, VD = 5 V, VEX = 0 V *Fig. 1	0.456	0.57	0.685	V
				0.15		V
L pin line-over voltage threshold	VL(ov)	VDD = VDD(ON) + 0.2V, VD = 5 V, VEX = 0 V *Fig. 1	3.36	4.2	5.04	V
L pin voltage threshold for ILIMITL	VL(cll)	VDD = VDD(ON) + 0.2V, VD = 5 V, VEX = 0 V *Fig. 1	1.68	2.1	2.52	V
Peak current limit	ILIMIT	VDD = VDD(ON) + 0.2 V, VL = 1.5 V, VEX = 0 V *Fig. 1, 3	0.9	1.0	1.1	A
Peak current limit over VL(cll)	ILIMITL	VDD = VDD(ON) + 0.2 V, VL = 2.5 V, VEX = 0 V *Fig. 1	0.88 × ILIMIT	0.93 × ILIMIT	0.98 × ILIMIT	A
Peak current limit at VEX = 2.0 V *	IEX2	VDD = VDD(ON) + 0.2 V, VL = 1.5 V, VEX=2.0 V *Fig. 2	0.348	0.4	0.452	A
Peak current limit reduction slope *	SLPIL	VDD = VDD(ON) + 0.2 V, VL = 1.5 V, SLPIL = (Ilimit (at EX = 1 V) – IEX2) / ((1-2)*ILIMIT) *Fig. 2		–30		%/V
EX pin voltage at operation stop	VEX(off)	VDD = VDD(ON) + 0.2 V, VL = 1.5 V *Fig. 2	2.55	2.85	3.15	V
VEX(off) hysteresis voltage *	VEX(hys)	VDD = VDD(ON) + 0.2 V, VL = 1.5 V *Fig. 2		50		mV

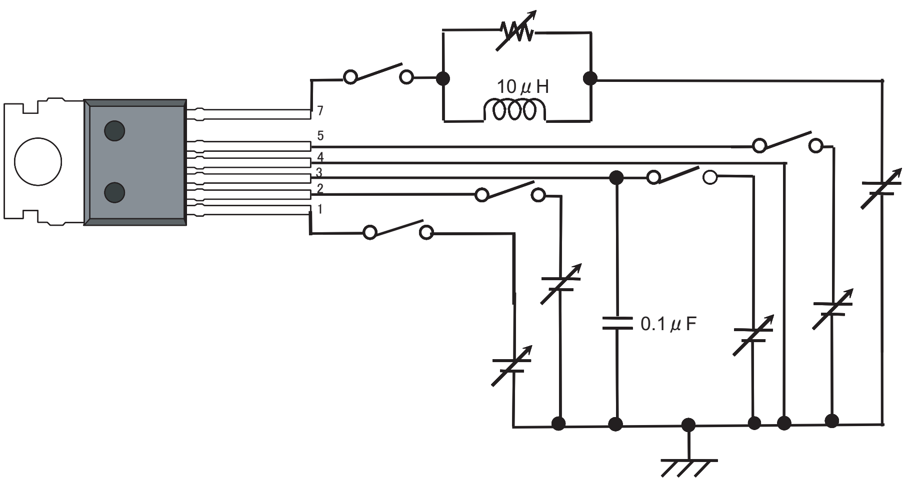
Note) *: Design guaranteed item

■ Electrical Characteristics (continued) T_a = 25°C±3°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit protections						
Leading edge blanking delay *	ton(BLK)	VDD = VDD(ON) + 0.2 V, VL = 1.5 V, EX = 0 V	100	150	200	ns
Peak current limit delay *	td(OCL)		100	150	200	ns
Thermal shutdown junction temperature *	TOTPJ		125	140	150	°C
Thermal shutdown hysteresis *	TOTPJ(hys)			70		°C
Output						
ON-state resistance	RDS(ON)	VDD = VDD(ON) + 0.2 V, VL = 1.5 V, VEX = 0 V , ID = 300 mA		6.0	6.8	Ω
OFF-state drain leakage current	IDSS	VDD = VDD(ON) + 0.2 V, VL = 0 V, VD = 650 V		5.0	20	μA
Drain breakdown voltage	VDSS	VDD = VDD(ON) + 0.2 V, VL = 0 V, ID = 100 μA	700			V
OFF-state VIN leakage current	IDSS(IN)	VDD = VDD(ON) + 0.2 V, VL = 0 V, VIN = 420 V		20	50	μA
Rise time	t_r	VDD = VDD(ON) + 0.2 V, VD = 5 V, VL = 1.5 V, VEX = 0 V *Fig. 4		200		ns
Fall time	t_f			50		ns
High Voltage Input						
VIN supply minimum voltage	VIN(MIN)	VD = 5 V, VL = 1.5 V, VEX = 0 V			45	V
Drain supply minimum voltage	VD(MIN)	VL = 1.5 V, VEX = 0 V			45	V

Note) *: Design guaranteed item

1. Measurement circuit



■ Electrical Characteristics (continued) $T_a = 25°C±3°C$

2. Figure.1 VL typical characteristic

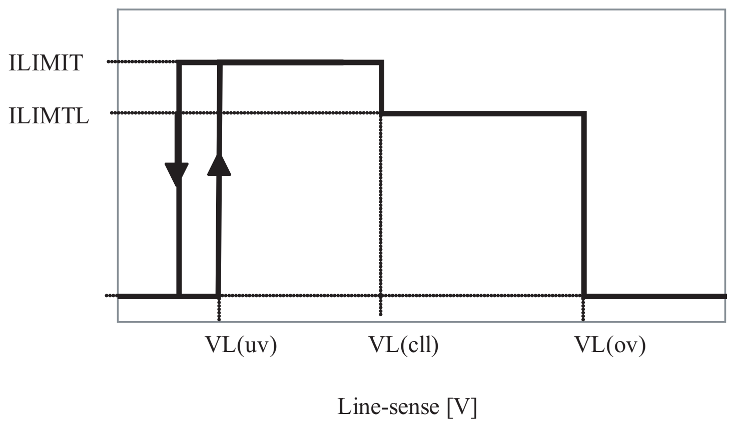


Figure2 ILIMIT vs. VEX typical characteristic

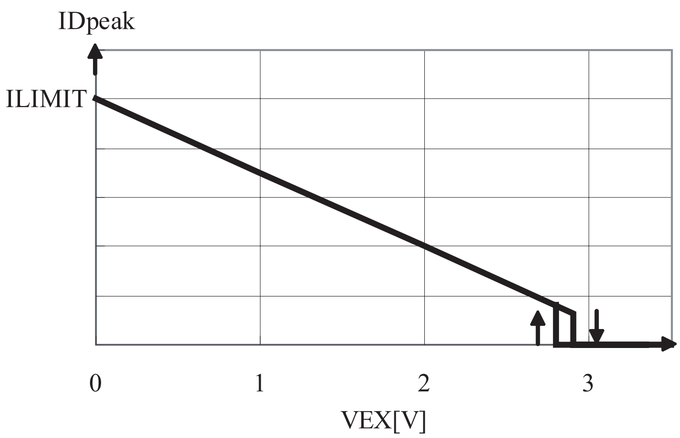
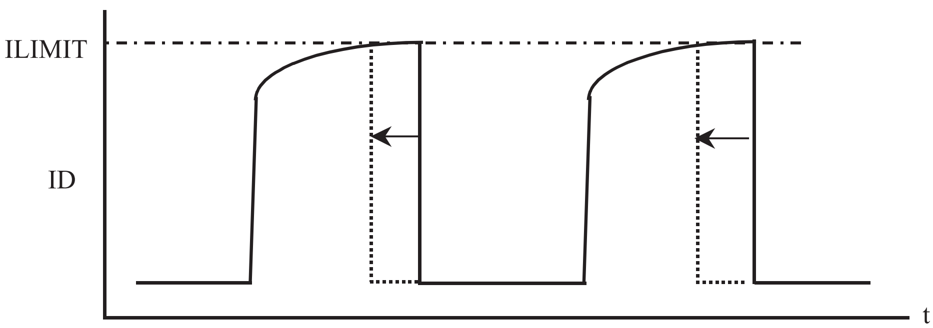
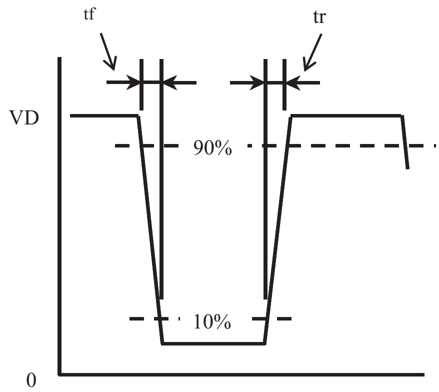


Figure. 3 ILIMIT measurement



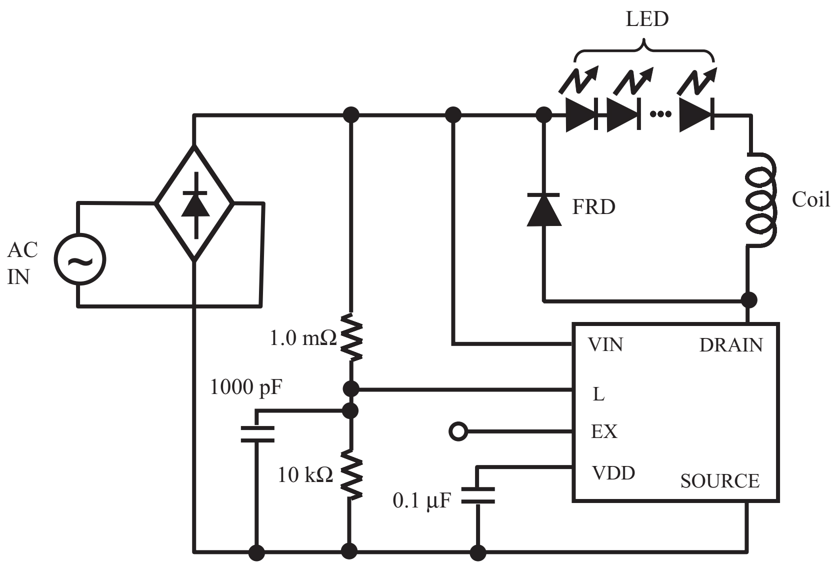
■ Electrical Characteristics (continued) $T_a = 25°C±3°C$

Figure. 4 t_r , t_f measurement



■ Application Circuit Example

Note) It is an example of the circuit, and no one to guarantee the power supply circuit.



■ Usage Notes

Connect a ceramic capacitor with value > 0.1 µF between VDD pin and GND.

The IPD has risks for break-down or burst or giving off smoke in following conditions. Avoid the following use.

Fuse should be added at the input side or connect zener diode between control pin and GND, etc as a countermeasure to pass regulatory Safety Standard. Concrete countermeasure could be provided individually. However, customer should make the final judgment.

(1) DRAIN pin short to VDD pin.
(2) DRAIN pin short to EX pin.
(3) DRAIN pin short to L pin.
(4) VIN pin short to VDD pin.
(5) VIN pin short to EX pin.
(6) VIN pin short to L pin.
(7) VIN pin short to DRAIN pin on operating.

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Attached table "IPD availability by customer"

Parts No.			Companies/areas to which products can be sold	Companies/areas to which products cannot be sold	Application
MIP0□□□ MIP3□□□ MIP9L□□	MIP1□□ MIP4□□□	MIP2□□□ MIP9A□□	· Japanese companies in Japan · Japanese companies in Asia (50% or more owned)	· Companies in European and American countries · Asian companies in Asia · Other local companies	· For power supply · For DC-DC converter
MIP55□ MIP9E□□	MIP803/804	MIP816/826	· Japanese companies in Japan · Japanese companies in Asia (50% or more owned) · Asian companies in Asia	· Companies in European and American countries · Other local companies	· For power supply · For EL driver · For LED lighting driver
MIP50□	MIP51□	MIP7□□	· No restrictions in terms of contract	· No restrictions in terms of contract	· For lamp driver/ car electronics accessories

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