

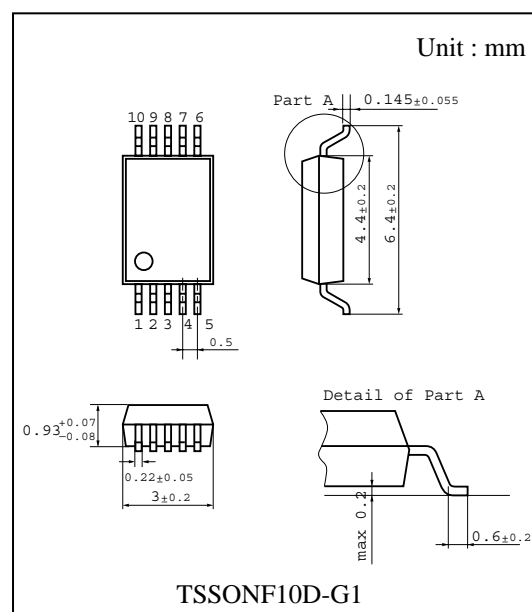
EL Display Driving IPD Series with Built-in Diode MIP824/MIP825/MIP826

Overview

This series of IPDs (Intelligent Power Devices) incorporates a diode which formerly was connected externally. It can drive an EL display with high brightness and low power consumption. When compared to conventional IPDs, package thickness has been reduced from 1.4mm to 1.2mm, thus contributing to smaller and lighter equipment design.

Feature

- Oscillating frequency adjustment possible with external resistor (MIP824, MIP825)
- Built-in diode to reduce need for external components
- Slim package (10-pin flat type)



Specifications

Parameter	Symbol	MIP824	MIP825	MIP826
Driving voltage	V _{cc}	2.5 to 5.5V	1.2 to 3.5V	1.2 to 3.5V
Driving system		Push-pull	Single	
EL frequency	f _{EL}	250Hz (R _T =820 kΩ)	340Hz (fixed)	230Hz (R _T =330 kΩ)
Max. EL voltage	V _{EL}	230VP-P	200VP-P	200VP-P
Static current consumption	I _{coff}	< 0.3 μA	< 0.1 μA	< 0.1 μA
EL area		UP to 70cm ²	UP to 30cm ²	UP to 30cm ²

Applications

- Cell phone backlights (displays, buttons)
- LCD backlights

The products and specification are subject to change without any notice. Please ask for the latest Product Standards to guarantee the satisfaction of your product requirements.

Semiconductor Company, Matsushita Electric Industrial Co., Ltd.

MIP824

CMOS Type

Electro Luminescent Lamp Driver

■ Absolute Maximum Ratings (Ta = 25 ± 3 °C)

Parameter	Symbol	Rating	Unit
Supply Voltage (VCC)	VCC	-0.5 to 5.5	V
Input Voltage (ENB)	VENB	-0.5 to VCC+0.5	V
Output Voltage (DC)	VDC	-0.5 to 115	V
Output Voltage (EL)	VEL	-0.5 to 115	V
Output Voltage (ELB)	VELB	-0.5 to 115	V
Output Peak Current (EL)	IEL	150	mA
Output Peak Current (ELB)	IELB	150	mA
Output Peak Current (CIL)	ICIL *1	600	mA
Output Current (CIL)*	IOCIL *2	100	mA
Power Dissipation	PD	120	mW
Operating Ambient Temperature	Topr	-20 to +70	°C
Operating Junction Temperature	Tch	-20 to +125	°C
Storage Temperature	Tstg	-55 to +125	°C

*1 : The saturation current of MOSFET for set-up coil.

*2 : Average current on inductor drive.

■ Electrical Characteristics (Ta = 25 ± 3 °C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
[Operating Condition]						
Supply Voltage (VCC)	VCC		2.5	–	5.5	V
High Level Input Voltage (ENB)	VIH	VCC = 2.5 to 5.5V	1.0	–	VCC	V
Low Level Input Voltage (ENB)	VIL	VCC = 2.5 to 5.5V	0	–	0.3	V

[Output]

Inductor Output (CIL)	Output Voltage	VDSS-CIL	ENB = 0V, ICIL = 20μA	115	–	–	V
	Output ON-State Resistance	RON	ICIL = 20mA	–	8	12	Ω
	Output OFF-Leakage Current	IDSS-CIL	ENB = 0V, VCIL = 120V	–	–	10	μA
	Output Current	IDSCIL3V	VCC = ENB = 3.0V VCIL = 20V	230	280	–	mA
		IDSCIL5V	VCC = ENB = 5.0V VCIL = 20V	–	520	–	mA

■ Electrical Characteristics (Ta = 25 ± 3 °C)

Parameter		Symbol	Condition	Min	Typ	Max	Unit
[Output]							
EL Output	Output Voltage	VDSS-EL	RT2 = 3.0V Idc - el = 60μA	115	–	–	V
	Output OFF-Leakage Current	IDSS-EL		–	–	50	μA
ELB Output	Output Voltage	VDSS-ELB	RT2 = 0V Idc - elb = 60μA	115	–	–	V
	Output OFF-Leakage Current	IDSS-ELB		–	–	50	μA
DC Output	Output OFF-Leakage Current	VDC	ENB = 0, DC = 115V	–	–	65	μA
Diode	Reverse Current	IR	DC = 115V, CIL = 0V ENB = 0V	–	–	1	μA
	Forward Voltage	VF	ICIL = 100mA, ENB = 0V, DC = 0V	–	–	1.4	V

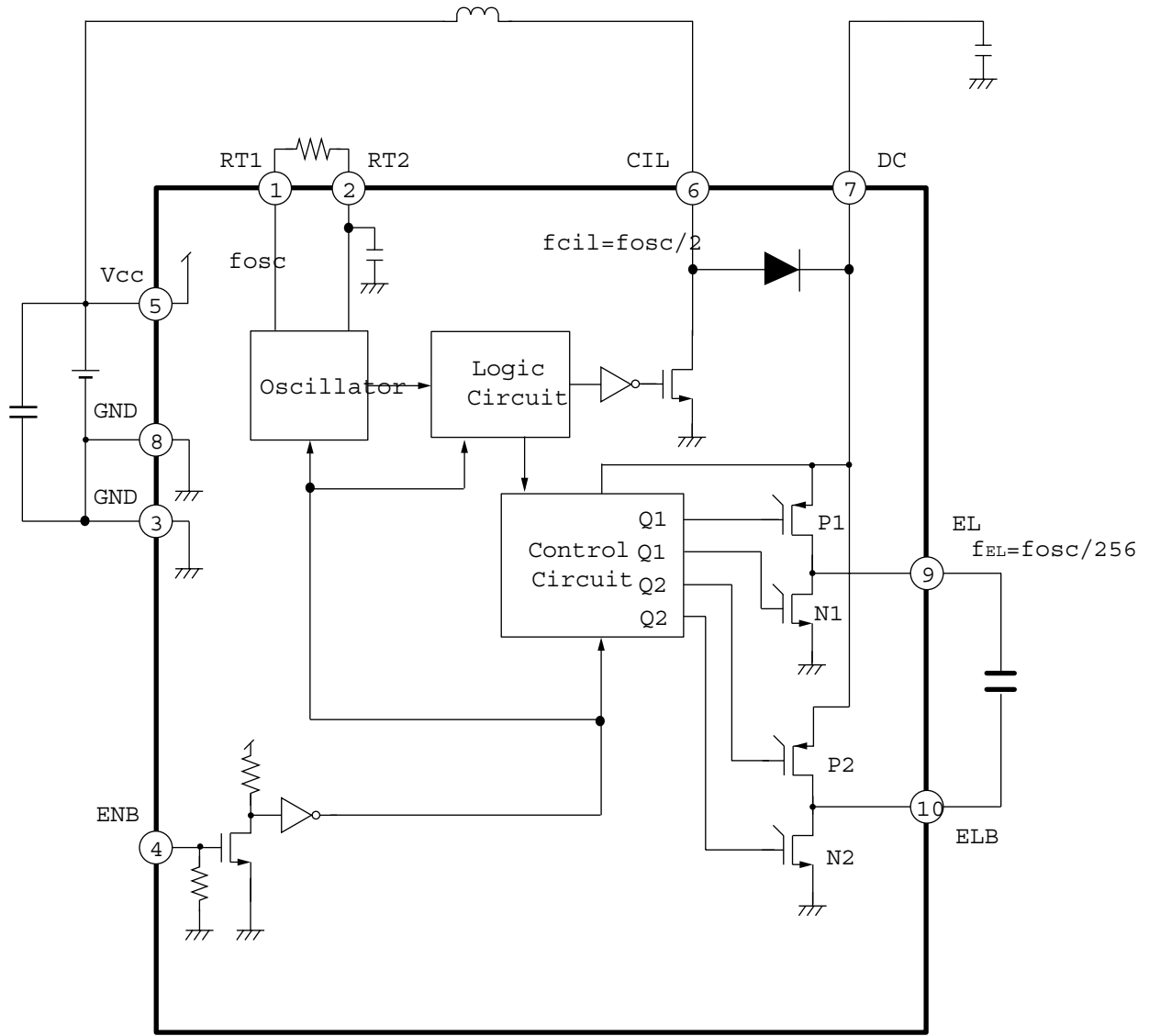
[Oscillator]

Oscillator output Frequency (RT1)	fosc 3V	RT = 820kΩ VCC = 3.0V, ENB = 3.0V	54	64	74	kHz
	fosc 5V	RT = 820kΩ VCC = 5.0V, ENB = 5.0V	–	64	–	kHz
EL Frequency (EL/ELB)	fel 3V	RT = 820kΩ VCC = 3.0V, ENB = 3.0V	213	254	295	Hz
	fel 5V	RT = 820kΩ VCC = 5.0V, ENB = 5.0V	–	254	–	Hz
Inductor Frequency (CIL)	fcoil 3V	RT = 820kΩ VCC = 3.0V, ENB = 3.0V	26.9	32	37.1	kHz
	fcoil 5V	RT = 820kΩ VCC = 5.0V, ENB = 5.0V	–	32	–	kHz
Inductor Duty Cycle (CIL)	Dcoil	RT = 820kΩ VCC = 3.0V, ENB = 3.0V	70	75	80	%

[Supply current]

Quiescent Supply Current	ICOFF	VCC = 5.0V, ENB = 0V RT = 390kΩ	–	–	0.3	μA
Supply Current (Excluding inductor current)	IC	VCC = ENB = 5.5V RT = 390kΩ	–	1	2	mA

■ Block Diagram



■ Pin Description

1	RT1	6	CIL
2	RT2	7	DC
3	GND	8	GND
4	ENB	9	EL
5	Vcc	10	ELB

MIP825

CMOS Type

Electro Luminescence Driver

■ Absolute Maximum Ratings (Ta = 25 ± 3 °C)

Parameter	Symbol	Rating	Unit
Supply Voltage (VCC)	VCC	-0.5 to 3.5	V
Input Voltage (ENB)	VENB	-0.5 to VCC+0.5	V
Output Voltage (CIL)	VCIL	-0.5 to 200	V
Output Voltage (ELD)	VELD	-0.5 to 200	V
Output Current (CIL)	ICIL *1	600	mA
Output Current (ELD)	IELD	50	mA
Power Dissipation	PD	120	mW
Operating Ambient Temperature	Topr	-20 to +70	°C
Operating Junction Temperature	Tch	-20 to +125	°C
Storage Temperature	Tstg	-55 to +125	°C

*1 : The saturation current of MOSFET for set-up coil.

■ Electrical Characteristics (Ta = 25 ± 3 °C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
[Operating Condition]						
Supply Voltage (VCC)	VCC		1.2	2.5	3.5	V
High Level Input Voltage (ENB)	VIH	VCC = 1.2 to 3.5V	1.0	–	VCC	V
Low Level Input Voltage (ENB)	VIL	VCC = 1.2 to 3.5V	0	–	0.3	V

[Output]

Inductor Output (CIL)	Output Voltage	VDSS-CIL	ENB = 0V, Ids = 20μA	200	–	–	V
	Output Current	IDS-CIL	VDS = 5V	–	350	–	mA
	Output ON-State Resistance	RON-CIL	Id = 5mA	–	8.0	12	Ω
	Output OFF-Leakage Current	IDSS-CIL	ENB = 0, VDS = 160V	–	–	10	μA
EL Output (ELD)	Output Voltage	VDSS-ELD	ENB = 0V, Ids = 20μA	200	–	–	V
	Output Current	IDS-ELD	VDS = 25V	4	10	–	mA
	Output ON-State Resistance	RON-ELD	Id = 5mA	–	3.0	3.5	kΩ
	Output OFF-Leakage Current	IDSS-ELD	ENB = 0, VDS = 160V	–	–	10	μA
Diode	Reverse Current	IR	VELD = 200V, VCIL = 0V	–	–	1	μA
	Forward Voltage	VF	ICIL = 100mA, VELD = 0V	–	–	1.4	V

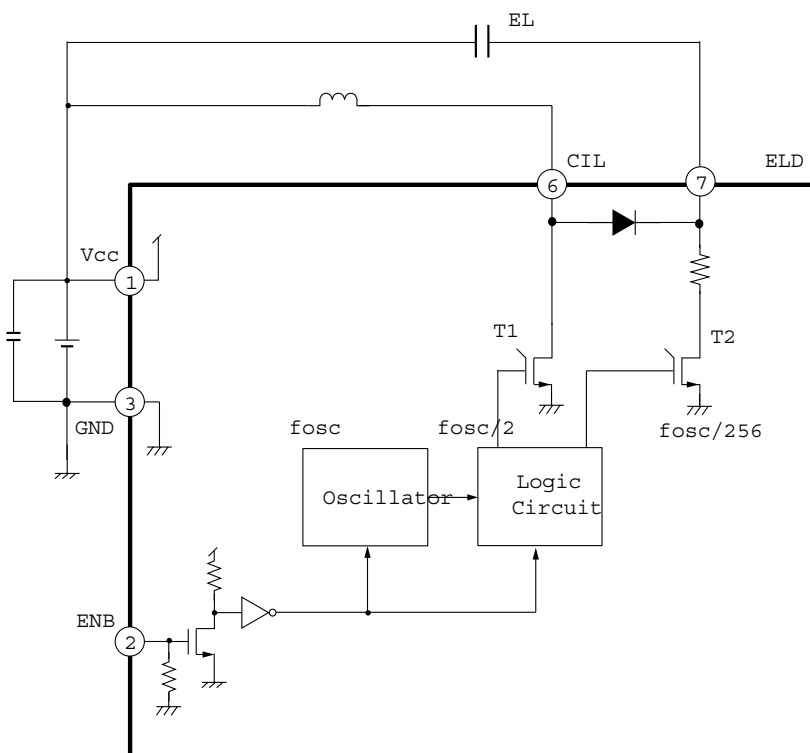
■ Electrical Characteristics (Ta = 25 ± 3 °C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
[Oscillator]						
Oscillator output Frequency	fosc	VCC = ENB = 2.5V, RT = build in	74	88	102	kHz
Inductor Frequency (CIL)	fcoil	VCC = ENB = 2.5V, RT = build in	37	44	51	kHz
Inductor Duty Cycle (CIL)	Dcoil	VCC = ENB = 2.5V, RT = build in	70	75	80	%
EL Frequency (ELD)	fel	VCC = ENB = 2.5V, RT = build in	290	340	400	Hz
EL Duty Cycle (ELD)	Del	VCC = ENB = 2.5V, RT = build in	20	25	30	%

[Supply Current]

Quiescent Supply Current	ICOFF	VCC = 3.5V, ENB = 0V RT = build in	–	–	0.1	μA
Supply Current (Excluding Inductor Current)	IC	VCC = ENB = 3.5V RT = build in	–	0.65	1.0	mA

■ Block Diagram



■ Pin Description

1	Vcc
2	ENB
3	GND
4	NC
5	NC
6	CIL
7	ELD
8	NC
9	NC
10	NC

MIP826

CMOS Type

Electro Luminescence Driver

■ Absolute Maximum Ratings (Ta = 25 ± 3 °C)

Parameter	Symbol	Rating	Unit
Supply Voltage (VCC)	VCC	-0.5 to 3.5	V
Input Voltage (ENB)	V _{ENB}	-0.5 to VCC+0.5	V
Output Voltage (CIL)	V _{CIL}	-0.5 to 200	V
Output Voltage (ELD)	V _{ELD}	-0.5 to 200	V
Output Current (CIL)	I _{CIL} *1	600	mA
Output Current (ELD)	I _{ELD}	50	mA
Power Dissipation	PD	120	mW
Operating Ambient Temperature	T _{opr}	-20 to +70	°C
Operating Junction Temperature	T _{ch}	-20 to +125	°C
Storage Temperature	T _{stg}	-55 to +125	°C

*1 : The saturation current of MOSFET for set-up coil.

■ Electrical Characteristics (Ta = 25 ± 3 °C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
[Operating Condition]						
Supply Voltage (VCC)	VCC		1.2	2.5	3.5	V
High Level Input Voltage (ENB)	V _{IH}	VCC = 1.2 to 3.5V	1.0	–	VCC	V
Low Level Input Voltage (ENB)	V _{IL}	VCC = 1.2 to 3.5V	0	–	0.3	V

[Output]

Inductor Output (CIL)	Output Voltage	V _{DSS-CIL}	ENB = 0V, I _{DS} = 20μA	200	–	–	V
	Output Current	I _{DS-CIL}	V _{DS} = 5V	–	350	–	mA
	Output ON-State Resistance	R _{ON-CIL}	I _D = 5mA	–	8.0	12	Ω
	Output OFF-Leakage Current	I _{DSS-CIL}	ENB = 0, V _{DS} = 160V	–	–	10	μA
EL Output (ELD)	Output Voltage	V _{DSS-ELD}	ENB = 0V, I _{DS} = 20μA	200	–	–	V
	Output Current	I _{DS-ELD}	V _{DS} = 25V	4	10	–	mA
	Output ON-State Resistance	R _{ON-ELD}	I _D = 5mA	–	3.0	3.5	kΩ
	Output OFF-Leakage Current	I _{DSS-ELD}	ENB = 0, V _{DS} = 160V	–	–	10	μA
Diode	Reverse Current	I _R	V _{ELD} = 200V, V _{CIL} = 0V	–	–	1	μA
	Forward Voltage	V _F	I _{CIL} = 100mA, V _{ELD} = 0V	–	–	1.4	V

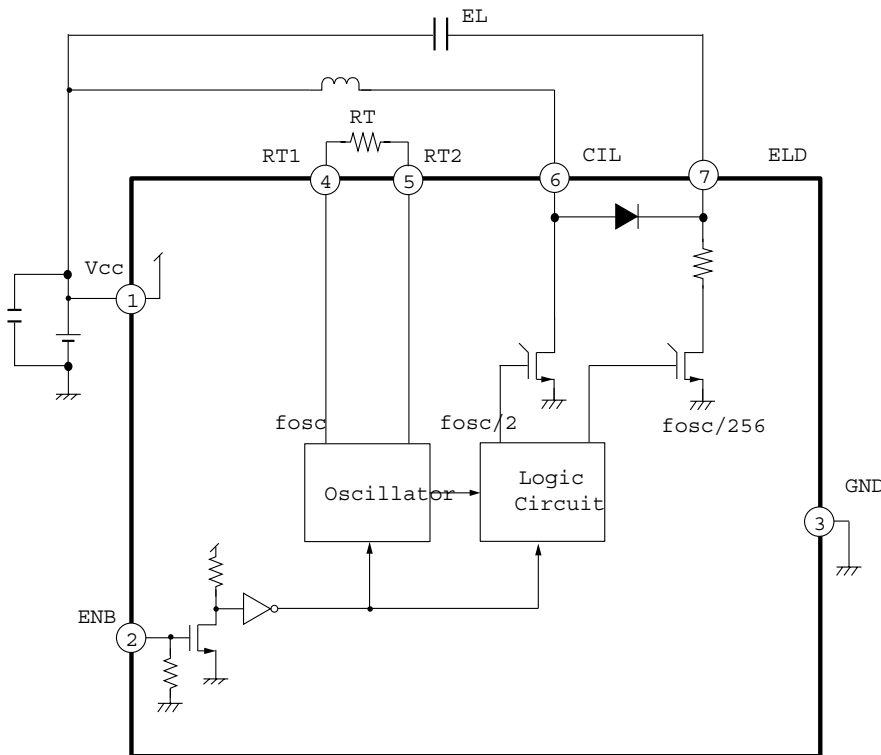
■ Electrical Characteristics (Ta = 25 ± 3 °C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
[Oscillator]						
Oscillator output Frequency	fosc	VCC = ENB = 2.5V, RT = 330kΩ	100	118	136	kHz
Inductor Frequency (CIL)	fcoil	VCC = ENB = 2.5V, RT = 330kΩ	50	59	68	kHz
Inductor Duty Cycle (CIL)	Dcoil	VCC = ENB = 2.5V, RT = 330kΩ	70	75	80	%
EL Frequency (ELD)	fel	VCC = ENB = 2.5V, RT = 330kΩ	390	460	530	Hz
EL Duty Cycle (ELD)	Del	VCC = ENB = 2.5V, RT = 330kΩ	20	25	30	%

[Supply Current]

Quiescent Supply Current	ICOFF	VCC = 3.5V, ENB = 0V RT = 330kΩ	–	–	100	μA
Quiescent Supply Current	ICOFF	VCC = 3.5V, ENB = 0V RT = 330kΩ	–	–	50	μA
Supply Current (Excluding Inductor Current)	IC	VCC = ENB = 3.5V RT = 330kΩ	–	0.65	1.0	mA

■ Block Diagram



■ Pin Description

1	VCC
2	ENB
3	GND
4	RT1
5	RT2
6	CIL
7	ELD
8	NC
9	NC
10	NC

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Note) There is no restriction on the product types MIP501 to 511, MIP704 to 709 and MIP805.

Attached table "IPD availability by customer"

Parts No.			Able to supply	Disable to supply	Application
MIP13*	MIP17*	MIP2**	Domestic Japanese companies Japanese companies in Asia (50% or more owned)	European and American companies Local Asian companies Other local companies	IPD for power supply
MIP14*	MIP18*	MIP30*			
MIP15*	MIP01**				
MIP16*	MIP02**				
MIP10*	MIP11*	MIP803/MIP804/MIP806	Domestic Japanese companies Japanese companies in Asia (50% or more owned)	European and American companies† Local Asian companies† Other local companies†	IPD for power supply IPD for EL drive
MIP501 to MIP511 MIP704 to MIP709 MIP805			No restrictions in terms of contract	No restrictions in terms of contract	IPD for lamp/Power supply IPD for EL power supply IPD for DC/AC converter

Note) †: Sales is possible with prior consent of Power Integrations, Inc.

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