

# MIP2K20MS

## Silicon MOS FET type integrated circuit

### ■ Features

- Built-in jitter function
- Built-in charge protection circuit
- Built-in overheating, loadshorting and overvoltage protection circuits

### ■ Applications

- Chargers (for DSC, etc.)
- AC adapter

### ■ Package

- Code  
DIP7-A1
- Pin Name
 

1. VDD	5. DRAIN
2. FB	6. —
3. CL	7. SOURCE
4. VCC	8. SOURCE

### ■ Absolute Maximum Ratings $T_a = 25^{\circ}\text{C} \pm 3^{\circ}\text{C}$

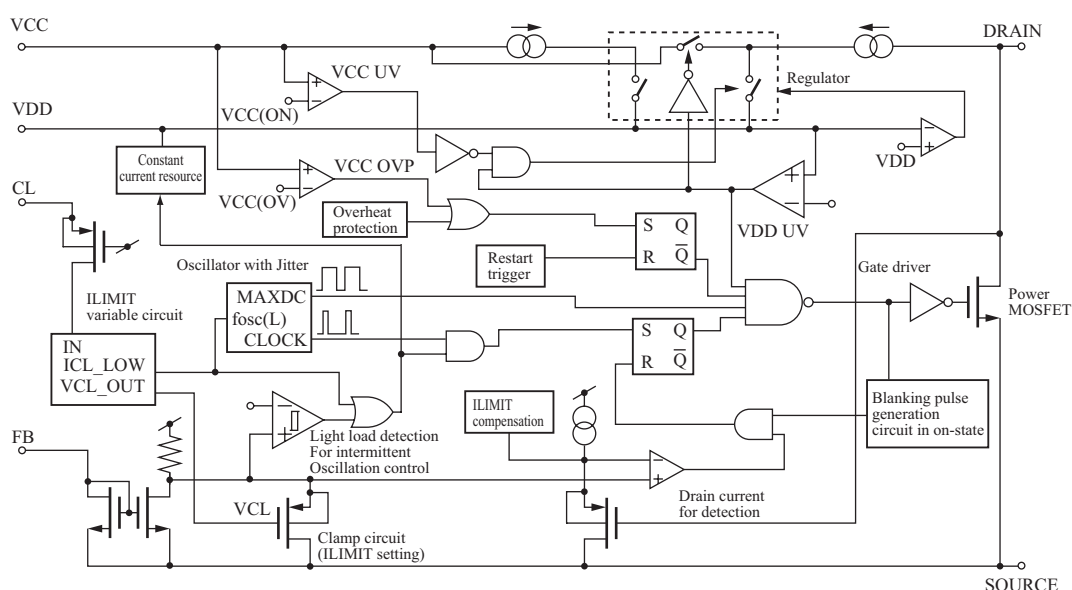
Parameter	Symbol	Rating	Unit
DRAIN voltage	VD	−0.3 to +700	V
VCC voltage	VCC	−0.3 to +45	V
VDD voltage	VDD	−0.3 to +8	V
Feedback voltage	VFB	−0.3 to +8	V
Feedback current	IFB	500	μA
CL pin voltage	VCL	−0.3 to +8	V
CL pin current	ICL	150	μA
Output peak current *	IDP	0.95	A
Channel temperature	Tch	150	°C
Storage temperature	Tstg	−55 to +150	°C

Note) \*: The guarantee within the following pulse width.

Leading edge: blanking delay + Current limit delay  $t_{on}(\text{BLK}) + t_d(\text{OCL})$

### ■ Marking Symbol: MIP2K2

### ■ Block Diagram



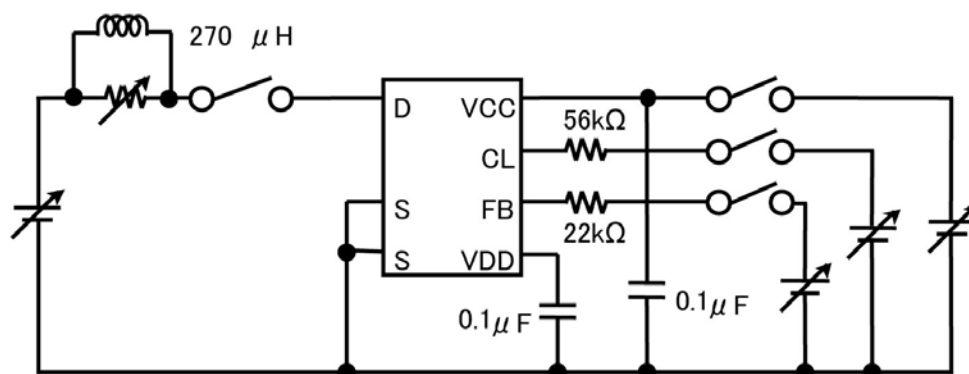
■ Electrical Characteristics  $T_C = 25^\circ\text{C} \pm 2^\circ\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Control functions						
Output frequency	fosc	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	90	100	110	kHz
	fosc(L)	VCC = 15 V, VD = 5 V, IFB: Open, ICL < ICL1	9	12	15	kHz
Jitter frequency deviation	$\Delta f$	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$		5.5		kHz
Jitter frequency modulation rate	fM	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$		260		Hz
Maximum duty cycle	MAXDC	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	45	47.5	50	%
VDD voltage	VDD	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	5.4	5.9	6.4	V
UV lockout threshold voltage	VUV	VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	4.6	5.1	5.6	V
VCC start voltage	VCC(ON)	VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	5.9	6.9	7.9	V
VCC charge stop threshold voltage	VCC1	VD = 40 V, FB: Open, CL: Open	11.8	12.8	13.8	V
Feedback threshold voltage	IFB1	ON $\rightarrow$ OFF VCC = 15 V, VD = 5 V, ICL = 50 $\mu\text{A}$	21	41	61	$\mu\text{A}$
Feedback hysteresis current	IFBHYS	VCC = 15 V, VD = 5 V, ICL = 50 $\mu\text{A}$		2		$\mu\text{A}$
FB pin current at heavy load	IFB0	ICC0 $\rightarrow$ ICC VCC = 15 V, VD = 5 V, ICL = 50 $\mu\text{A}$	6	9.5	13	$\mu\text{A}$
FB pin voltage	VFB	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	0.7	1.0	1.3	V
Supply current	ICC	VCC = 15 V, VD = 5 V, IFB = 20 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	0.25	0.40	0.50	mA
Supply current at light load	ICC(OFF)	VCC = 15 V, VD = 5 V, IFB = IFB1 + 5 $\mu\text{A}$ , ICL = 50 $\mu\text{A}$	0.26	0.36	0.46	mA
Supply current at heavy load	ICC0	VCC = 15 V, VD = 5 V, IFB: Open, ICL = 50 $\mu\text{A}$	0.45	0.60	0.75	mA
VDD charging current	Ich1	VDD = 0 V, VD = 40 V, FB: Open, CL: Open	-5.8	-3.8	-1.8	mA
	Ich2	VDD = 4 V, VD = 40 V, FB: Open, CL: Open	-2.2	-1.3	-0.4	mA
CL pin voltage	VCL	VCC = 15 V, VD = 5 V, FB: Open, ICL = ICL1	2.0	2.3	2.6	V
Dropped fosc CL pin current *2	ICL1	fosc $\rightarrow$ fosc(L) VCC = 15 V, VD = 5 V, FB: Open	16.5	22	27.5	$\mu\text{A}$
CL pin hysteresis current *2	ICLHYS	VCC = 15 V, VD = 5 V, FB: Open		1.5		$\mu\text{A}$

■ Electrical Characteristics (continued)  $T_C = 25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 

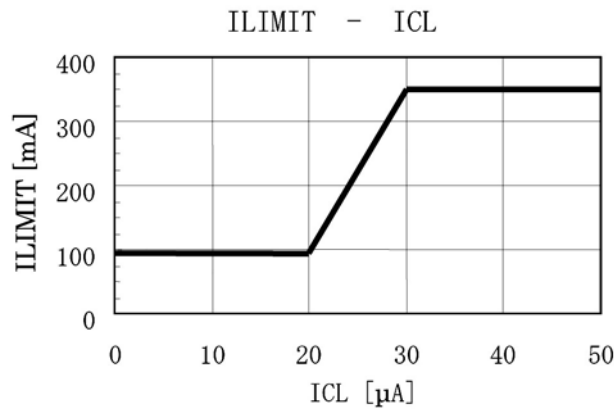
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit protections						
Self protection current limit *1, 3	ILIMIT	VCC = 15 V, FB: Open, ICL = 50 $\mu\text{A}$ , DUTY = 30%	0.315	0.350	0.385	A
ILIMIT modified coefficient *1, 3	R_slope	VCC = 15 V, FB: Open, ICL = 50 $\mu\text{A}$		28		mA/ $\mu\text{s}$
Minimum ILIMIT	ILIMITmin	Ton = 3 $\mu\text{s}$ , VCC = 15 V, FB: Open, ICL = 0 $\mu\text{A}$	40	110	200	mA
Drain current at light load	ID(OFF)	Ton = 3 $\mu\text{s}$ , VCC = 15 V, IFB = IFB1 + IFBHYS, ICL = 50 $\mu\text{A}$	30	70	150	mA
Leading edge blanking delay	ton(BLK)	VCC = 15 V, FB: Open, ICL = 50 $\mu\text{A}$	230	290	350	ns
Current limit delay	td(OCL)		100	150	200	ns
Over voltage protection	VCC(OV)	VD = 5 V, FB: Open, ICL = 50 $\mu\text{A}$	22	24.5	27	V
Thermal shutdown temperature	TOTP		130	140	150	$^{\circ}\text{C}$
Output						
Power up reset threshold voltage	VDDreset		1.8	2.6	3.5	V
ON state resistance	RDS(ON)	ID = 100 mA		16.5	21	$\Omega$
OFF state current	IDSS	VCC = 26 V, VD = 650 V, FB: Open, CL: Open		10	20	$\mu\text{A}$
Breakdown voltage	VDSS	VCC = 26 V, ID = 100 $\mu\text{A}$ , FB: Open, CL: Open	700			V
Rise time *4	tr	VCC = 15 V, VD = 5 V, FB: Open, ICL = 50 $\mu\text{A}$		100		ns
Fall time *4	tf	VCC = 15 V, VD = 5 V, FB: Open, ICL = 50 $\mu\text{A}$		25		ns
Supply voltage characteristics						
Drain supply voltage	VD(MIN)	VCC: Open, FB: Open, CL: Open	50			V

Note) 1. Measurement circuit

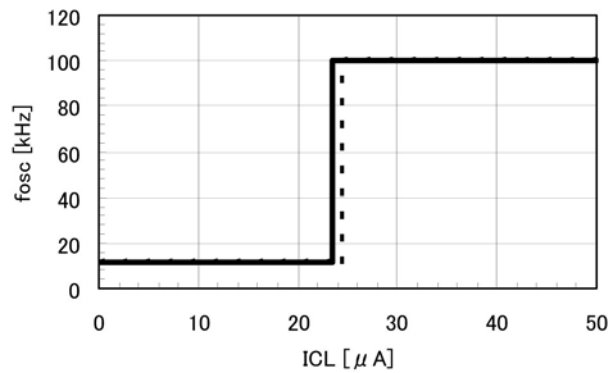


■ Electrical Characteristics (continued)  $T_C = 25^{\circ}\text{C} \pm 2^{\circ}\text{C}$

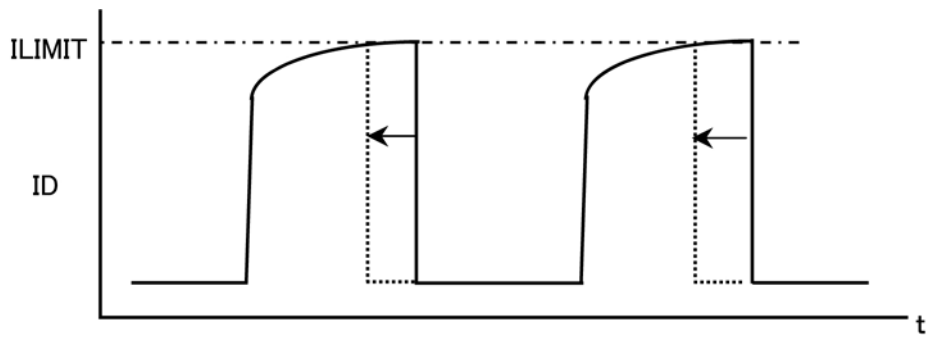
2. \*1: ILIMIT vs. ICL Typical characteristic



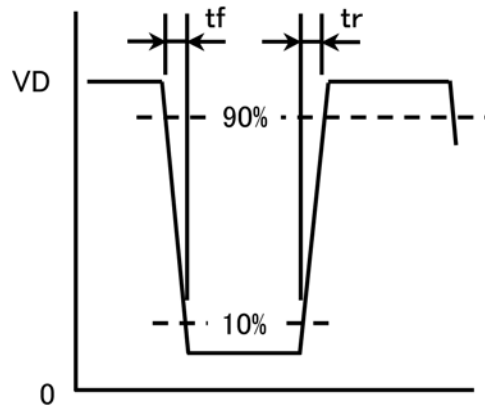
\*2: fosc vs. ICL Typical characteristic



\*3: ILIMIT Measurement



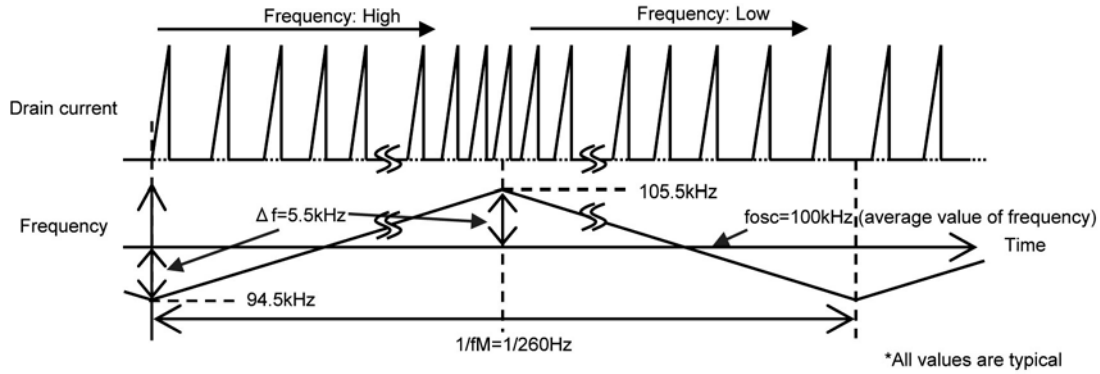
\*4: tr, tf Measurement



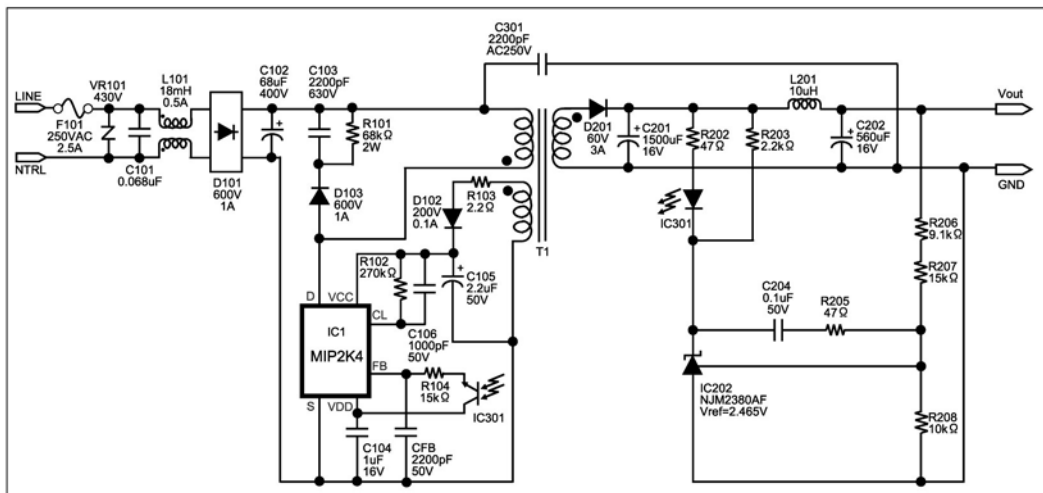
## Frequency jitter function

By frequency jitter function, frequency jitter variation( $\Delta f$ ) changes periodically, by frequency of frequency jitter modulation factor ( $f_M$ ) as shown below.

$f_{osc} = 100 \text{ kHz (typ.)}$ ,  $\Delta f = 5.5 \text{ kHz (typ.)}$ ,  $f_M = 260 \text{ Hz (typ.)}$

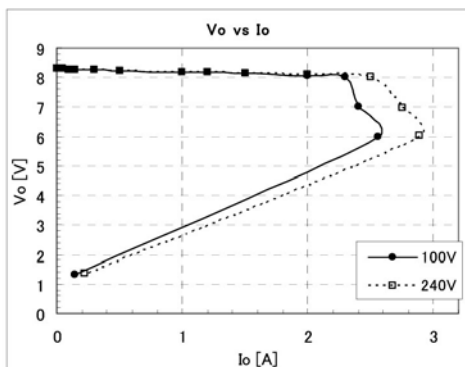


## Adapter circuit sample (MIP2K4)

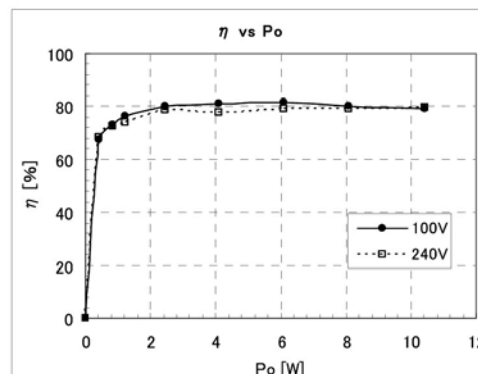


## Electric characteristics (MIP2K4 : Worldwide input, 8.3V/1.5A output)

VI characteristics of adapter circuit



Power efficiency



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Note) The products of MIP50\*\*, MIP51\*\*, and MIP7\*\* are excluded from above-mentioned precautions, 1) to 3).

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
MIP01** MIP2** MIP9A**	MIP02** MIP3** MIP9L**	MIP1** MIP4**	<ul style="list-style-type: none"> <li>• Japanese companies in Japan</li> <li>• Japanese companies in Asia (50% or more owned)</li> </ul>	<ul style="list-style-type: none"> <li>• Companies in European and American countries</li> <li>• Asian companies in Asia</li> <li>• Other local companies</li> </ul>	<ul style="list-style-type: none"> <li>• For power supply</li> <li>• For DC-DC converter</li> </ul>
MIP00** MIP55** MIP816/826	MIP52** MIP56** MIP9E**	MIP53** MIP803/804	<ul style="list-style-type: none"> <li>• Japanese companies in Japan</li> <li>• Japanese companies in Asia (50% or more owned)</li> <li>• Asian companies in Asia</li> </ul>	<ul style="list-style-type: none"> <li>• Companies in European and American countries</li> <li>• Other local companies</li> </ul>	<ul style="list-style-type: none"> <li>• For power supply</li> <li>• For EL driver</li> <li>• For LED lighting driver</li> </ul>
MIP50**	MIP51**	MIP7**	<ul style="list-style-type: none"> <li>• No restrictions in terms of contract</li> </ul>	<ul style="list-style-type: none"> <li>• No restrictions in terms of contract</li> </ul>	<ul style="list-style-type: none"> <li>• For lamp driver/ car electronics accessories</li> </ul>

Note) For details, contact our sales division.