DESCRIPTION

The AG2136 is a high voltage, high speed power MOSFET and IGBT drivers with a three independent high and low side referenced output channels for 3-phase applications. The floating channels can be used to drive N-channel power MOSFETs or IGBTs in the high side configuration which operates up to 600V. Logic inputs are compatible with CMOS or LSTTL outputs, down to 3.3V logic. A current trip function which terminates all six outputs can be derived from an external current sense resistor. An enable function is available to terminate all six outputs simultaneously. An open-drain FAULT signal is provided to indicate that an over-current or under-voltage shutdown has occurred. Over-current fault conditions are cleared automatically after a delay programmed externally via an RC network connected to the RCIN input. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify use in high frequency applications.

AG2136 is available in a SOP28 package.

FEATURES

- Fully operational to +600V
- 3.3V logic compatible
- dV/dt Immunity ±50V/nsec
- Floating channel designed for bootstrap operation
- Gate drive supply range from 10V to 20V
- UVLO for all channels
- Cross-conduction prevention logic
- Over-current shutdown turns off all six drivers
- Externally programmable delay for automatic fault clear
- Independent 3 half-bridge drivers
- - 6V negative Vs ability
- Matched propagation delay for all channels
- Available in a SOP28 package.

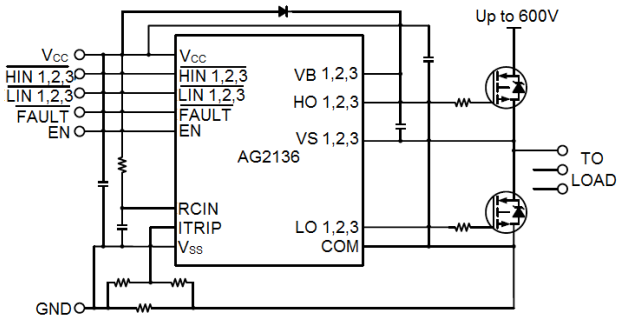
APPLICATION

- Motor Control
- Air Conditioners/ Washing Machines
- General Purpose Inverters
- Micro/Mini Inverter Drives

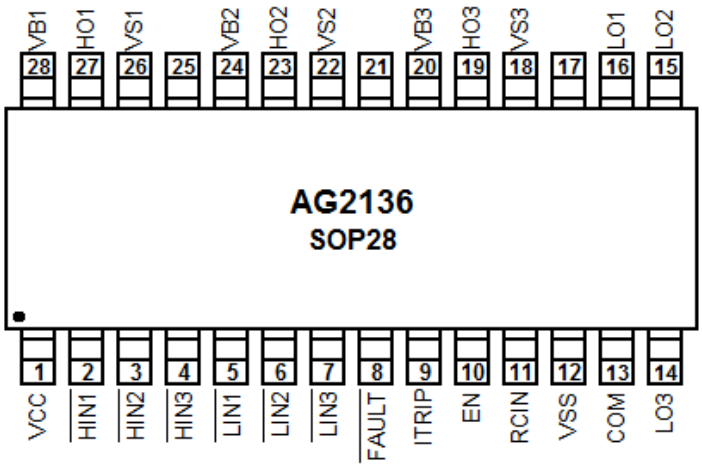
ORDERING INFORMATION

Package Type	Part Number	
SOP28 (wide body) SPQ: 1,000pcs/Reel	M28	AG2136M28R
		AG2136M28VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

TYPICAL APPLICATION CIRCUIT



PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	V_{CC}	Low side and logic fixed supply voltage
2	$\overline{HIN1}$	Signal Input for 1 Phase High-side
3	$\overline{HIN2}$	Signal Input for 2 Phase High-side
4	$\overline{HIN3}$	Signal Input for 3 Phase High-side
5	$\overline{LIN1}$	Signal Input for 1 Phase Low-side
6	$\overline{LIN2}$	Signal Input for 2 Phase Low-side
7	$\overline{LIN3}$	Signal Input for 3 Phase Low-side
8	$\overline{FAULT}$	Indicates over-current (ITRIP)or low-side under-voltage lockout
9	ITRIP	Analog input for overcurrent shutdown.
10	EN	Logic input to enable I/O functionality
11	RCIN	External RC network input used to define FAULT CLEAR delay
12	V_{SS}	Logic ground
13	COM	Low side gate drivers return
14	LO3	Low side gate driver outputs for 3 Phase
15	LO2	Low side gate driver outputs for 2 Phase
16	LO1	Low side gate driver outputs for 1 Phase
18	VS3	High voltage floating supply return for 3 Phase
19	HO3	High side gate driver outputs for 3 Phase
20	VB3	High side floating supply for 3 Phase

Pin #	Symbol	Function
22	VS2	High voltage floating supply return for 2 Phase
23	HO2	High side gate driver outputs for 2 Phase
24	VB2	High side floating supply for 2 Phase
26	VS1	High voltage floating supply return for 1 Phase
27	HO1	High side gate driver outputs for 1 Phase
28	VB1	High side floating supply for 1 Phase

ABSOLUTE MAXIMUM RATINGS

$V_{B1,2,3}$, High Side Floating Supply		-0.3V ~ 625V
$V_{S1,2,3}$, High Side Floating Supply Return		V_B -25V ~ V_B +0.3V
$V_{HO1,2,3}$, High Side Gate Drive Output		V_S -0.3V ~ V_B +0.3V
V_{CC}, Low Side and Main Power Supply		-0.3V ~ 25V
$V_{LO1,2,3}$, Low Side Gate Drive Output		-0.3V ~ V_{CC} +0.3V
V_{IN}, Logic Input of $\overline{HIN}$ & $\overline{LIN}$		-0.3V ~ V_{SS} +5.5V
COM, Power Ground		V_{CC} -25V ~ V_{CC} +0.3V
V_{RCIN}, RCIN Input Voltage		V_{SS} -0.3V ~ V_{CC} +0.3V
V_{FLT}, $\overline{FAULT}$ Output Voltage		V_{SS} -0.3V ~ V_{CC} +0.3V
dV_S/dt, Allowable Offset Supply Voltage Transient		50V/ns
ESD, HBM Model		2.0kV
ESD, CDM Model		500V
P_D, Package Power Dissipation @ T_A ≤25°C	SOP28	0.625W
Rth_{JA}, Thermal Resistance Junction to Ambient	SOP28	200℃/W
T_J, Junction Temperature		150℃
T_S, Storage Temperature		-55℃~150℃
T_L, Lead Temperature (Soldering, 10 seconds)		300℃

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Max.	Units
High Side Floating Supply	$V_{B1,2,3}$	V_S +10	V_S +20	V
High Side Floating Supply Return	$V_{S1,2,3}$	-6	600	
High Side Gate Drive Output Voltage	$V_{HO1,2,3}$	$V_{S1,2,3}$	$V_{B1,2,3}$	
Low Side Supply	V_{CC}	10	20	
Low Side Gate Drive Output Voltage	$V_{LO1,2,3}$	0	V_{CC}	
Logic Input Voltage($\overline{HIN}$ & $\overline{LIN}$)	V_{IN}	0	V_{CC}	
Logic Ground	V_{SS}	-5	5	
RCIN Input Voltage	V_{RCIN}	V_{SS}	V_{CC}	
$\overline{FAULT}$ Output Voltage	V_{FLT}	V_{SS}	V_{CC}	
Ambient Temperature	T_A	-40	125	℃

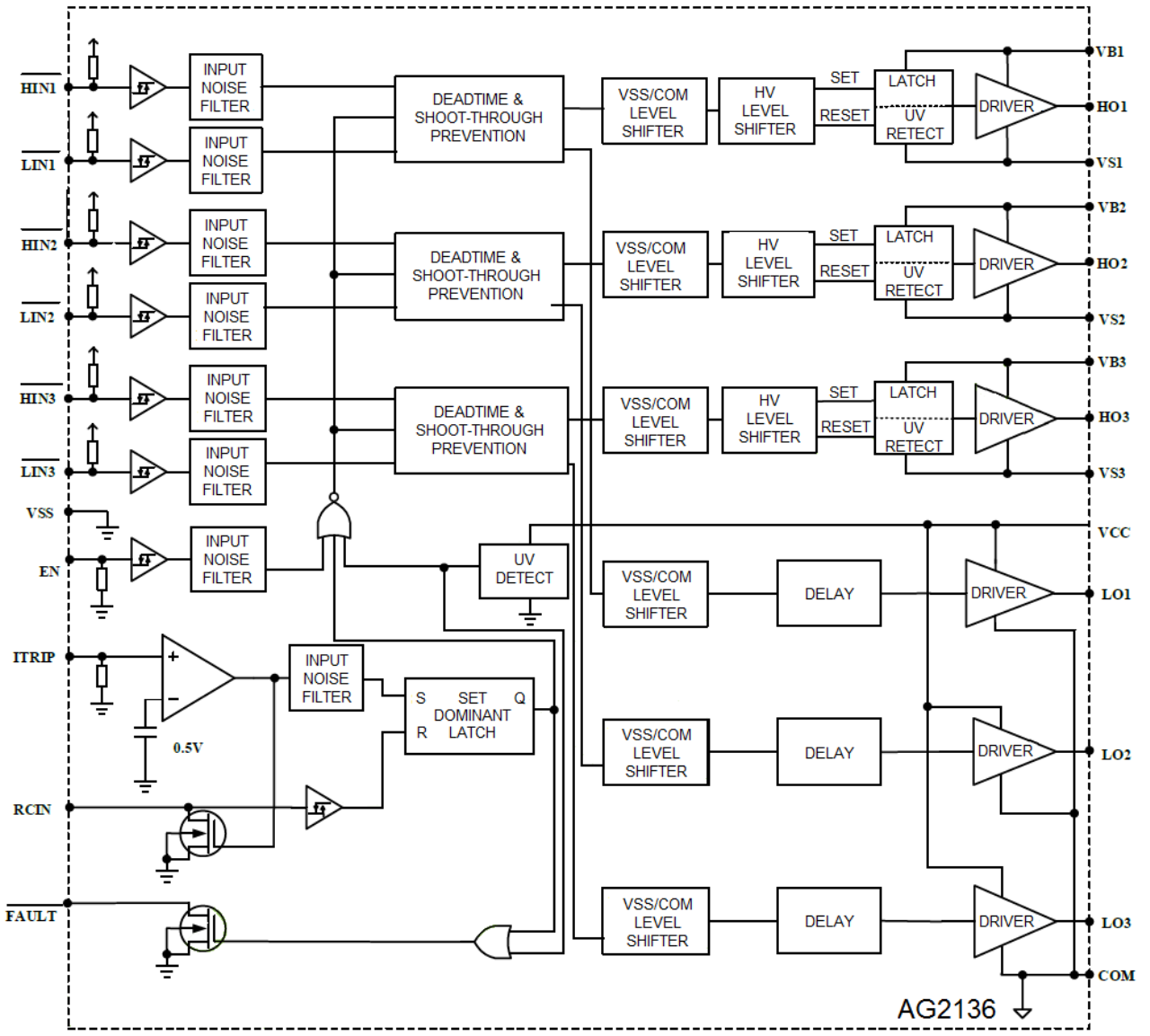
ELECTRICAL CHARACTERISTICS

V_{BIAS} (V_{CC}, V_{BS}) = 15V, C_L = 1000pF and T_A = 25°C, unless otherwise specified.

Parameter		Symbol	Conditions	Min	Typ.	Max	Units
Dynamic							
Turn-On Propagation Delay		t_{on}		500	630	850	ns
Turn-Off Propagation Delay		t_{off}		500	630	850	
Turn-On rise time		t_r		-	60	130	
Turn-Off fall time		t_f		-	40	90	
ENABLE low to output shutdown propagation delay		t_{EN}		400	625	950	
ITRIP to output shutdown propagation delay		t_{ITRIP}		500	750	1200	
ITRIP blanking time		t_{bl}		-	350	-	
ITRIP to $\overline{FAULT}$ propagation delay		t_{FLT}		400	625	950	
Input filter time ($\overline{HIN}$ & $\overline{LIN}$)	Negative Pulse	t_{FLTIN}		230	390	540	
	Positive Pulse			150	300	460	
Input filter time (EN)		$t_{filterEN}$		200	350	-	
Deadtime		DT		190	290	420	
Matching delay ON and OFF		MT		-	-	50	
Matching delay, max (t_{on}, t_{off}) – min (t_{on}, t_{off}), (t_{on}, t_{off} are applicable to all 3 channels)		MDT		-	-	60	
Output pulse width matching		PM		-	-	75	
FAULT clear time RCIN: R=2MΩ, C=1nF		t_{FLTCLR}		1.3	1.6	2	ms
Static							
Logic “1”($\overline{HIN}$ & $\overline{LIN}$)Input Voltage		V_{IH}		2.5	-	-	V
Logic “0” ($\overline{HIN}$ & $\overline{LIN}$) Input Voltage		V_{IL}		-	-	0.8	
Enable Positive Going Threshold		$V_{EN,TH}$+		-	-	2.5	
Enable Negative Going Threshold		$V_{EN,TH}$-		0.8	-	-	
ITRIP Positive Going Threshold		$V_{IT,TH}$+		0.37	0.46	0.55	
ITRIP Input Hysteresis		$V_{IT,HYS}$		-	0.06	-	
RCIN Positive Going Threshold		$V_{RCIN,TH}$+		-	8	-	
RCIN Input Hysteresis		$V_{RCIN,HYS}$		-	3	-	
High Level Output Voltage, V_{BIAS} - V_O		V_{OH}		-	-	0.3	
Low Level Output Voltage, V_O		V_{OL}		-	-	0.3	

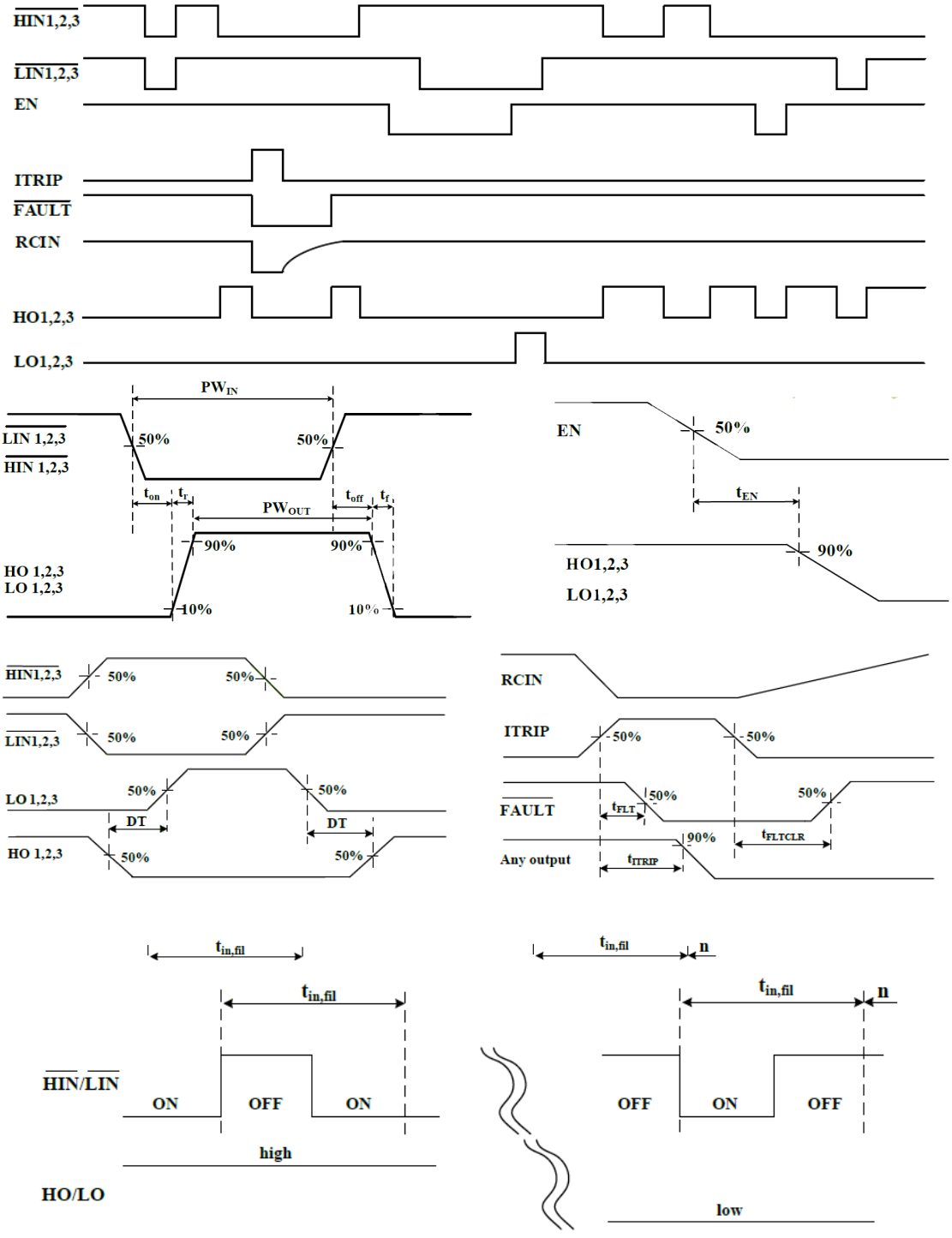
Parameter	Symbol	Conditions	Min	Typ.	Max	Units
V_{CC} Supply UVLO Threshold	V_{CCUV+}		7.8	8.6	9.8	V
	V_{CCUV-}		7.2	8.0	9.0	
V_{CC} Supply Under-Voltage Hysteresis	V_{CCUVHY}		0.3	0.6	-	
V_{BS} Supply UVLO Threshold	V_{BSUV+}		7.8	8.6	9.8	
	V_{BSUV-}		7.2	8.0	9.0	
VBS supply under-voltage hysteresis	V_{BSUVHY}		0.3	0.6	-	
Leakage Current from V_S(600V) to GND	I_{LK}		-	-	50	μA
Quiescent V_B Supply Current	I_{QBS}		-	70	140	
Quiescent V_{CC} Supply Current	I_{QCC}		-	1.1	3	mA
Input Clamp Voltage (HIN,LIN,ITRIP and EN)	$V_{IN,CLAMP}$		5.5	6	6.55	V
Input Bias Current(LOUT=HI)	I_{LIN+}		-	90	150	μA
Input Bias Current(LOUT=LO)	I_{LIN-}		-	160	240	
Input Bias Current(HOUT=HI)	I_{HIN+}		-	90	150	
Input Bias Current(HOUT=HO)	I_{HIN-}		-	160	240	
“High” ITRIP Input Bias Current	I_{ITRIP+}		-	6	15	
“Low” ITRIP Input Bias Current	I_{ITRIP-}		-	-	1	
“High” ENABLE Input Bias Current	I_{EN+}		-	6	15	
“Low” ENABLE Input Bias Current	I_{EN-}		-	-	1	
RCIN Input Bias Current	I_{RCIN}		-	-	1	
Output High Short Circuit Pulsed Current	I_{O+}		370	450	-	mA
Output Low Short Circuit Pulsed Current	I_{O-}		600	700	-	
RCIN Low on Resistance	R_{on_RCIN}		-	30	80	Ω
$\overline{FAULT}$Low on Resistance	R_{on_FAULT}		-	30	80	

BLOCK DIAGRAM



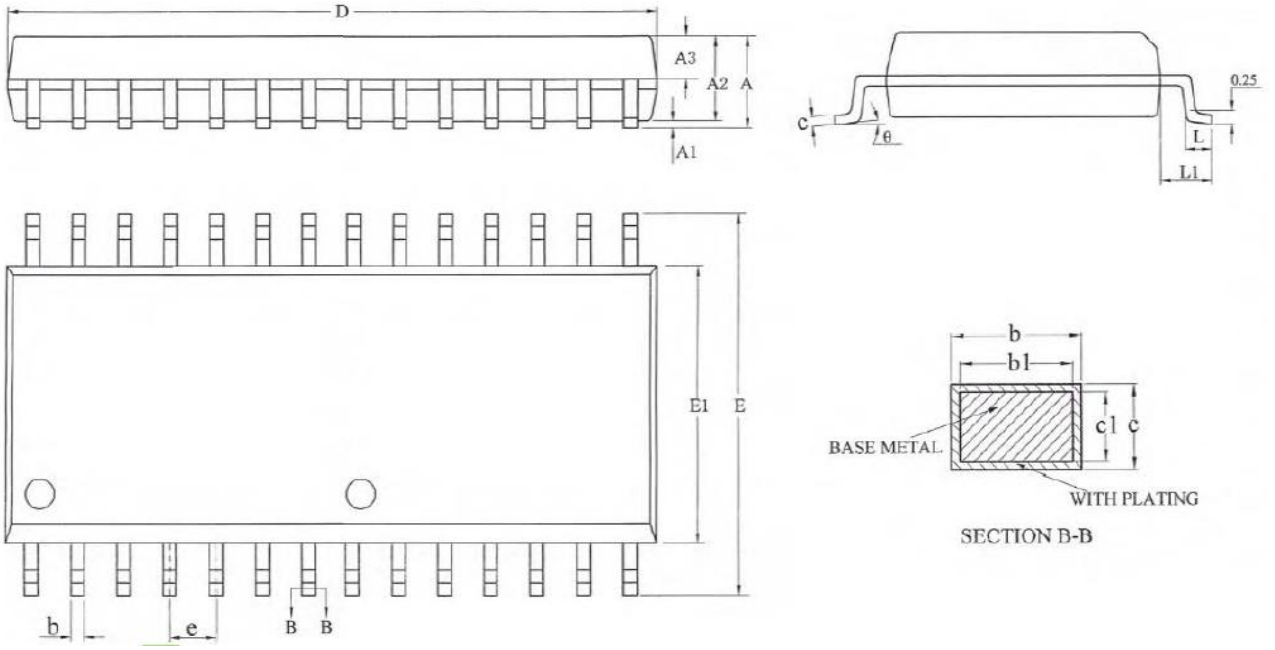
DETAILED INFORMATION

Logic Function & Timing Specification



PACKAGE INFORMATION

Dimension in SOP28 (Unit: mm)



Symbol	Min.	Max.
A	-	2.65
A1	0.10	0.30
A2	2.25	2.35
A3	0.97	1.07
b	0.39	0.48
b1	0.38	0.43
c	0.25	0.31
c1	0.24	0.26
D	17.89	18.29
E	10.10	10.50
E1	7.30	7.70
e	1.27 BSC	
L	0.70	1.00
L1	1.40 BSC	
θ	0°	8°

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