MIP713

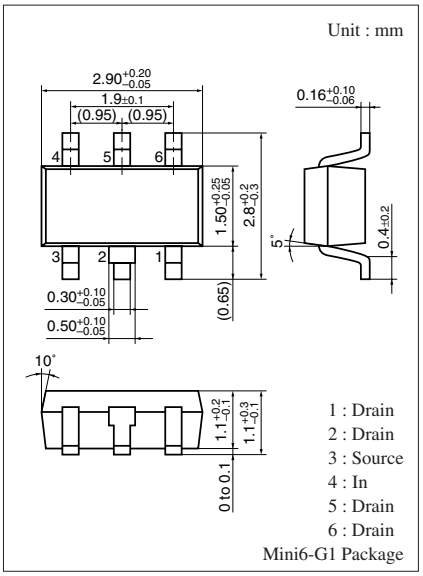
Silicon MOS IC

■ Features

- Five protective functions (over-current, over-voltage, short-circuit load, over heat, ESD) built-in.
- Heat which goes up when load short-circuits is controlled.
- Although it is a small package, it has resistance of low heat. (When mounted in a substrate.)
- Driving directly from CMOS (microcomputer) is possible.

■ Applications

- For automotive electric equipment



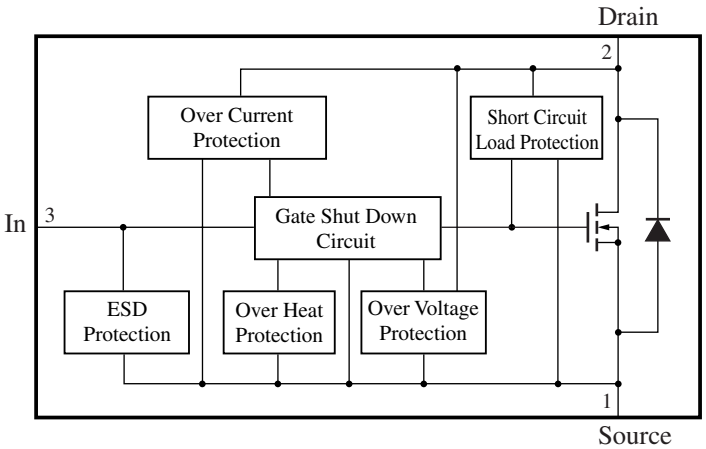
Marking Symbol: MA

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Drain-source voltage	V_{DS}	− 0.5 to +40	V
Output peak current	I_{OP}	3.0	A
Output current	I_O	1.0	A
Input voltage	V_{IN}	− 0.5 to +6.0	V
Input current	I_{IN}	±2	mA
Drain clamp energy *1	E_{CLP}	17	mJ
Power dissipation 1 *2	P_{D1}	0.2	W
Power dissipation 2 *3	P_{D2}	0.8	W
Channel temperature	T_{ch}	−40 to +150	°C
Storage temperature	T_{stg}	−55 to +150	°C

Note) ∗1 : L = 10 mH, I_L = 1.84 A, V_{DD} = 20 V 1 pulse, T_C = 25°C
∗2 : Single unit
∗3 : Mounting on the PCB (40 mm², Thick 1.7 mm Glass epoxy substrate) (T_a = 25°C)

■ Block Diagram



■ Electrical Characteristics $T_C = 25°C \pm 3°C$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-source ON resistance	$R_{DS(on)}$	V_{IN} = 5 V, I_{DS} = 1 A		0.55	0.8	Ω
Drain-source voltage	$V_{DS(on)}$	V_{IN} = 5 V, I_{DS} = 1 A		0.55	0.8	V
Drain clamp voltage	$V_{DS(CLP)}$	V_{IN} = 0 V, I_{DS} = 3 mA	40	52	65	V
Drain-source cutoff current 1	$I_{DS(off)1}$	V_{IN} = 0 V, V_{DS} = 12 V		27	50	μA
Drain-source cutoff current 2	$I_{DS(off)2}$	V_{IN} = 0 V, V_{DS} = 16 V		36	68	
Drain-source cutoff current 3	$I_{DS(off)3}$	V_{IN} = 0 V, V_{DS} = 30 V		79	170	
Input voltage high-level	$V_{IN(H)}$	I_{DS} = 1 A	4			V
Input voltage low-level	$V_{IN(L)}$	I_{DS} = 1 mA			0.8	V
Input current (normal)	$I_{IN(on)}$	V_{IN} = 5 V, V_{DS} = 0 V		0.2	0.3	mA
Input current (act on protection) *	$I_{IN(PROT)}$	V_{IN} = 5 V		0.6	0.9	mA
Over current protection limit	I_{OCP}	V_{IN} = 5 V	2.0	3.0		A
Short circuit load protection limit	$V_{DS(SHT)}$	V_{IN} = 5 V	2.0	4.0		V
Input voltage of act on protection	$V_{IN(PROT)}$		3.9	6.0		V

Note) 1. At on-state when drain voltage exceeds the "Short circuit load protection voltage", output current begin to oscillate.
2. When drain voltage exceeds the "Drain clamp voltage" output MOS turn on, so drain voltage are clamped before the drain-source junction become breakdown.
3. ∗: State of short circuit laod protection and over heat protection (Designed guarantee).

■ Electrical Characteristics (Reference value: Non guarantee value)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Over heat protection temperature	T_{SHD}	V_{IN} = 5 V	150	190		°C
Turn-on time	t_{ON}	V_{DD} = 30 V, R_L = 30 Ω		4		μs
Turn-off time	t_{OFF}	I_{DS} = 1 A, V_{IN} = 5 V		7		

Note) If the chip temperature exceeds the "Over heat protection temperature", output current is shut down. And if the chip cool down, the protection will operate automatically again.

■ Electrical Characteristics $T_C = -40°C$ to 125°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-source ON resistance	$R_{DS(on)}$	V_{IN} = 5 V, I_{DS} = 1 A			1.6	Ω
Drain-source voltage	$V_{DS(on)}$	V_{IN} = 5 V, I_{DS} = 1 A			1.6	V
Drain clamp voltage	$V_{DS(CLP)}$	V_{IN} = 0 V, I_{DS} = 3 mA	40		65	V
Drain-source cutoff current 1	$I_{DS(off)1}$	V_{IN} = 0 V, V_{DS} = 12 V			100	μA
Drain-source cutoff current 2	$I_{DS(off)2}$	V_{IN} = 0 V, V_{DS} = 16 V			136	
Drain-source cutoff current 3	$I_{DS(off)3}$	V_{IN} = 0 V, V_{DS} = 30 V			340	
Input voltage high-level	$V_{IN(H)}$	I_{DS} = 1 A	4.3			V
Input voltage low-level	$V_{IN(L)}$	I_{DS} = 1 mA			0.8	V
Input current (normal)	$I_{IN(on)}$	V_{IN} = 5 V, V_{DS} = 0 V			0.45	mA
Input current (act on protection)	$I_{IN(PROT)}$	V_{IN} = 5 V			1.2	mA
Over current protection limit	I_{OCP}	V_{IN} = 5 V	1.15			A
Short circuit load protection limit	$V_{DS(SHT)}$	V_{IN} = 5 V	1.6			V
Input voltage of act on protection	$V_{IN(PROT)}$		4.0	6.0		V

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