

3A Current-Limited Power Distribution Switches

General Description

The EMS6040 is an N-channel MOSFET high-side power switch without parasitic body diode between drain and source. The EMS6040 provides very low on-resistance as 58mΩ and continuously delivers up to 3A output current. The fault flag output function indicates fault conditions to the local USB controller. The other features include soft start, current limit protection, Power-On-Reset function, and over temperature protection. The EMS6040 is available in MSOP-8 package.

Features

- Wide Input Range 2.5V to 5.5V
- Low MOSFET On Resistance(58mΩ)
- Low Quiescent(25uA) & Shutdown Current
- Deglitched Open-Drain Fault Flag Output
- Reverse Current Flow Blocking
- Power On Reset Function
- Current Limit Protection
- Over Temperature Protection
- Soft Start and Fast Turn Off
- Reverse Voltage Protection
- Enable Active High or Active Low

Ordering Information

Part Number	Package	Remark
EMS6040A	MSOP-8	3A Active Low
EMS6040B	MSOP-8	3A Active High

Applications

- USB
- Notebook & Netbook & MB

Typical Application

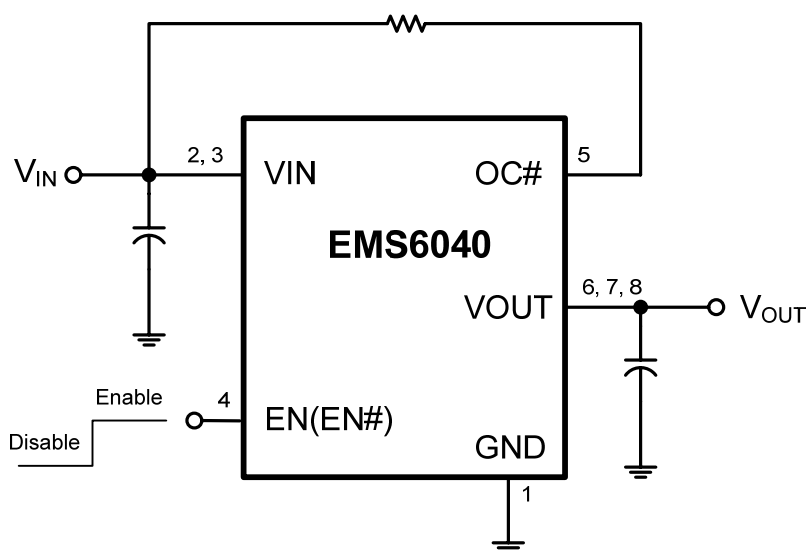
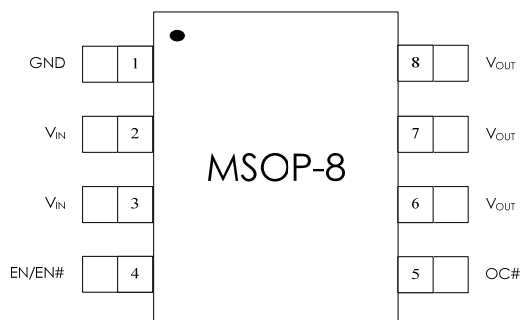


Fig. 1

Note: A low ESR 150uF capacitor between VIN, VOUT & GND is recommended.

Package Configuration



EMS6040X-MH08NRR

X Output current

MH08 MSOP-8 Package

NRR RoHS & Halogen free package

Rating: -40 to 85°C

Package in Tape & Reel

Order, Mark & Packing information

Package	Iout(A)	Product ID	Marking	Packing
MSOP-8	3.0	EMS6040A-MH08NRR		Tape & Reel 3Kpcs
		EMS6040B-MH08NRR		

Functional Block Diagram

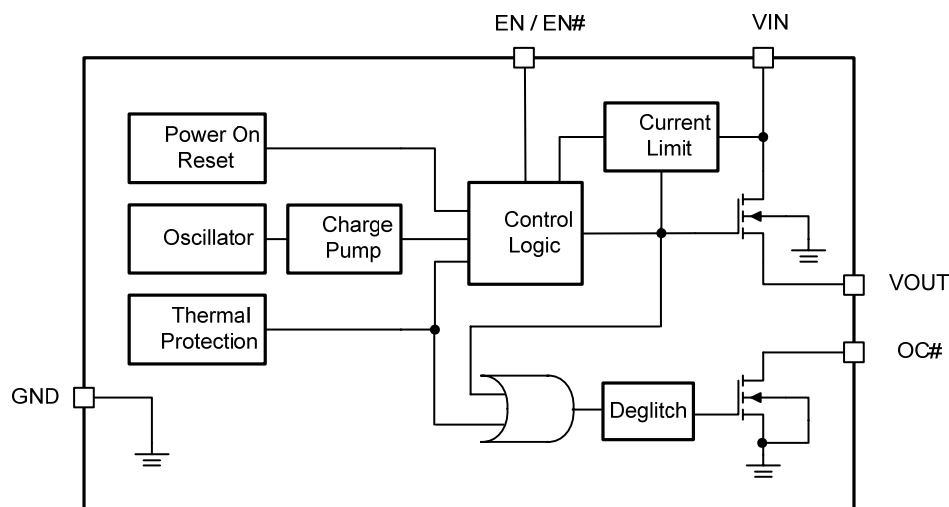


Fig. 2

Pin Functions

Pin Name	SOT-23-5	Function
GND	1	Ground.
VIN	2, 3	Input Voltage. This is the drain input to the power device that supplies current to the output pin. Minimum 1uF low ESR ceramic capacitor is recommended at this pin.
EN/EN#	4	Chip Enable Input (Active high for EN, Active low for EN#)
OC#	5	OC Flag Output. This is an open-drain output and is set low impedance once current limit or over temperature protection enabled.
VOUT	6, 7, 8	Output Voltage. VOUT is power output pin.

Absolute Maximum Ratings_(Note1)

Devices are subjected to fail if they stay above absolute maximum ratings.

- Input Voltage ----- -0.3V to +6V
- Other Pins ----- -0.3V to (VIN+0.3V)
- Power Dissipation, P_D@T_A=25, MSOP-8 ----- 0.66W
- Package Thermal Resistance, θ_{JA} , MSOP-8 _(Note 2) ----- 150°C/W
- Junction Temperature ----- 150°C
- Lead Temperature (Soldering, 10 sec.) ----- 260°C
- Storage Temperature ----- -65°C to 150°C
- ESD susceptibility _(Note3)
 - HBM (Human Body Mode) ----- 2KV
 - MM (Machine Mode) ----- 200V

Recommended Operating Conditions_(Note4)

- Supply Input Voltage, V_{IN} ----- +2.5V to +5.5V
- Junction Temperature ----- -40°C to 125°C
- Ambient Temperature ----- -40°C to 85°C

Electrical Characteristics

- VIN=5V, T_A=+25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Section						
POR Threshold	V _{PORTH}		-	2.2	2.5	V
Quiescent Current	I _Q	I _{OUT} =0A	-	65	45	μA
Shutdown Current	I _{SD}	EN#=5V	-	0.1	1	μA
Output Voltage						
On Resistance	R _{ON}	I _{OUT} =0.5A	-	58	65	mΩ
Reverse Leakage Current	I _{Rev}	V _{OUT} =5V, V _{IN} =0V	-	0.1	2	μA
Soft-Start Time		Rising from 10% to 90%	-	1.5	2	ms
Enable						
Enable High Level	V _{EN}		1.2	-	-	V
Disable Low Level	V _{SD}		-	-	0.5	V
EN Input Current	I _{EN}		-	0.1	1	μA
OC# Flag Output						
OC# Output Resistance	R _{FLGB}	I _{SINK} =1mA	-	20	80	Ω
OC# Off Current	I _{FLGB_OFF}	V _{FLGB} =5V	-	0.1	1	μA
OC# Delay Time	T _D		8	15	22	ms
OUT Shutdown Discharge Resistance	R _{DIS}		-	100	-	Ω

Electrical Characteristics (cont.)

■ VIN=5V, TA=+25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Protection						
OCP Threshold Level	I _{OCP}		3.3	3.8	4.3	A
Output Short Circuit Current	I _{SC}		1.7	2.1	3	A
Thermal Shutdown Temperature	T _{SD}		-	160	-	°C
Thermal Shutdown Hysteresis	T _{SDHYS}		-	30	-	°C

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

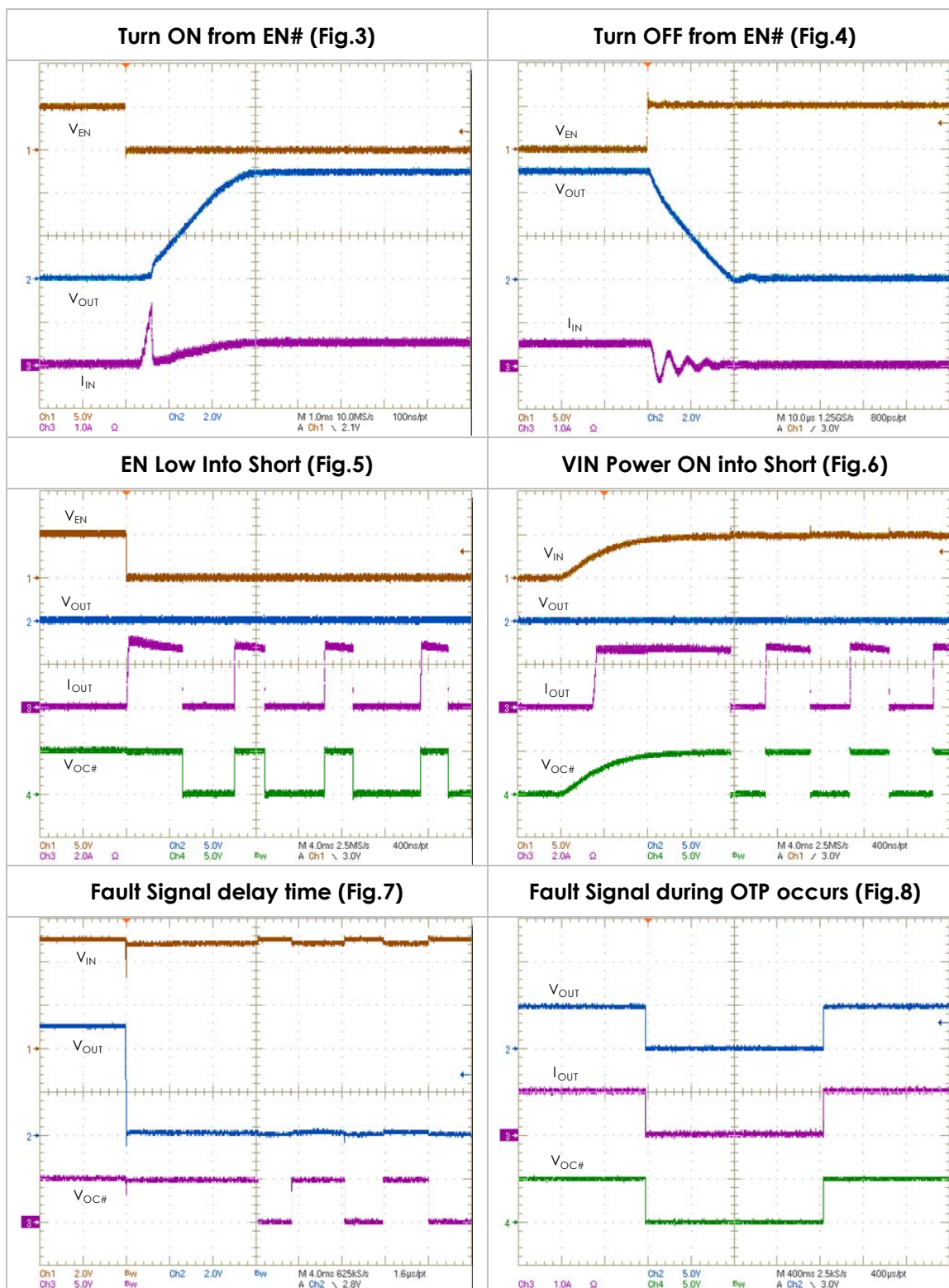
Note 2. θ_{JA} is measured in the natural convection at TA=25°C on a low effective thermal conductivity test board (Single layout, 1S) of JEDEC 51-3 thermal measurement standard.

Note 3. Devices are ESD sensitive. Handling precaution is recommended.

Note 4. The device is not guaranteed to function outside its operating conditions.

Typical Performance Characteristics

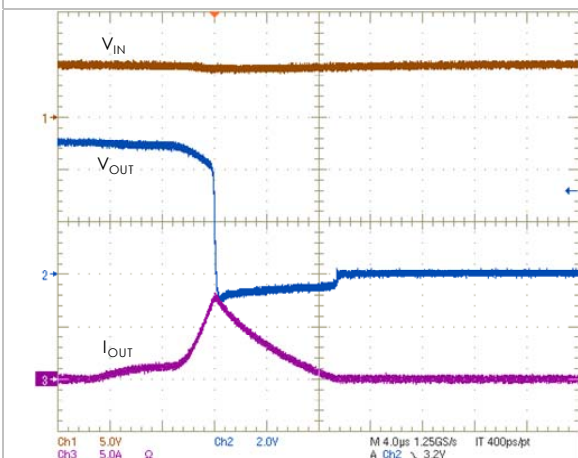
■ $V_{IN}=5V$, $T_A=25^{\circ}C$, unless otherwise specified.



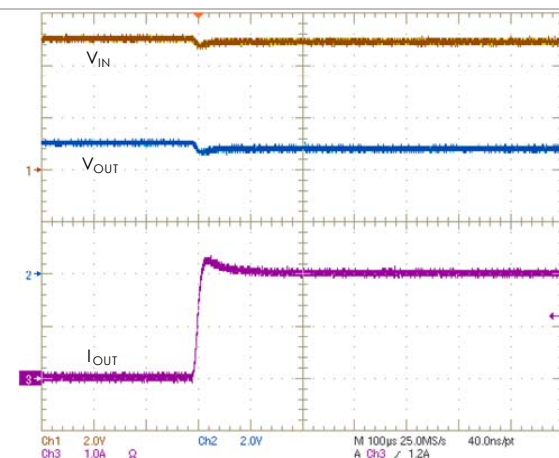
Typical Performance Characteristics (cont.)

■ $V_{IN}=5V$, $T_A=25^{\circ}C$, unless otherwise specified.

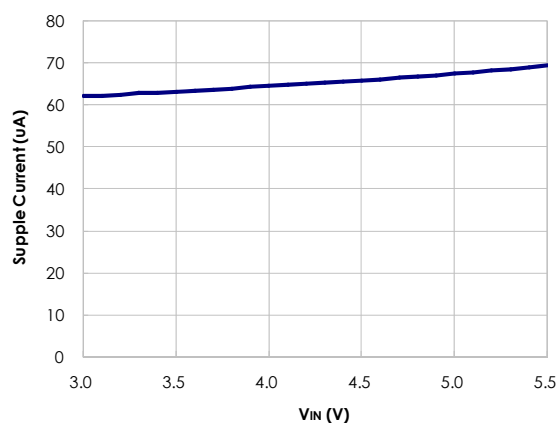
3.5us Response for output short protection (Fig.9)



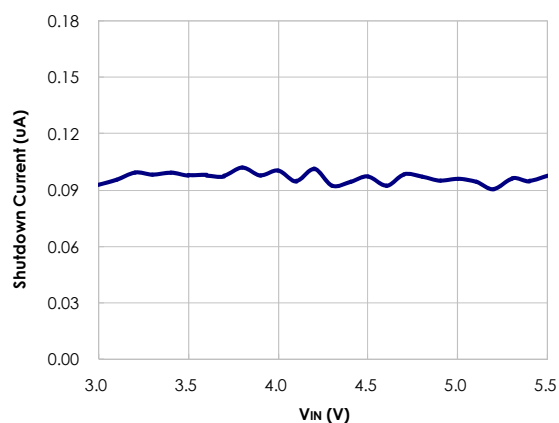
Normal operating 2A output current (Fig.10)



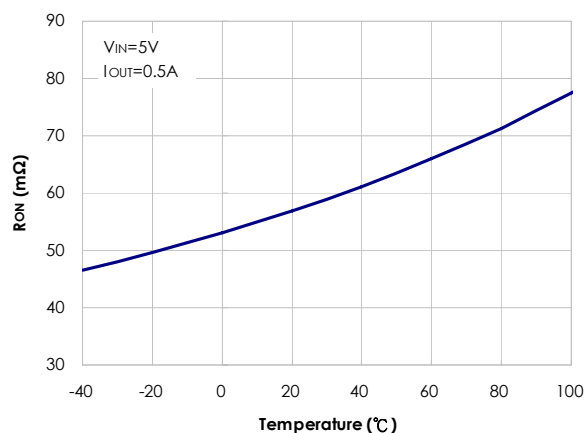
Supply Current vs. Input Voltage (Fig.11)



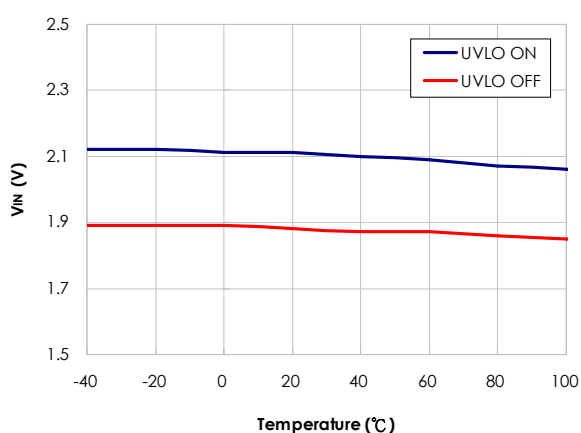
Shutdown Current vs. Input Voltage (Fig.12)



R_{ON} Performance vs. Temperature (Fig.13)



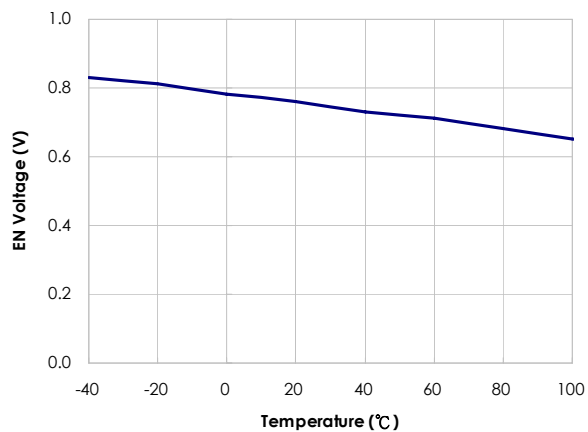
UVLO ON/OFF Voltage vs. Temperature (Fig.14)



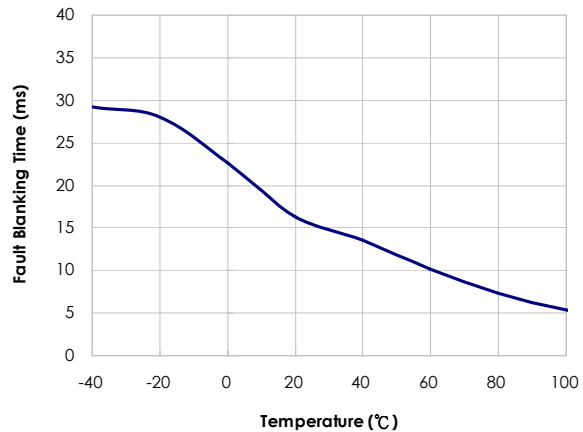
Typical Performance Characteristics (cont.)

■ $V_{IN}=5V$, $T_A=25^{\circ}C$, unless otherwise specified.

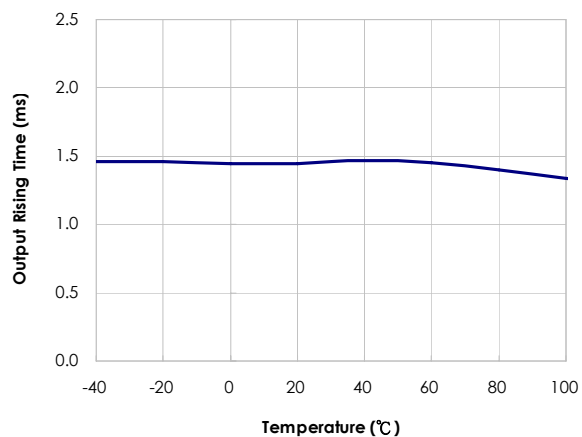
Enable Voltage vs. Temperature (Fig.15)



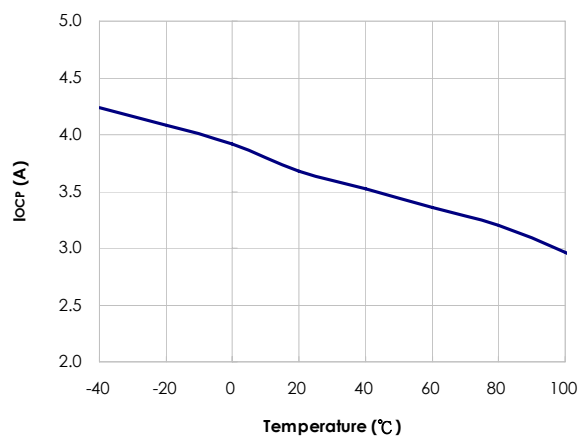
Fault Blanking Time vs. Temperature (Fig.16)



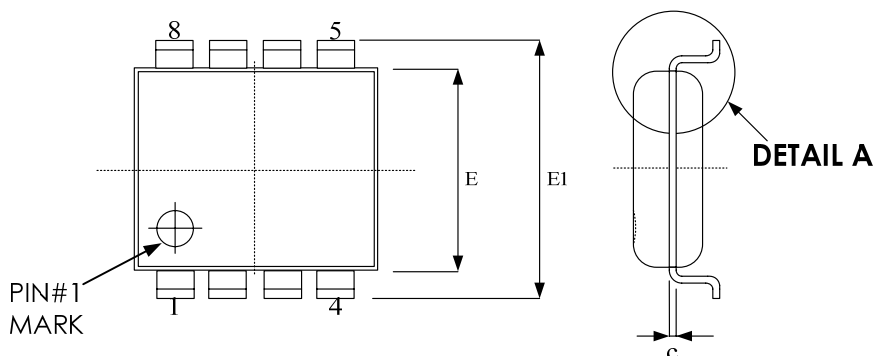
Output Rising Time vs. Temperature (Fig.17)



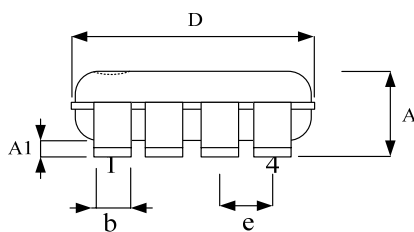
Over Current Protection vs. Temperature (Fig.18)



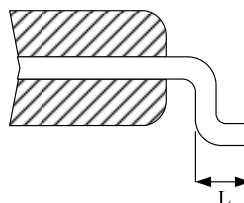
Package Outline Drawing
MSOP-8L (118 mil)



TOP VIEW



SIDE VIEW



DETAIL A

Symbol	Dimension in mm	
	Min	Max
A	0.81	1.10
A1	0.00	0.15
b	0.22	0.38
c	0.13	0.23
D	2.90	3.10
E	2.90	3.10
E1	4.80	5.00
e	0.65 BSC	
L	0.40	0.80

Revision History

Revision	Date	Description
0.1	2016.04.15	Initial version.
1.0	2016.09.01	1. Remove preliminary word and modify version to 1.0 2. Modify order information

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