

Features

- Input voltage up to 500V
- Fast-recovery MOSFET with $R_{ON}=2.0\Omega$
- Built-in bootstrap diode
- Under-voltage lockout protection
- Cross-conduction prevention
- Compatible with 3.3V/5V logic
- Lower-bridge open source for current sensing
- Low EMI
- Lead-Free (ROHS Compliant)

Description

MSI50550S is compact half-bridge power module for small appliance motor driving. It integrates a robust pre-driver, a bootstrap diode and a pair of fast recovering MOSFET's. MSI50550S stop operations once V_{CC} or V_{B-SW} drops below the UVLO threshold. The cross-conduction prevention protects the power devices from simultaneous turn-on due to noise or errors of control logic.

Ordering Information

Product Summary

V_{IN}	500V
$I_{BSD,Max}$	600mA
$R_{DS(on),typ.}$	2.0 Ω
Q_{rr}	280nC
Dead time	1 μ s

Part No.	Package Type	Packing Form
MSI50550S1	HSOP-11EP	Tape & Reel
MSI50550S2	HSOP-11	Tape & Reel
MSI50550S3	HSOP-12EP	Tape & Reel
MSI50550S4	HSOP-12	Tape & Reel

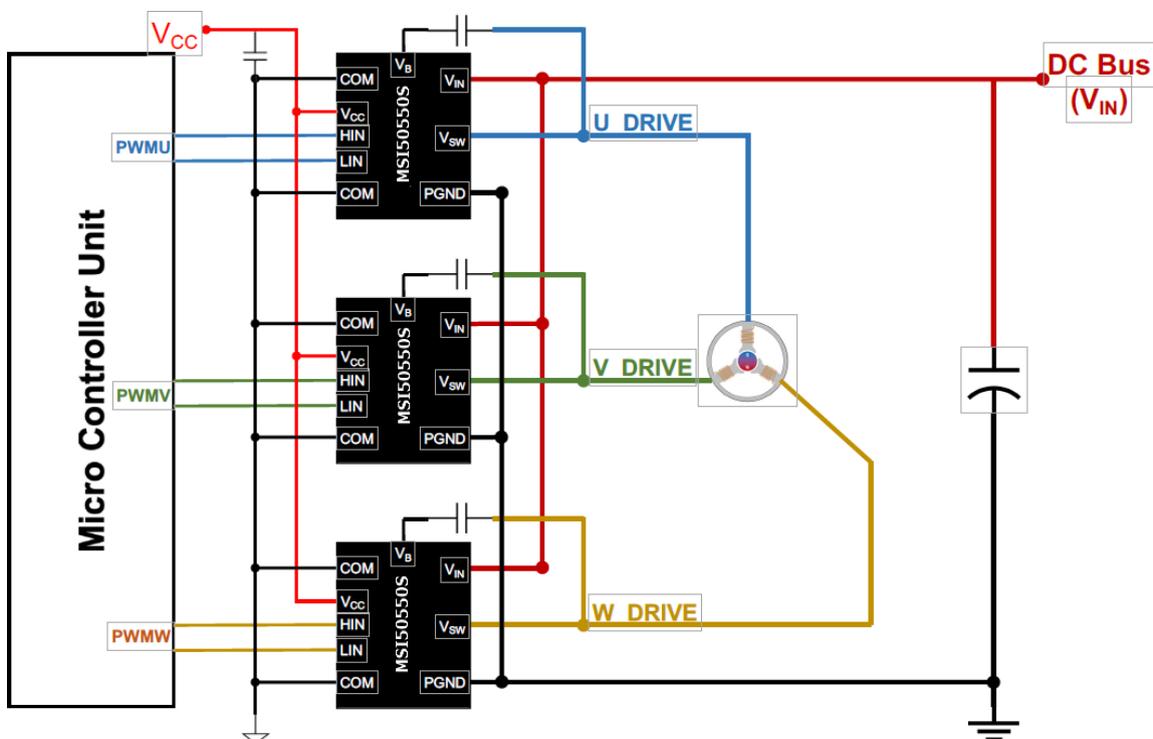


Figure 1. Typical configuration

Pin Assignments & Definition

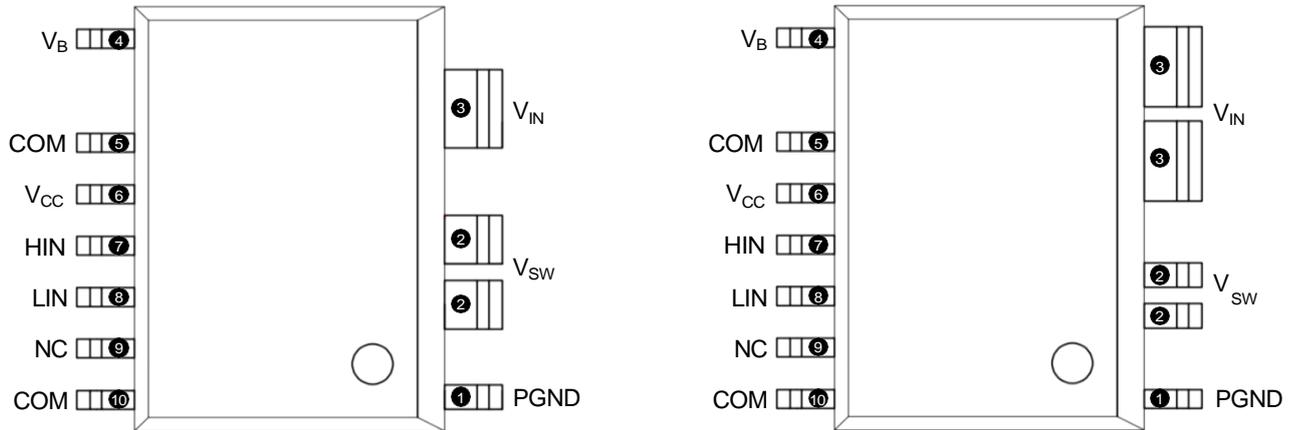


Figure 2 Pin assignment (HSOP-11/HSOP-12)

Pin #	Symbol	Description
1	PGND	Power ground for low side MOSFET, open-source
2	V_{SW}	Phase output, high side floating supply return
3	V_{IN}	Input DC bus
4	V_B	High side floating power supply
5	COM	Ground, low side supply return
6	V_{CC}	Low side power supply
7	HIN	Logic input for high side gate driver control
8	LIN	Logic input for low side gate driver control
9	NC	No connection
10	COM	Ground, low side supply return

Functional Block Diagram

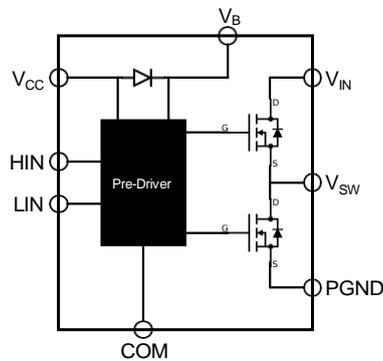


Figure 3. Functional block diagram

Absolute Maximum Ratings

All voltages are absolute voltage referenced to V_{COM} unless otherwise specified. ($T_A=25^{\circ}C$)

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input DC bus supply voltage	-0.3	500	V
V_B	High side floating supply voltage (referred to V_{SW})	-0.3	25	
V_{CC}	Low side supply voltage	-0.3	25	
HIN	High side input logic voltage	-0.3	$V_{CC}+0.3$	
LIN	Low side input logic voltage	-0.3	5.5	
PGND	Low side MOSFET open-source voltage	-0.3	10	
I_D	Single MOSFET continuous current, $T_J<150^{\circ}C$	-	2.5	A
I_{DM}	Single MOSFET pulse current, pulse<100 μ s	-	5.0	
P_D	Package power dissipation, $T_A<25^{\circ}C$ (1)	-		W
R_{thJA}	Thermal resistance, junction to ambient ⁽²⁾	-		$^{\circ}C/W$
T_J	Junction temperature	-40	150	$^{\circ}C$
T_S	Storage temperature	-55	150	

(1) Total power dissipation depends on package and mounting conditions, here is based on 12-lead SOIC package.

(2) Thermal resistance depends on package and mounting conditions, here is based on 12-lead SOIC package.

Recommended Operating Conditions

All voltages are absolute voltage referenced to V_{COM} unless otherwise specified. ($T_A=25^{\circ}C$)

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input DC bus voltage	-	400	V
V_B	High side floating supply absolute voltage	$V_{SW}+12$	$V_{SW}+18$	
V_{CC}	Low side and logic fixed supply voltage	12	18	
HIN	High side input logic voltage	0	5	
LIN	Low side input logic voltage	0	5	
DT	HIN & LIN dead time (depends on MCU control)	1	-	μ s
F_{PWM}	PWM carrier frequency	-	50	kHz
T_A	Ambient temperature	-40	85	$^{\circ}C$

Gate Driver Electrical Characteristics

$V_{B-SW} = V_{CC} = 15V$ unless otherwise specified ($T_A = 25^\circ C$)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
V_{IH}	Logic " 1 " input voltage	3	-	-	V	$V_{CC} = 5V \sim 20V$
V_{IL}	Logic " 0 " input voltage	-	-	0.8		$V_{CC} = 5V \sim 20V$
V_{BSUV+}	V_{B-SW} under voltage on-threshold	4.0	4.7	5.2		$V_{B-SW} = 0V \rightarrow 15V$
V_{BSUV-}	V_{B-SW} under voltage off-threshold	3.8	4.5	5.0		$V_{B-SW} = 15V \rightarrow 0V$
V_{BSUVH}	V_{B-SW} under voltage lockout hysteresis	-	0.2	-		
V_{CCUV+}	V_{CC} under voltage on-threshold	4.0	4.7	5.2		$V_{CC} = 0V \rightarrow 15V$
V_{CCUV-}	V_{CC} under voltage off-threshold	3.8	4.5	5.0		$V_{CC} = 15V \rightarrow 0V$
V_{CCUVH}	V_{CC} under voltage lockout hysteresis	-	0.2	-		
I_{LK}	Offset supply leakage current	-	-	3	μA	$V_B = V_{SW} = 500V$
I_{QCC}	Quiescent V_{CC} supply current	-	20	-		$HIN = LIN = 0V$
I_{QBS}	Quiescent V_{B-SW} supply current	-	15	-		$HIN = LIN = 0V$
I_{IN+}	Logic " 1 " input bias current	-	10	-		$HIN = 5V, LIN = 5V$
I_{IN-}	Logic " 0 " input bias current	-	-	1		$HIN = 0V, LIN = 0V$

MOSFET Electrical Characteristics
 $V_{CC}=V_{BS}=15V, C_L=1nF$ unless otherwise specified ($T_A=25^{\circ}C$)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-source breakdown voltage	500	-	-	V	$V_{CC}=0V, I_D=250\mu A$
I_{DSS}	Zero gate voltage drain leakage current	-	-	1	μA	$V_{CC}=0V, V_{DS}=500V$
V_{SD}	Body diode forward voltage	-	-	1.2	V	$V_{CC}=V_{BS}=15V, I_D=2.5A$
$R_{DS(on)}$	Drain-source on-resistance	-	2.0	2.6	Ω	
T_{RR}	Diode reverse recovery time	-	185	200	ns	$V_{IN}=400V$ $I_F=5A$ $diF/dt=100A/\mu s$ load: IPW6R041C6
$I_{RR,MAX}$	Peak diode reverse recovery current	-	4.2	4.4	A	
Q_{RR}	Diode reverse recovery charge	270	285	300	nC	
t_{on}	Turn-on propagation delay	-		-	ns	
t_{off}	Turn-off propagation delay	-		-	ns	
t_r	V_{SW} rise time	-		-	ns	
t_f	V_{SW} fall time	-		-	ns	
$SR_{V,rising}$	V_{SW} rising edge voltage slew rate	-		-	V/ns	
$SR_{I,rising}$	V_{SW} rising edge current slew rate	-		-	A/ μs	
$SR_{V,falling}$	V_{SW} falling edge voltage slew rate	-		-	V/ns	
$SR_{I,falling}$	V_{SW} falling edge current slew rate	-		-	A/ μs	

Timing Diagrams

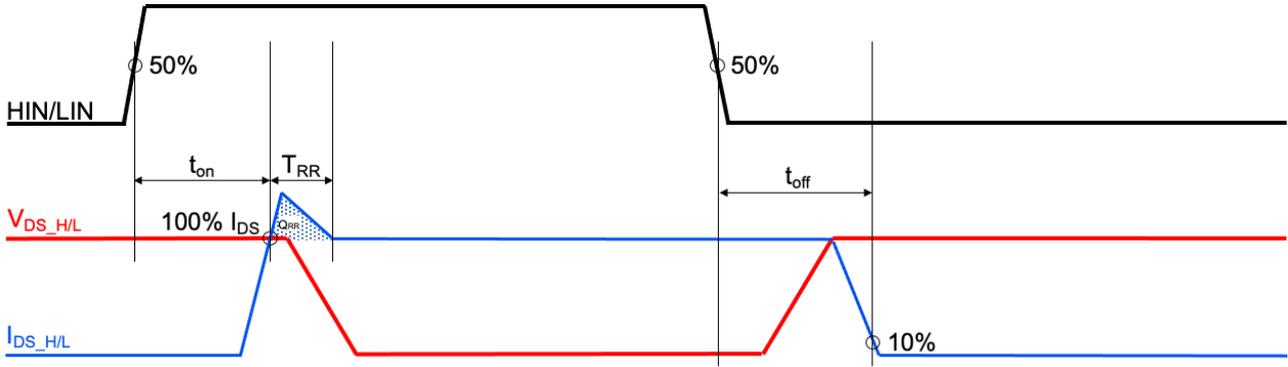
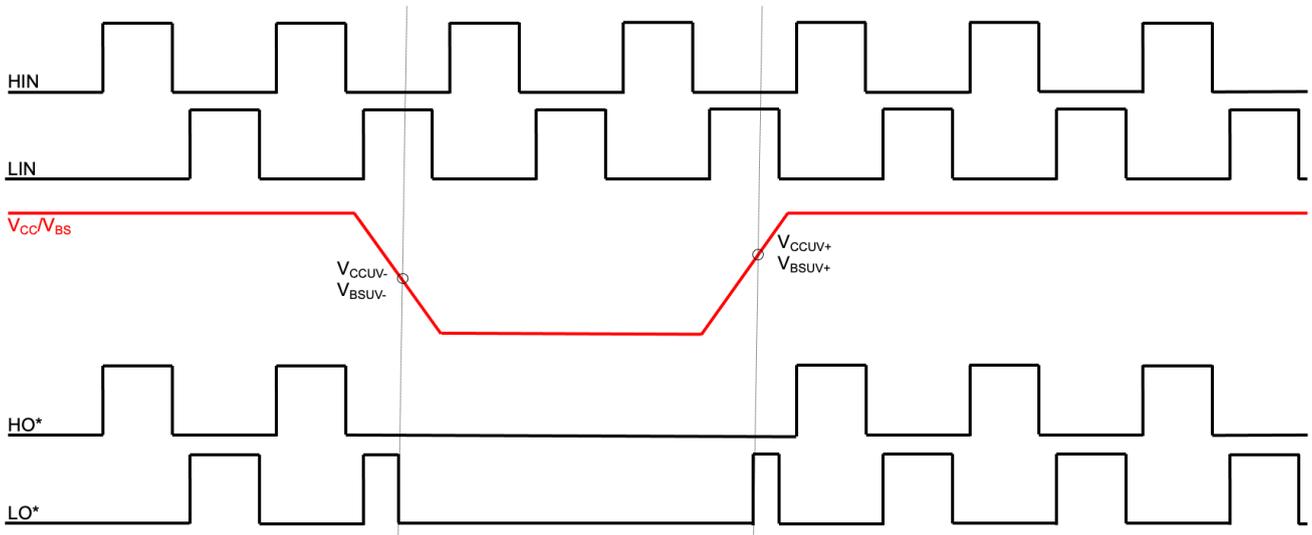


Figure 4. Propagation delay, diode reverse recovery time & recovery charge

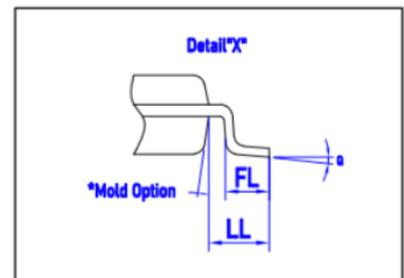
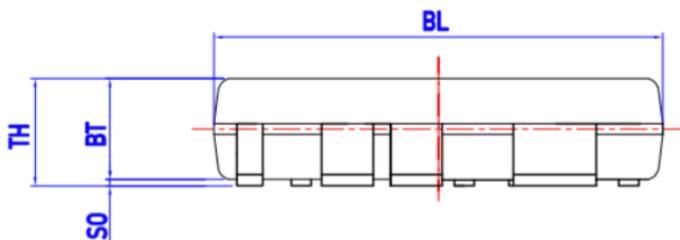
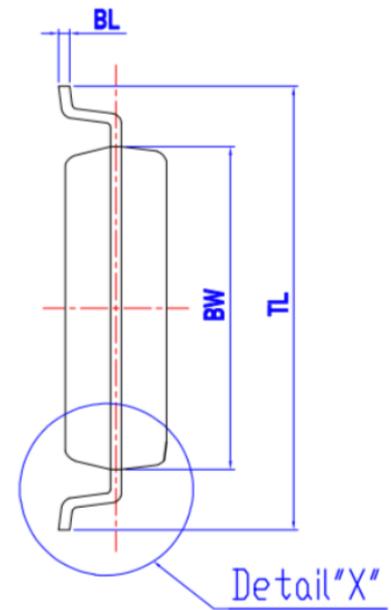
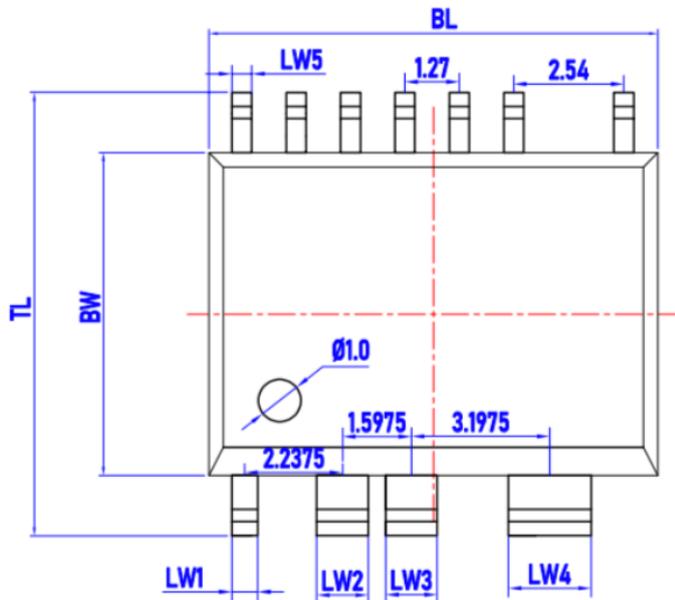


*HO & LO are gate control signals internal to the power module.

Figure 5. Under-Voltage Lock-Out (UVLO) for V_{CC}/V_{BS}

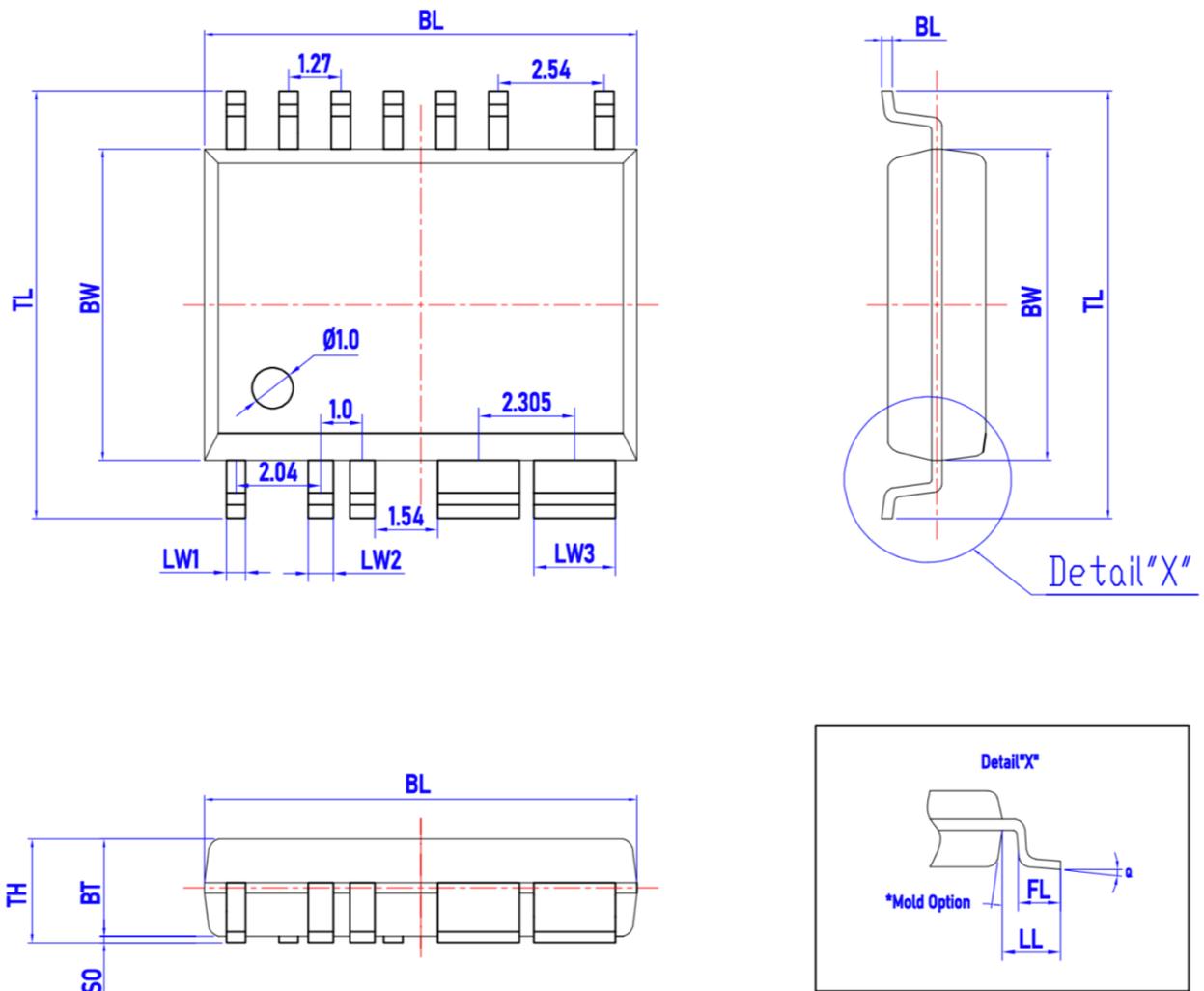
Package Information

HSOP-11 (w/ or w/o exposed pad)



Item	BL	BW	TL	LW1	LW2	LW3	LW4	LW5	FT	BT	S0	TH	LL	FL	Q
Unit	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	°
Spec	10.45	7.70	10.50	0.60	1.195	1.19	1.905	0.4	0.260	2.44	0.25	2.590	1.50	1.00	8
	(10.35)	(7.50)	(10.30)	TYP	TYP	TYP	TYP	TYP	(0.254)	(2.34)	(0.20)	Max.	(1.40)	(0.80)	(4)
	10.2	7.30	10.10						0.244	2.24	0.10		1.30	0.60	0

HSOP-12 (w/ or w/o exposed pad)



Item	BL	BW	TL	LW1	LW2	LW3	FT	BT	S0	TH	LL	FL	Q
Unit	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	°
Spec	10.45	7.70	10.50	0.40	0.60	1.905	0.260	2.44	0.25	2.590	1.50	1.00	8
	(10.35)	(7.50)	(10.30)	TYP	TYP	TYP	(0.254)	(2.34)	(0.20)	Max.	(1.40)	(0.80)	(4)
	10.2	7.30	10.10				0.244	2.24	0.10		1.30	0.60	0