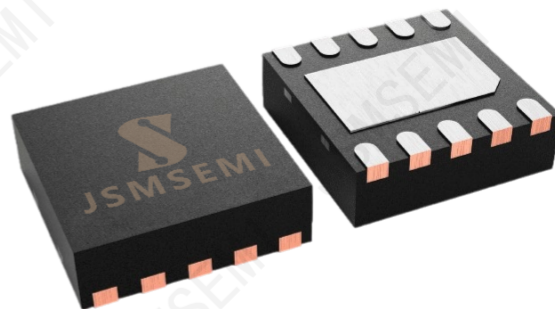


Description

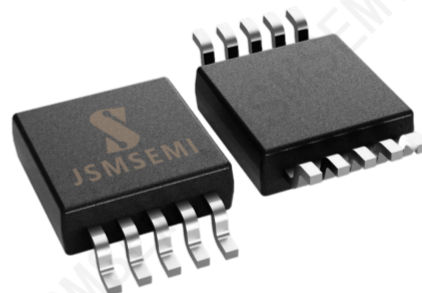
The DGD0506A is a high-frequency half-bridge gate driver capable of driving N-channel MOSFETs in a half-bridge configuration. The floating high-side driver is rated up to 50V.

The DGD0506A logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) to interface easily with MCUs. UVLO for high-side and low-side will protect a MOSFET with loss of supply. To protect MOSFETs, cross conduction prevention logic prevents the HO and LO outputs being on at the same time.

Fast and well-matched propagation delays allow a higher switching frequency, enabling a smaller, more compact power switching design using smaller associated components. The DGD0506A is offered in the DFN3030-10L and MSOP-10 packages and operates over an extended -40°C to +125°C temperature range.



DFN3030-10L



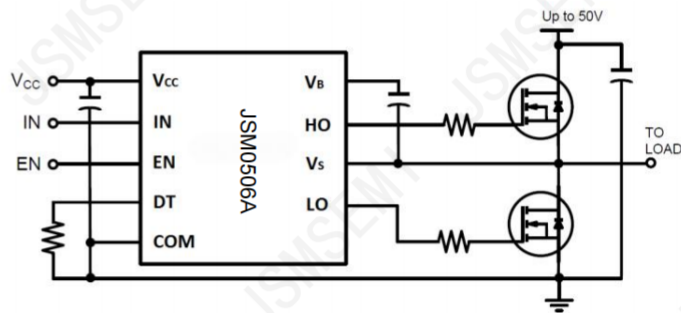
MSOP-10

Features

- 50V Floating High-Side Driver
- Drives Two N-Channel MOSFETs in a Half-Bridge Configuration
- 4.5A Source / 5.0A Sink Output Current Capability
- Internal Bootstrap Diode Included
- Undervoltage Lockout for High-Side and Low-Side Drivers
 - Typ V_{BSUV-} of 4.2V
 - Typ V_{BSUV-} of 3.9V
 - Typ V_{CCUV+} of 4.5V
 - Typ V_{CCUV+} of 4.0V
- Programmable Deadtime to Protect MOSFETs
- Logic Input (IN and EN) 3.3V Capability
- Ultra Low Standby Currents
- Extended Temperature Range: -40°C to +125°C
- Industry Standard MSOP-10 and DFN3030-10L Package
- RoSH compatible

Applications

- DC-DC Converters
- Motor Controls
- Battery Powered Hand Tools
- eCig Devices
- Class D Power Amplifiers

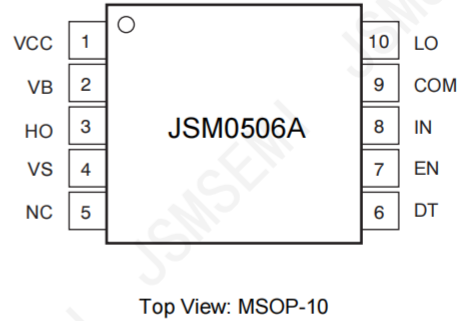
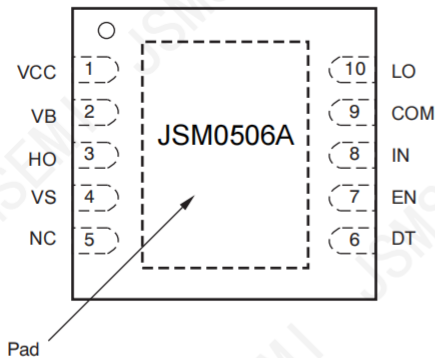


Typical Configuration

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship,Quantity	Green
DGD0506AM10-13-JSM	MSOP-10	JSM0506A	-40 to 125°C	3	TR&5000	Rohs
DGD0506AFN-13-JSM	DFN3030-10L	JSM0506A	-40 to 125°C	3	TR&5000	Rohs

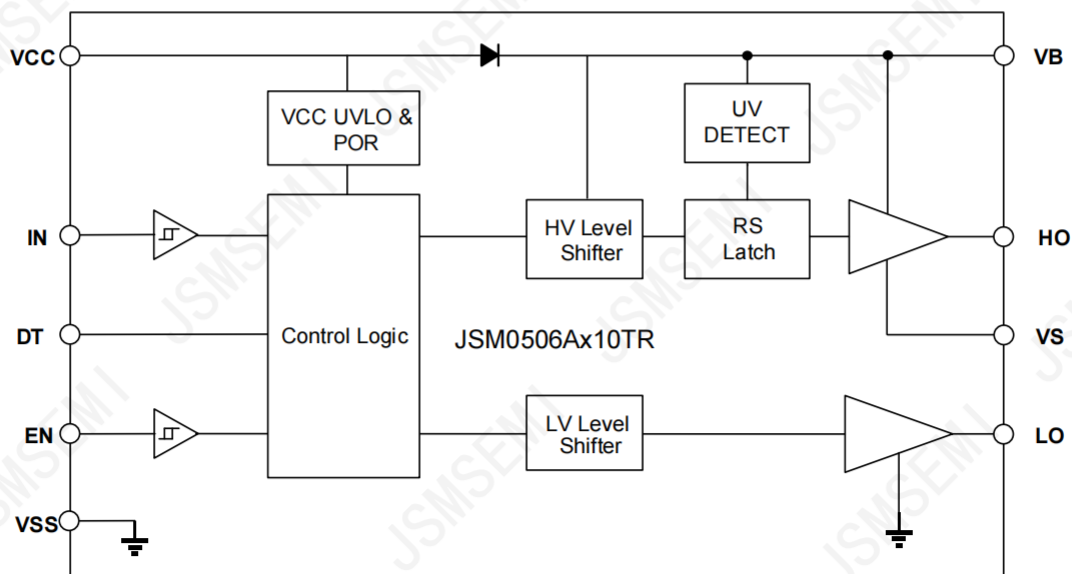
Pin Diagrams



Pin Descriptions

Pin Number	Pin Name	Function
1	V _{CC}	Low-Side and Logic Supply
2	V _B	High-Side Floating Supply
3	H _O	High-Side Gate Drive Output
4	V _S	High-Side Floating Supply Return
5	NC	No Connect (No Internal Connection)
6	DT	Deadtime Control
7	EN	Logic Input Enable, a Logic Low turns off Gate Driver
8	IN	Logic Input for High-Side and Low-Side Gate Driver Outputs (H _O and L _O), in Phase with H _O
9	COM	Low-Side and Logic Return
10	L _O	Low-Side Gate Drive Output
PAD	Substrate	Connect to COM on PCB

Functional Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
High-Side Floating Positive Supply Voltage	V _B	-0.3 to +60	V
High-Side Floating Negative Supply Voltage	V _S	V _B -14 to V _B +0.3	V
High-Side Floating Output Voltage	V _{HO}	V _S -0.3 to V _B +0.3	V
Offset Supply Voltage Transient	dV _S /dt	50	V/ns
Logic and Low-Side Fixed Supply Voltage	V _{CC}	-0.3 to +20	V
Low-Side Output Voltage	V _{LO}	-0.3 to V _{CC} +0.3	V
Logic Input Voltage (IN and EN)	V _{IN}	-0.3 to V _{CC} +0.3	V

Thermal Characteristics – DFN3030-10L (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P _D	1.0	W
Thermal Resistance, Junction to Ambient	R _{θJA}	64	°C/W
Thermal Resistance, Junction to Case	R _{θJC}	42	°C/W
Operating Temperature	T _J	+150	°C
Lead Temperature (Soldering, 10s)	T _L	+300	
Storage Temperature Range	T _{STG}	-50 to +150	

Thermal Characteristics – MSOP-10 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P _D	0.75	W
Thermal Resistance, Junction to Ambient	R _{θJA}	166	°C/W
Thermal Resistance, Junction to Case	R _{θJC}	32	°C/W
Operating Temperature	T _J	+150	°C
Lead Temperature (Soldering, 10s)	T _L	+300	
Storage Temperature Range	T _{STG}	-55 to +150	

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
High-Side Floating Supply	V _B	V _S + 8	V _S + 15	V
High-Side Floating Supply Offset Voltage	V _S	-5	50	V
High-Side Floating Output Voltage	V _{HO}	V _S	V _B	V
Logic and Low Side Fixed Supply Voltage	V _{CC}	8	15	V
Low-Side Output Voltage	V _{LO}	0	V _{CC}	V
Logic Input Voltage (IN and EN)	V _{IN}	0	5	V
Ambient Temperature	T _A	-40	+125	°C

DC Electrical Characteristics ($V_{CC} = V_{BS} = 12V$, $COM = V_S = 0V$, @ $T_A = +25^\circ C$, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Logic "1" Input Voltage	V_{IH}		2.2	2.7	V	
Logic "0" Input Voltage	V_{IL}	0.8	1.5		V	
Enable Logic "1" Input Voltage	V_{ENIH}	1.5			V	
Enable Logic "0" Input Voltage	V_{ENIL}			0.7	V	
Input Voltage Hysteresis	V_{INHYS}		0.5		V	
High Level Output Voltage, $V_{BIAS} - V_O$	V_{OH}			0.1	V	$I_{O+} = 100mA$
Low Level Output Voltage, V_O	V_{OL}			0.1	V	$I_{O-} = 100mA$
Offset Supply Leakage Current	I_{LK}		0.1	10	μA	$V_B = V_S = 60V$
V_{CC} Shutdown Supply Current	I_{CCSD}		0	1	μA	$V_{IN} = 0V$ or $5V$, $V_{EN} = 0V$
V_{CC} Quiescent Supply Current	I_{CCQ}		0.25	0.4	mA	$V_{IN} = 0V$ or $5V$, $R_{DT} = 100k\Omega$
V_{CC} Operating Supply Current	I_{CCOP}		7.6		mA	$f_s = 500kHz$, $C_L = 1000pF$
V_{BS} Quiescent Supply Current	I_{BSQ}		35	90	μA	$V_{IN} = 0V$ or $5V$
V_{BS} Operating Supply Current	I_{BSOP}		7.8		mA	$f_s = 500kHz$, $C_L = 1000pF$
Logic "1" Input Bias Current	I_{IN+}		25	60	μA	$V_{IN} = 5V$
Logic "0" Input Bias Current	I_{IN-}		0	1	μA	$V_{IN} = 0V$
V_{BS} Supply Undervoltage Positive Going Threshold	V_{BSUV+}		4.2		V	
V_{BS} Supply Undervoltage Negative Going Threshold	V_{BSUV-}		3.9		V	
V_{CC} Supply Undervoltage Positive Going Threshold	V_{CCUV+}		4.5		V	
V_{CC} Supply Undervoltage Negative Going Threshold	V_{CCUV-}		4.0		V	
Output High Short-Circuit Pulsed Current	I_{O+}		4.5		A	$V_O = 0V$, $PW \leq 10\mu s$
Output Low Short-Circuit Pulsed Current	I_{O-}		5.0		A	$V_O = 15V$, $PW \leq 10\mu s$
Forward Voltage of Bootstrap Diode	V_{F1}		0.67		V	$I_F = 100\mu A$
Forward Voltage of Bootstrap Diode	V_{F2}		1.7		V	$I_F = 100mA$

Note: The V_{IN} and I_{IN} parameters are applicable to the two logic pins: IN and EN. The V_O and I_O parameters are applicable to the respective output pins: HO and LO.

AC Electrical Characteristics ($V_{CC} = V_{BS} = 15V$, $COM = V_S = 0V$, $C_L = 1000pF$, @ $T_A = +25^\circ C$, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Turn-On Propagation Delay, HO & LO	t_{ON}		260		ns	$R_{DT} = 10k\Omega$
			800		ns	$R_{DT} = 100k\Omega$
Turn-Off Propagation Delay, HO & LO	t_{OFF}		150		ns	
Turn-On Rise Time	t_R		17		ns	
Turn-Off Fall Time	t_F		10		ns	
Delay Matching	t_{DM}			50	ns	
Deadtime: $t_{DT LO-HO}$ & $t_{DT HO-LO}$	t_{DT}		130		ns	$R_{DT} = 10k\Omega$
			530		ns	$R_{DT} = 100k\Omega$
Deadtime Matching	t_{MDT}			500	ns	$R_{DT} = 100k\Omega$

Timing Waveforms

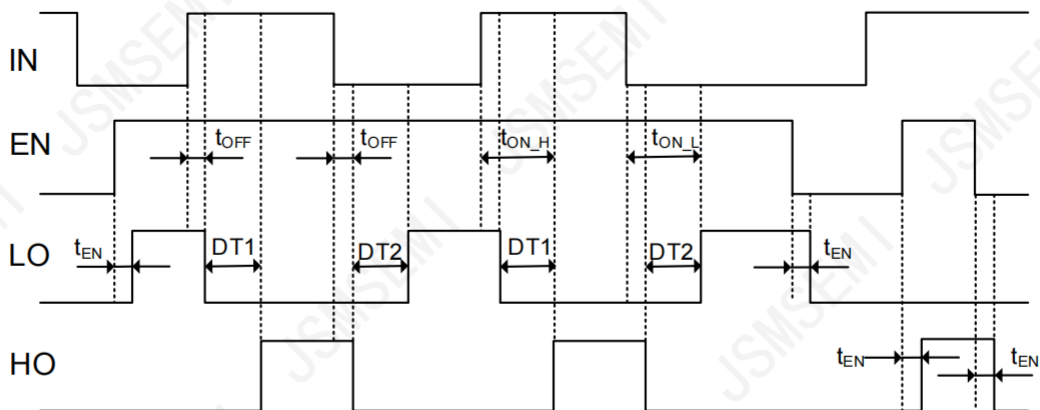


Figure 1. Input and Output Timing Waveform

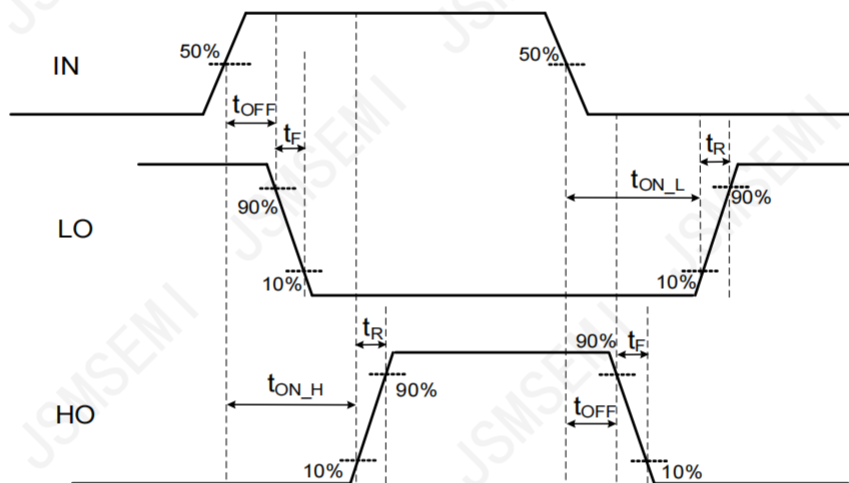


Figure 2. Definition of the Switching Time Waveform

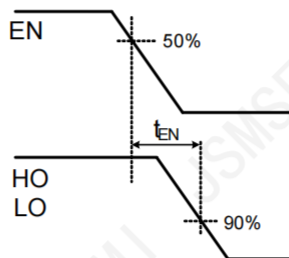


Figure 3. Definition of the turn-off waveform

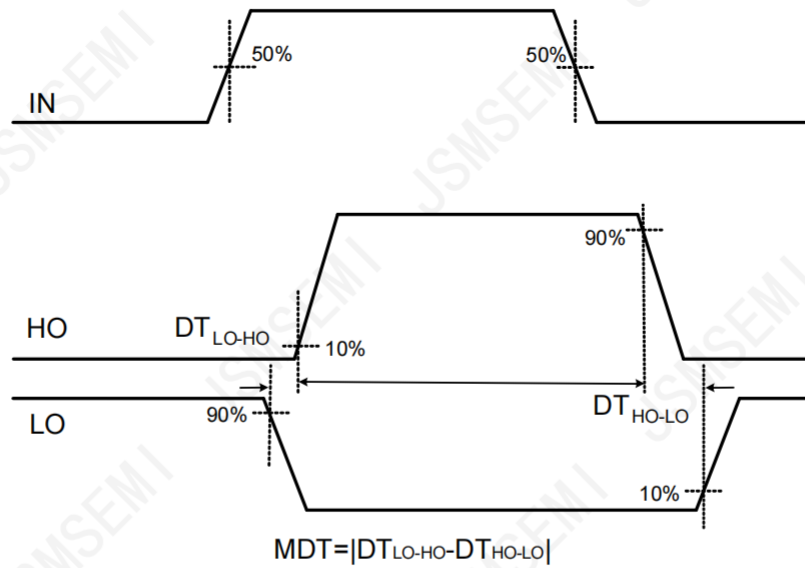


Figure 4. Definition of the dead time waveform

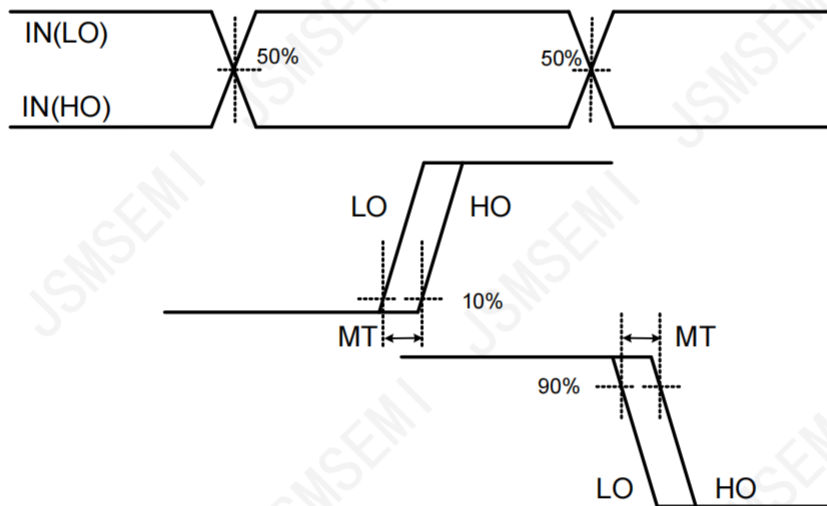


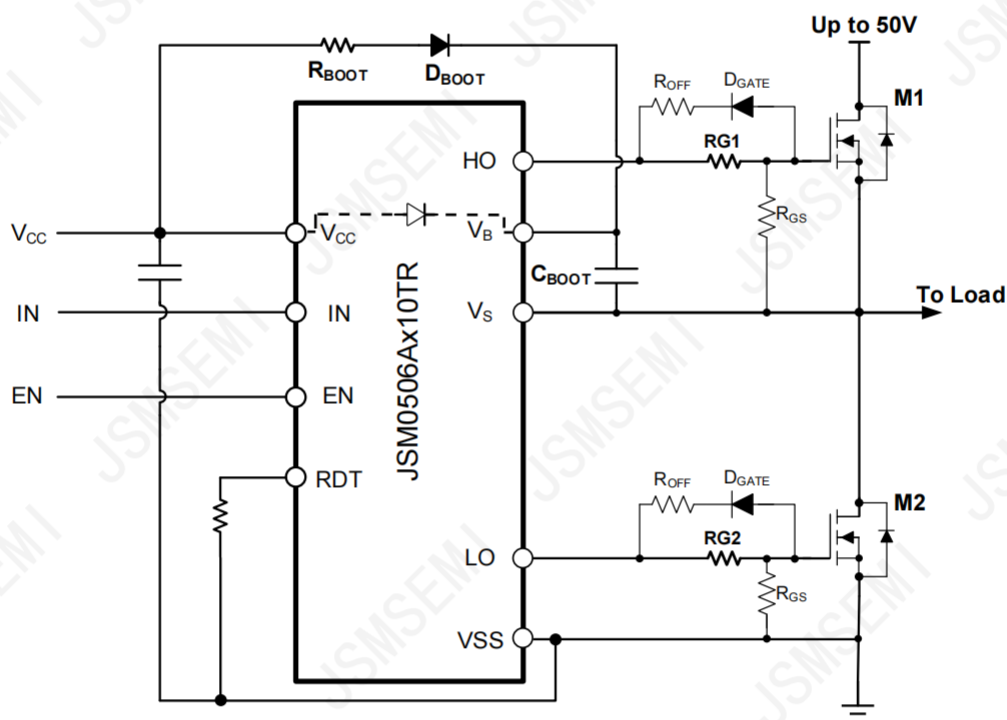
Figure 5. Definition of Delay-Matched Waveform

Device Functional Modes

Function Table

EN	IN Pin	LO Pin	HO Pin
L	-	L	L
H	H	L	H
H	L	H	L

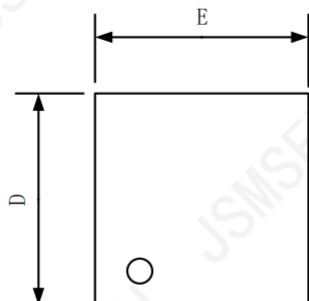
Typical Application



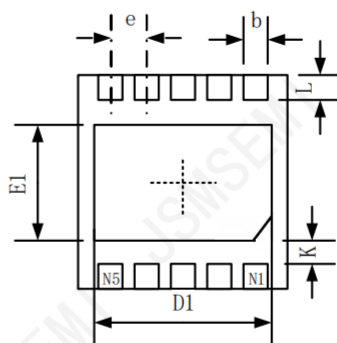
Note: JSM0506A has a built-in bootstrap diode. When the switching frequency $f \geq 250\text{kHz}$ or when working in high temperature environments, peripheral bootstrap diodes and resistors should be used to ensure that the chip works properly. It is recommended to use fast recovery diodes for bootstrap diodes.

Package Information

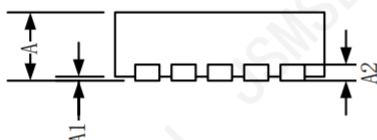
DFN3030-10L



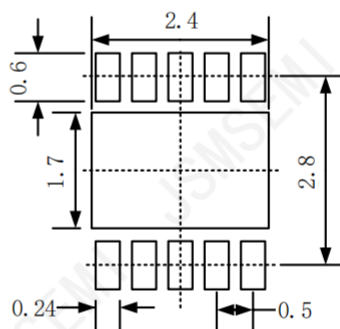
TOP VIEW



BOTTOM VIEW



SIDE VIEW

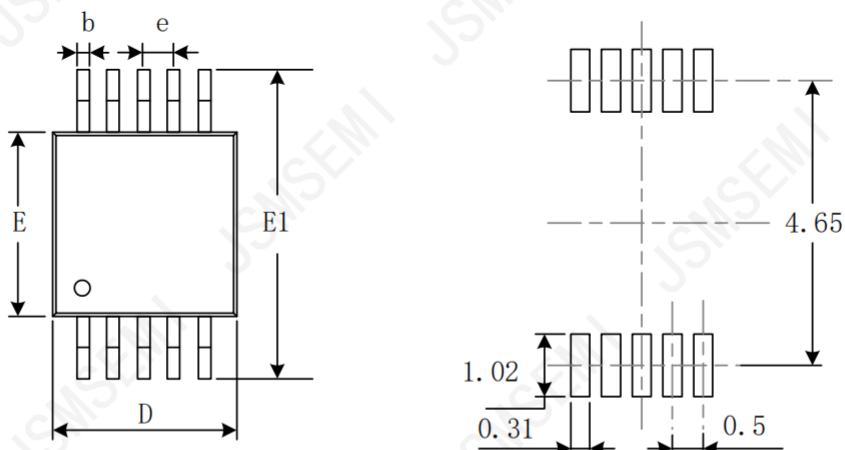


RECOMMENDED LAND PATTERN (Unit: mm)

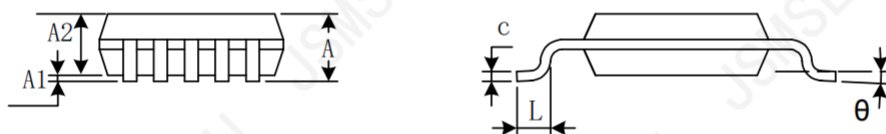
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203		0.008	
b	0.180	0.300	0.007	0.012
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.103
E	2.900	3.100	0.114	0.122
E1	1.500	1.800	0.059	0.071
e	0.500 TYP		0.020 TYP	
k	0.200 MIN		0.008 MIN	
L	0.300	0.500	0.012	0.020

Package Information

MSOP-10



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.50(BSC)		0.020(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

Revision History

Rev.	Change	Date
V1.0	Initial version	3/17/2023

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