

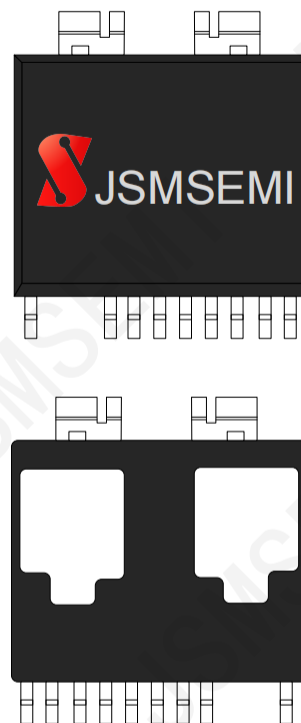
General Description

JSM05M50HBE is a highly integrated and highly reliable half-bridge brushless DC motor drive circuit, primarily

used for driving low-power motors such as fans. It incorporates fast recovery power MOSFETs and half-bridge high-voltage gate drive circuits.

The JSM05M50HBE integrates an undervoltage protection function internally, providing excellent protection and fail-safe operation.

JSM05M50HBE features a design that is highly insulated, easily thermally conductive, and low in electromagnetic interference. It offers a very compact package, making it highly convenient to use, especially suitable for applications built into motors and situations requiring compact installation. JSM05M50HBE is packaged in ESOP13, can operate within the temperature range of -40 to 150°C.



Features

- 500 V $R_{DS(on)} = 1.4\Omega$ (Typ) FRFET MOSFET Inverter with Gate Drivers and Protection
- Built-In Bootstrap Diodes Simplify PCB Layout
- High-Side Under-Voltage Protection
-Trigger level : 7.7V
-Reset level : 8.7V
- High-level effective, supported 3.3V, 5V and 15V input
- Optimized for Low Electromagnetic Interference
- HVIC for Gate Driving and Under-Voltage Protection
- Isolation Rating: 1500 V_{rms} / min.

- Moisture Sensitive Level (MSL) 3
- RoHS Compliant

Applications

- BLDC Motor control
- Indoor/outdoor air conditioning
- Refrigerator compressor
- Exhaust fan
- Fan
- Air purifier
- Dishwasher water pump

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship, Quantity	Green
JSM05M50HBE	ESOP-13	JSM05M50HBE	-40 to 150°C	3	T&R, 2500	RoHS

Pin descriptions

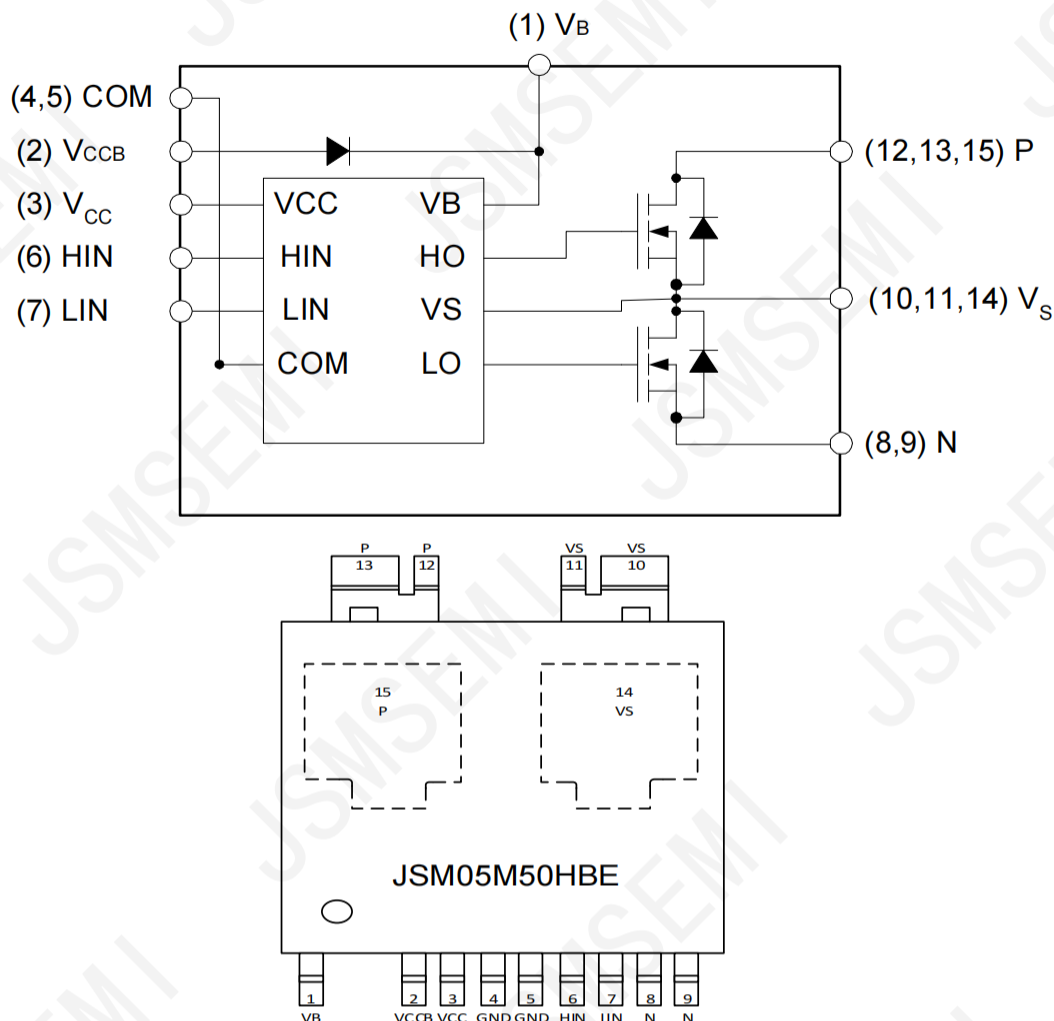


Figure 1. Pin Configuration and Internal Block Diagram (Bottom View)

Pin Number	Pin Name	Pin Description
1	VB	Bias Voltage for High-Side MOSFET Driving
2	VCCB	Internal Diode Input
3	VCC	Bias Voltage for Low Side MOSFET Driving
4	COM	IC Common Supply Ground
5	COM	IC Common Supply Ground
6	HIN	Signal Input for High-Side
7	LIN	Signal Input for Low-Side
8	N	Negative DC-Link Input
9	N	Negative DC-Link Input
10	VS	Output for Bias Voltage Ground for High-Side MOSFET Driving
11	VS	Output for Bias Voltage Ground for High-Side MOSFET Driving
12	P	Positive DC-Link Input
13	P	Positive DC-Link Input
14	VS	Output for Bias Voltage Ground for High-Side MOSFET Driving
15	P	Positive DC-Link Input



Absolute Maximum Ratings

Exceeding the limit maximum rating may cause permanent damage to the device. All voltage parameters are rated with reference to COM and an ambient temperature of 25°C.

Inverter Part (each MOSFET unless otherwise specified.)

Symbol	Parameter	Conditions	Ratings	Unit
V _{DSS}	Drain-Source Voltage of Each MOSFET	T _C = 25°C	500	V
I _D	Each MOSFET Current, Continuous	T _C = 25°C	5	A
		T _C = 75°C	2.7	A
I _{DM}	Each MOSFET Pulse Current, Peak	T _C = 25°C, less than 100us	10	A
		T _C = 75°C	7	A
I _{Drms}	Each MOSFET Current, Rms	T _C = 25°C, F _{PWM} < 20KHz	0.85	Arms
P _D	Maximum Power Dissipation	T _C = 25°C, For Each MOSFET	15	W

Control Part (each HVIC unless otherwise specified.)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Control Supply Voltage	Applied between V _{CC} and COM	20	V
V _{BS}	High-side Bias Voltage	Applied between V _B and V _S	20	V
V _{IN}	Input Signal Voltage	Applied between V _{IN} and COM	-0.3~V _{CC} +0.3	V

Bootstrap Diode Part (each bootstrap diode unless otherwise specified.)

Symbol	Description	Conditions	Rating	Unit
V _{RRMB}	Maximum Repetitive Reverse Voltage	T _C = 25°C	500	V
I _{FB}	Forward Current	T _C = 25°C	0.25	A
I _{FPB}	Forward Peak Current, Peak	T _C = 25°C, Less than 1mS	0.5	A

Total System

Symbol	Parameter	Conditions	Ratings	Unit
T _J	Operating Junction Temperature		-40~150	°C
T _{STG}	Storage Temperature	T _C = 25°C	-40~150	°C
V _{ISO}	Isolation Voltage	60Hz, Sinusoidal, AC 1 min, between pins and heat-sink plate	1500	Vrms

NOTE1: To insure safe operation of the IPM, the average junction temperature should be limited to T_J ≤ 150°C (@T_C ≤ 100°C).

Thermal Resistance

Symbol	Parameter	Conditions	Ratings	Unit
R _{th(J-B)}	Thermal resistance, junction to mounting pad, each MOSFET	For Each MOSFET	1.0	°C/W
R _{th(J-A)}	Thermal resistance, junction to ambient, each MOSFET	For Each MOSFET	40	°C/W



Recommended Operating Condition

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{PN}	Supply Voltage	Applied between P and N	-	300	400	V
V _{CC}	Control Supply Voltage	Applied between VCC and COM	13.5	-	18.5	V
V _{BS}	High-Side Bias Voltage	Applied between VB and VS	13.5	-	18.5	V
V _{IN(ON)}	Input ON Threshold Voltage	Applied between VIN and COM	3.0	-	V _{CC}	V
V _{IN(OFF)}	Input OFF Threshold Voltage		0	-	0.6	V
t _{dead}	Blanking Time for Preventing Arm-Shor	V _{CC} = V _{BS} = 13.5 ~ 16.5 V, T _j <150°C	1.0	-	-	μs
F _{PWM}	PWM Switching Frequency	T _j <150°C	-	15	-	kHz

Electrical Characteristics (T_j = 25°C, V_{CC} = V_{BS} = 15 V unless otherwise specified.)

Inverter Part (each MOSFET unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain - Source Breakdown Voltage	V _{IN} = 0 V, I _D = 250μA (NOTE 2)	500	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{IN} = 0 V, V _{DS} = 500 V	-	-	0.5	μA
V _{SD}	Drain - Source Diode Forward Voltage	V _{CC} = V _{BS} = 15V, V _{IN} = 0 V, I _D = -4 A	-	-	1.2	V
R _{DS(on)}	Drain-Source Turn-On Resistance	V _{CC} = V _{BS} = 15 V, V _{IN} = 5 V, I _D = 2 A	-	1.4	-	ohm
t _{ON}	Switching Times	V _{PN} = 300 V, V _{CC} = V _{BS} = 15 V, I _D = 0.5 A V _{IN} = 0/5 V, Inductive Load L = 3 mH (NOTE 3)	-	870	-	ns
t _{OFF}			-	520	-	ns
t _{rr}			-	210	-	ns
E _{ON}			-	40	-	μJ
E _{OFF}			-	10	-	μJ
R _{BSOA}	Reverse Bias Safe Operating Area	V _{PN} = 400 V, V _{CC} = V _{BS} = 15 V, I _D = I _{DP} , V _{DS} = BV _{DSS} , T = 150°C	Full Square			

NOTE 2: BV_{DSS} is the absolute maximum voltage rating between drain and source terminal of each FRFET inside IPM. V_{PN} should be sufficiently less than this value considering the effect of the stray inductance so that V_{DS} should not exceed BV_{DSS} in any case.

NOTE 3: t_{ON} and t_{OFF} include the propagation delay time of the internal drive IC. Listed values are measured at the laboratory test condition, and they can be different according to the field applications due to the effect of different printed circuit boards and wirings. Please see Fig 2 for the switching time definition.

Control Part (each HVIC unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _{QCC}	Quiescent VCC Supply Current	V _{CC} = 15V V _{IN} = 5V Applied between VCC and COM	-	100	220	μA
I _{QB}	Quiescent VBS Supply Current	V _{DB} = 15V V _{IN} = 5V Applied between VB -VS	-	50	100	μA
UV _{CCD}	Low-Side Under-Voltage Protection	VCC Under-Voltage Protection Detection Level	-	7.7	-	V
UV _{CCR}		VCC Under-Voltage Protection Reset Level	-	8.7	-	V
UV _{BSD}	High-Side Under-Voltage Protection	VBS Under-Voltage Protection Detection Level	-	7.7	-	V
UV _{BSR}		VBS Under-Voltage Protection Reset Level	-	8.7	-	V
V _{IH}	ON Threshold Voltage	Logic HIGH Level, Applied between VIN and COM	-	-	2.6	V
V _{IL}	OFF Threshold Voltage	Logic Low Level, Applied between VIN and COM	-	-	0.8	V



Function Description

Basic Function description

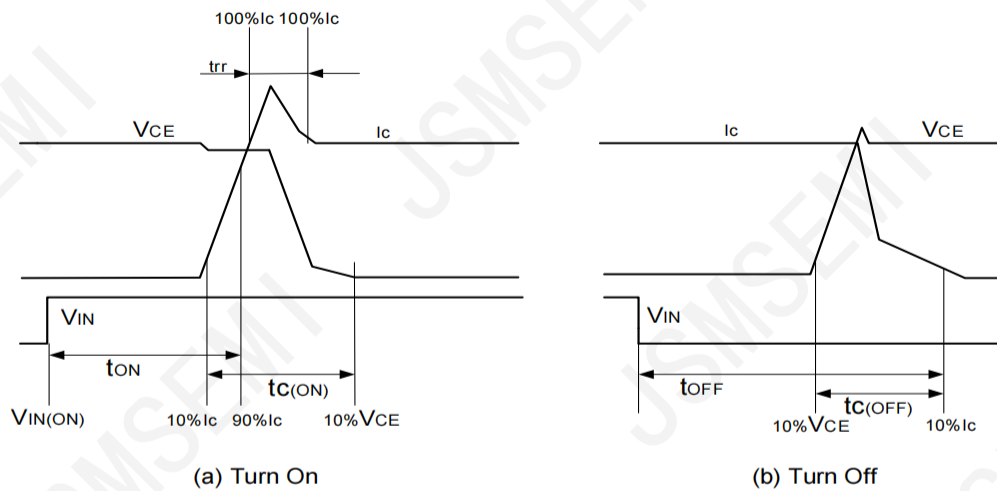


Figure 2. Switching Time Definitions

Time Charts of Protective Function

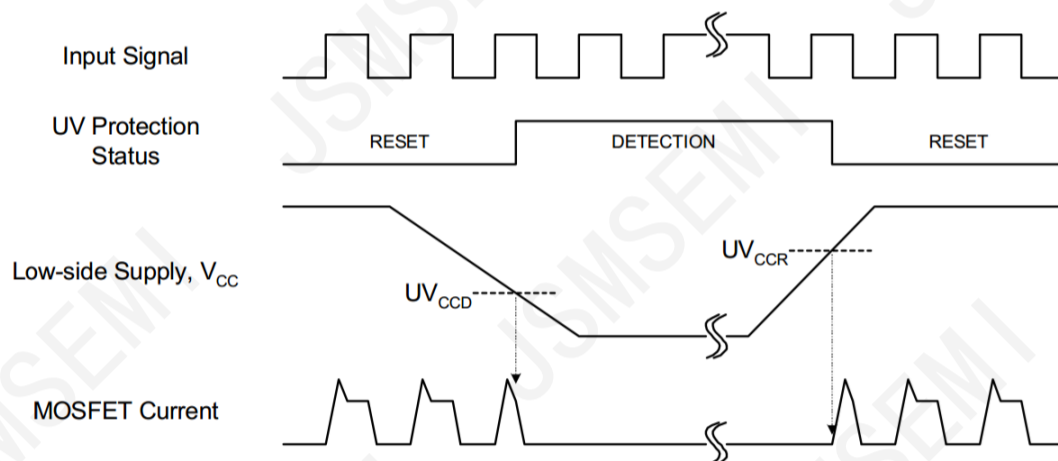


Figure 3. Under voltage Protection (Low-side)

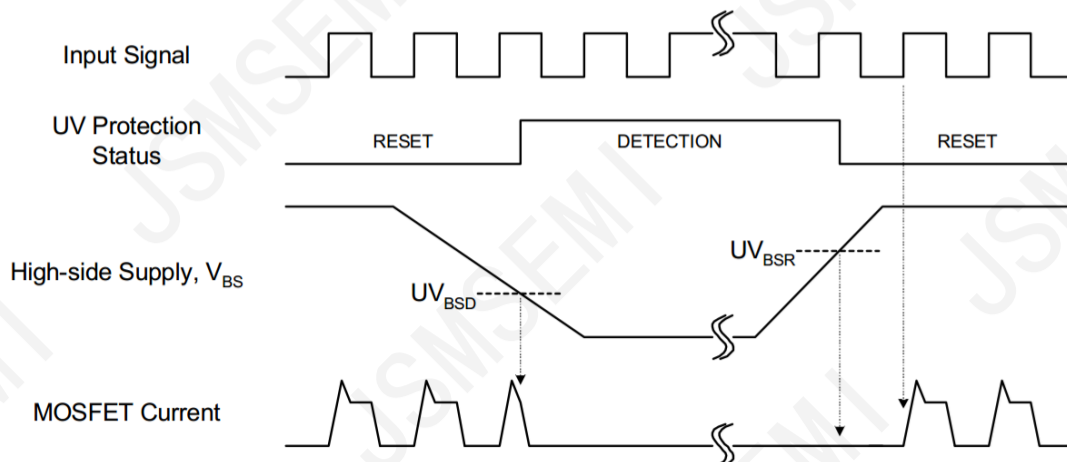


Figure 4. Under voltage Protection (High-side)

Typical Application Circuit

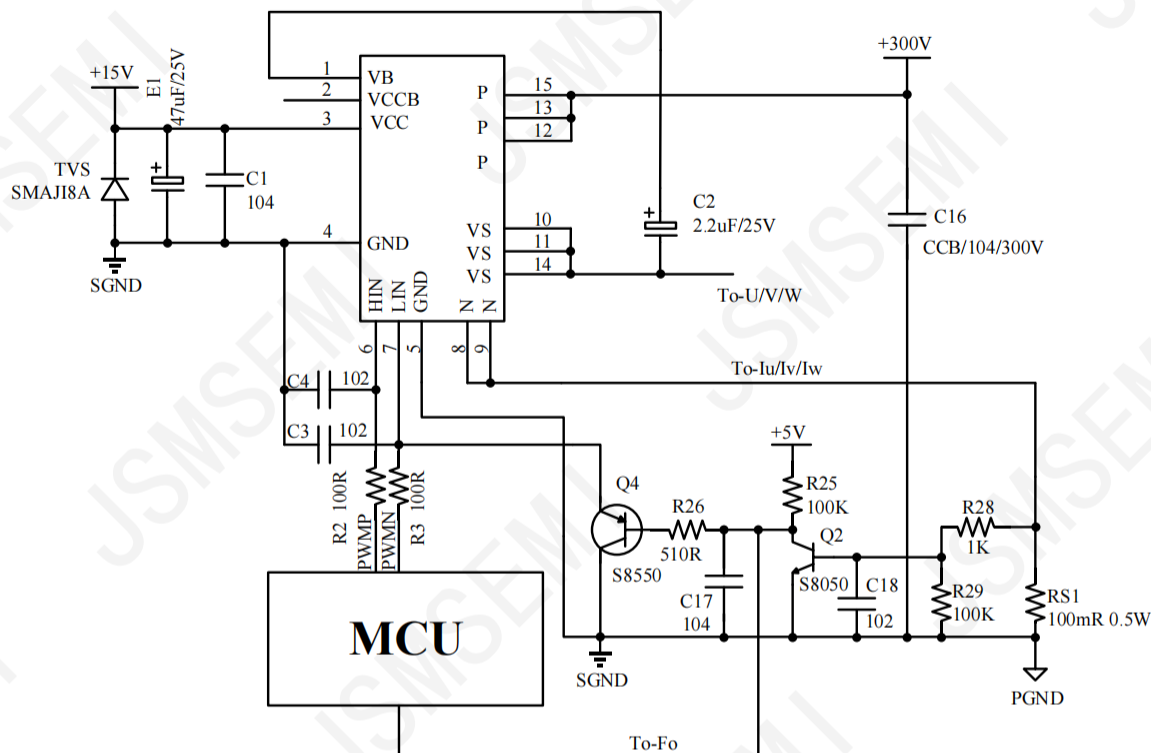
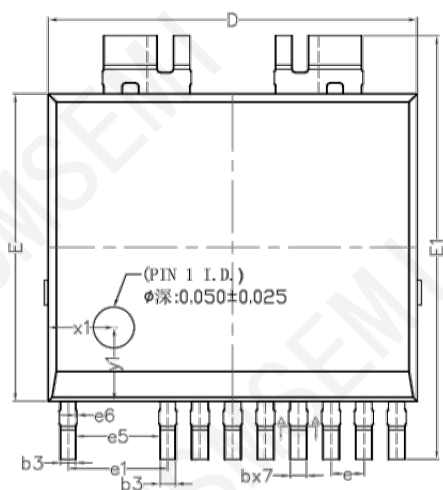


Figure 5. Typical Application Connection JSM05M50HBE

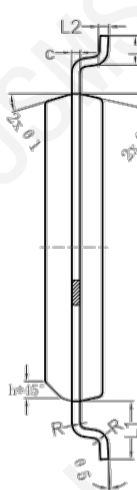
HIN	LIN	Output	Note
0	0	High Resistance	Both MOSFET Off
0	1	0	Low side MOSFET On
1	0	VDC	High side MOSFET On
1	1	Forbidden	Shoot through
open	open	High Resistance	Both MOSFET Off

Package Information

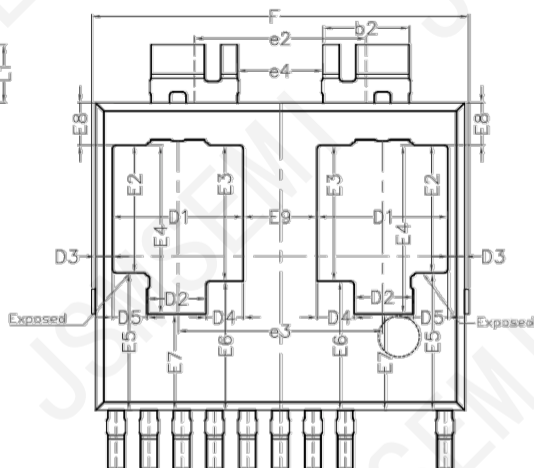
ESOP-13



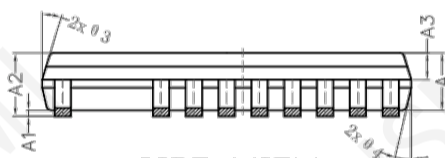
TOP VIEW



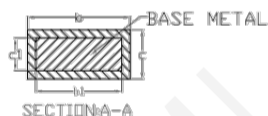
SIDE VIEW



BOTTOM VIEW



SIDE VIEW



SECTION A-A

Size Symbol	MIN(mm)	TYP(mm)	MAX(mm)	Size Symbol	MIN(mm)	TYP(mm)	MAX(mm)
A	1.350	1.400	1.450	E8	0.932	1.032	1.132
A1	0.020	/	0.120	E9	1.750	1.800	1.850
A2	1.370	/	1.570	e	0.750	0.800	0.850
A3	0.600	0.650	0.700	e1	2.380	2.430	2.480
b	0.380	/	0.460	e2	4.140	4.190	4.240
b1	0.370	0.400	0.430	e3	4.940	4.990	5.040
b2	2.050	2.100	2.150	e4	2.040	2.090	2.140
b3	0.320	0.370	0.420	e5	1.910	2.060	2.110
c	0.193	/	0.253	e6	-0.02	0.030	0.080
c1	0.170	0.203	0.230	F	9.000	-	9.400
D	8.900	9.000	9.100	L	0.620	0.720	0.820
D1	3.090	3.190	3.290	L1	1.320	1.420	1.520
D2	1.340	1.440	1.540		L1 difference between the two sides:0.15 MAX		
D3	0.310	0.410	0.510	L2	0.25 BSC		
D4	0.805	0.905	1.005	R	0.10	/	/
D5	0.745	0.845	0.945	h	0.35	0.40	0.45
E	7.400	7.500	7.600	Ø1	15°	17°	19°
E1	10.240	10.340	10.440	Ø2	11°	13°	15°
E2	3.018	3.118	3.218	Ø3	15°	17°	19°
E3	3.218	3.318	3.418	Ø4	11°	13°	15°
E4	4.018	4.118	4.218	Ø5	0°	3°	6°
E5	3.250	3.350	3.450	Ø	0.90	1.00	1.10
E6	3.050	3.150	3.250	x1	1.50	1.60	1.70
E7	2.250	2.350	2.450	vl	1.70	1.80	1.90

Revision History

Rev.	Change	Date
V1.0	Initial version	2/27/2024
V1.1	Figure Update, Rectify parameters	8/07/2026

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