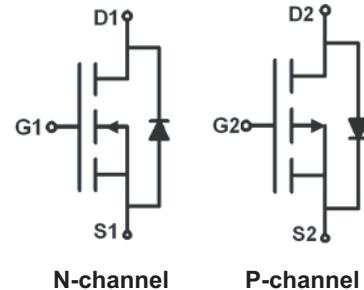


## N and P-Channel Enhancement Mode Power MOSFET

### Description

The RM4077S8 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The SOP-8 package is universally preferred for all commercial industrial surface mount applications and suited for high and low side switches for inverter; high and low side switches for generic Half-Bridge, low voltage applications such as DC/DC converters.



### General Features

#### ● N-Channel

$$V_{DS} = 40V, I_D = 6.7A$$

$$R_{DS(ON)} < 45m\Omega @ V_{GS}=4.5V$$

$$R_{DS(ON)} < 32m\Omega @ V_{GS}=10V$$

#### ● P-Channel

$$V_{DS} = -40V, I_D = -7.2A$$

$$R_{DS(ON)} < 60m\Omega @ V_{GS}=-4.5V$$

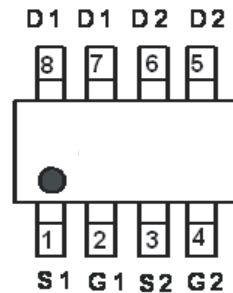
$$R_{DS(ON)} < 40m\Omega @ V_{GS}=-10V$$

- High power and current handling capability
- Lead free product is acquired
- Surface mount package

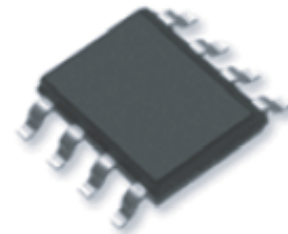
### Application

- DC/DC converters
- Power management
- Halogen-free

#### Schematic diagram



#### Marking and pin assignment



**SOP-8 top view**

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
4077	RM4077S8	SOP-8	8830mm	12mm	2500 units

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit	
Drain-Source Voltage	$V_{DS}$	40	-40	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V	
Continuous Drain Current	$I_D$	$T_c = 25^\circ C$	6.7	-7.2	A
		$T_c = 100^\circ C$	4.3	-4.5	
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	26.8	-28.8	A	
Maximum Power Dissipation	$P_D$	2.5	2.5	W	
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	-55 To 150	$^\circ C$	

## N-CH Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise)

Symbol	Parameter	Conditions	Min.	TYP	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	40	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C , I <sub>D</sub> =1mA	---	0.04	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =40V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =32V , V <sub>GS</sub> =0V , T <sub>J</sub> =125	---	---	10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V	---	---	±100	nA

### On Characteristics

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =5A	---	24	32	mΩ
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =3A	---	32	45	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	1.8	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-3	---	mV/
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V , I <sub>D</sub> =3A	---	3.6	---	S

### Dynamic and switching Characteristics

Q <sub>g</sub>	Total Gate Charge <sup>2,3</sup>	V <sub>DS</sub> =20V , V <sub>GS</sub> =4.5V , I <sub>D</sub> =3A	---	2.8	5.6	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2,3</sup>		---	0.5	1	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2,3</sup>		---	1.5	3	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2,3</sup>	V <sub>DD</sub> =20V , V <sub>GS</sub> =4.5V , R <sub>G</sub> =25Ω I <sub>D</sub> =1A	---	3.2	6	ns
T <sub>r</sub>	Rise Time <sup>2,3</sup>		---	8.6	16	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2,3</sup>		---	18	36	
T <sub>f</sub>	Fall Time <sup>2,3</sup>		---	6	12	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V , V <sub>GS</sub> =0V , F=1MHz	---	420	800	pF
C <sub>oss</sub>	Output Capacitance		---	65	120	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	40	80	

### Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	6.7	A
I <sub>SM</sub>	Pulsed Source Current		---	---	13.4	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C	---	---	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.

## P-CH Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)

### Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-40	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.04	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-40V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	---	---	-1 -10	uA uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	---	---	±100	nA

### On Characteristics

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4A	---	32	40	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	---	45	60	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.0	-1.6	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	3	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-3A	---	5	---	S

### Dynamic and switching Characteristics

Q <sub>g</sub>	Total Gate Charge <sup>2,3</sup>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	---	8	16	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2,3</sup>		---	2.1	4.2	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2,3</sup>		---	3.6	7.2	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2,3</sup>	V <sub>DD</sub> =-20V, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =25Ω I <sub>D</sub> =-1A	---	20	40	ns
T <sub>r</sub>	Rise Time <sup>2,3</sup>		---	12	24	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2,3</sup>		---	46	80	
T <sub>f</sub>	Fall Time <sup>2,3</sup>		---	6	12	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, F=1MHz	---	1050	1600	pF
C <sub>oss</sub>	Output Capacitance		---	110	160	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	80	120	

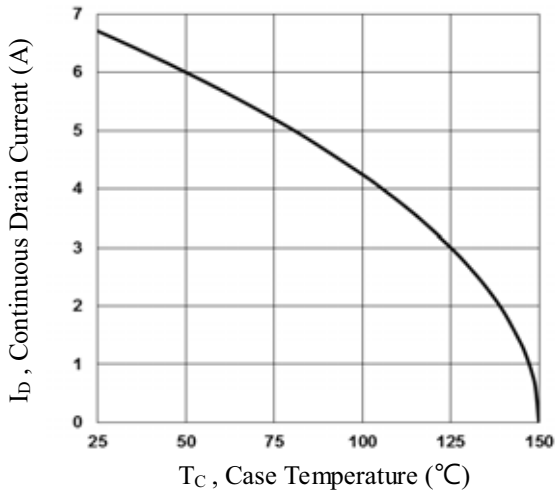
### Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-7.2	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-14.4	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V

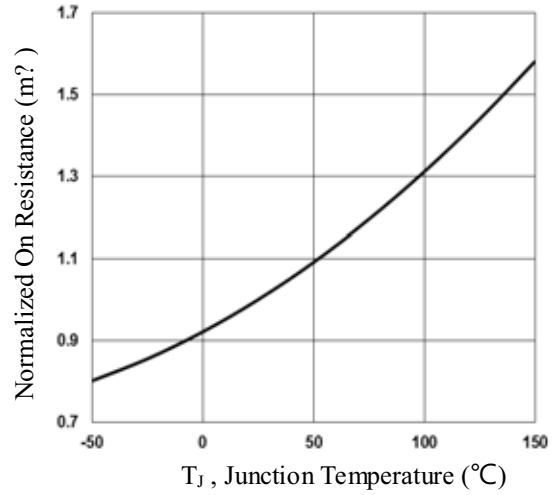
Note :

4. Repetitive Rating : Pulsed width limited by maximum junction temperature.
5. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
6. Essentially independent of operating temperature.

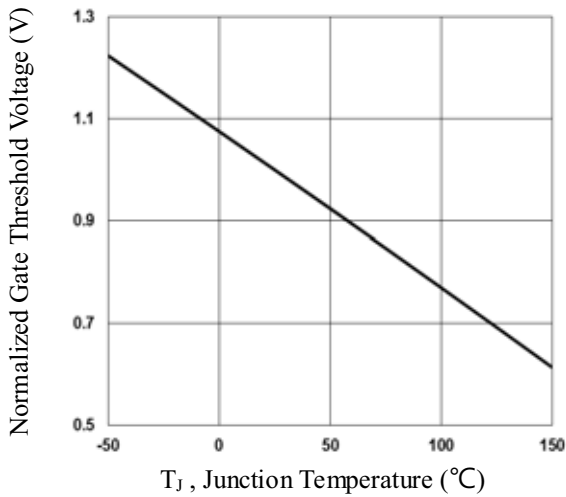
## RATING AND CHARACTERISTICS CURVES (RM4077S8)



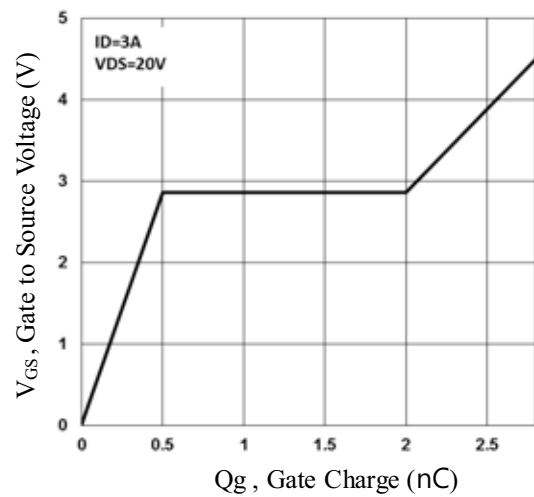
**Fig.1 Continuous Drain Current vs.  $T_c$**



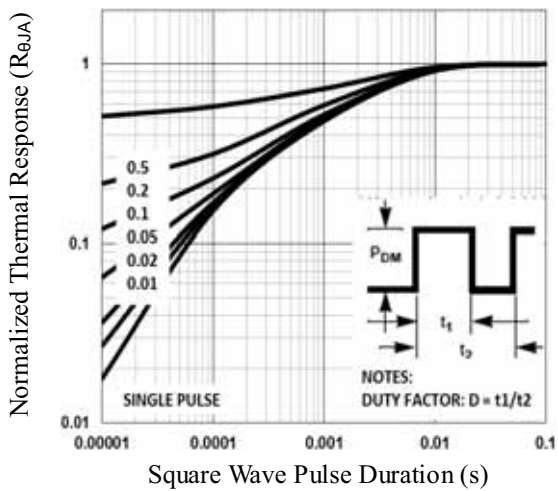
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



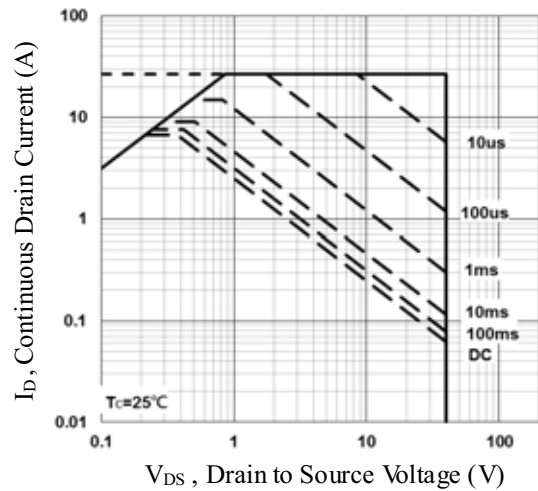
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.4 Gate Charge Waveform**

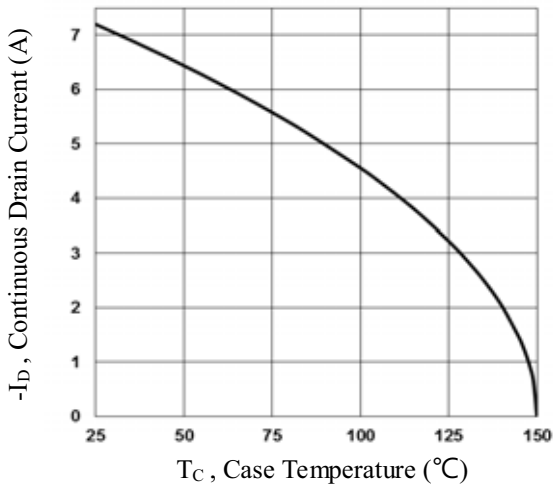


**Fig.5 Normalized Transient Impedance**

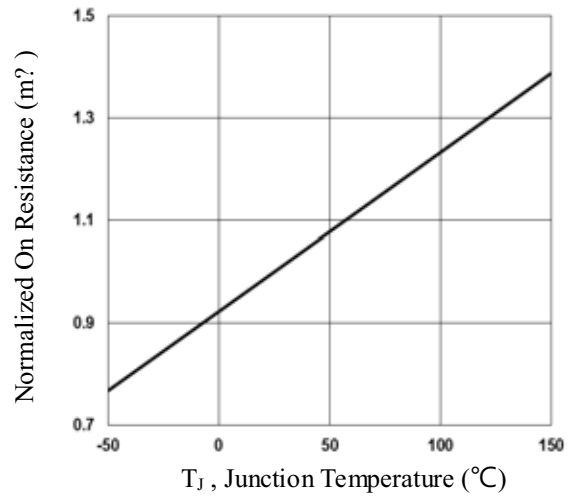


**Fig.6 Maximum Safe Operation Area**

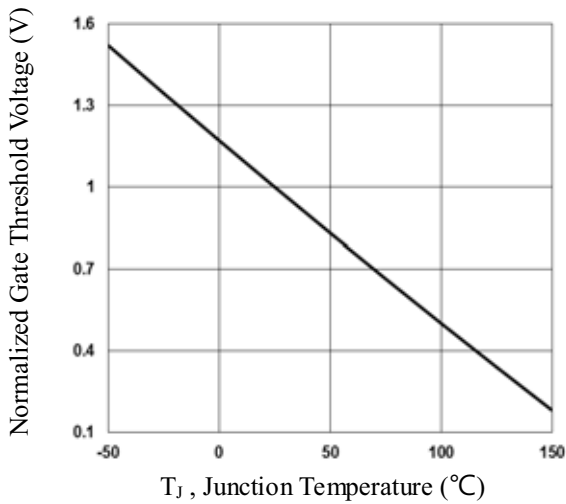
## RATING AND CHARACTERISTICS CURVES (RM4077S8)



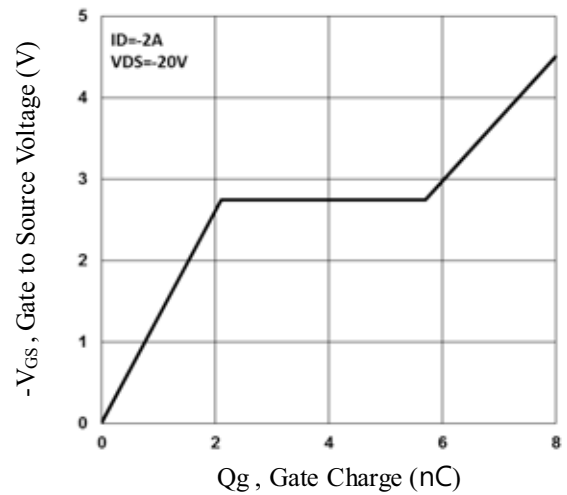
**Fig.7 Continuous Drain Current vs.  $T_c$**



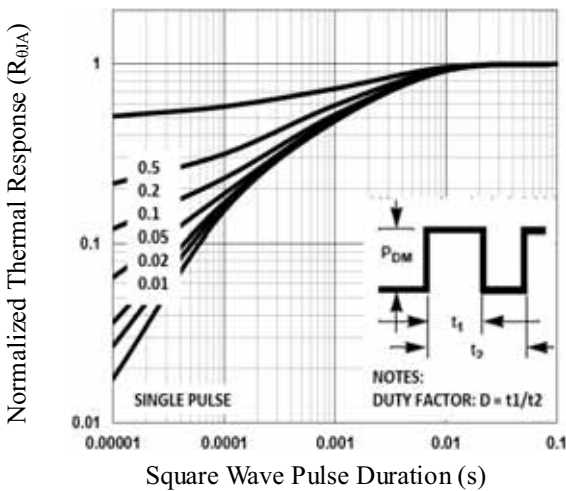
**Fig.8 Normalized  $R_{DS(on)}$  vs.  $T_j$**



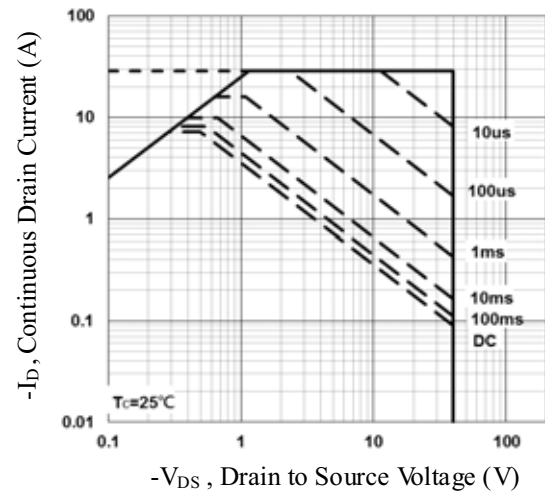
**Fig.9 Normalized  $V_{th}$  vs.  $T_j$**



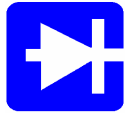
**Fig.10 Gate Charge Waveform**



**Fig.11 Normalized Transient Impedance**

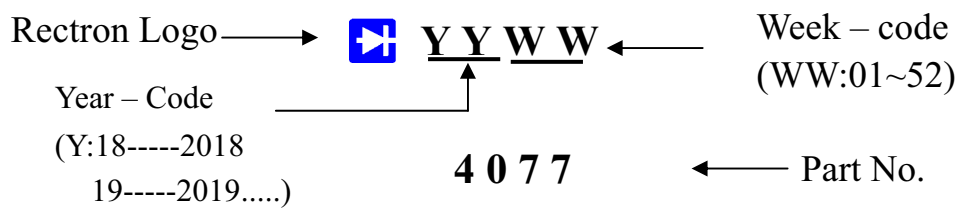


**Fig.12 Maximum Safe Operation Area**

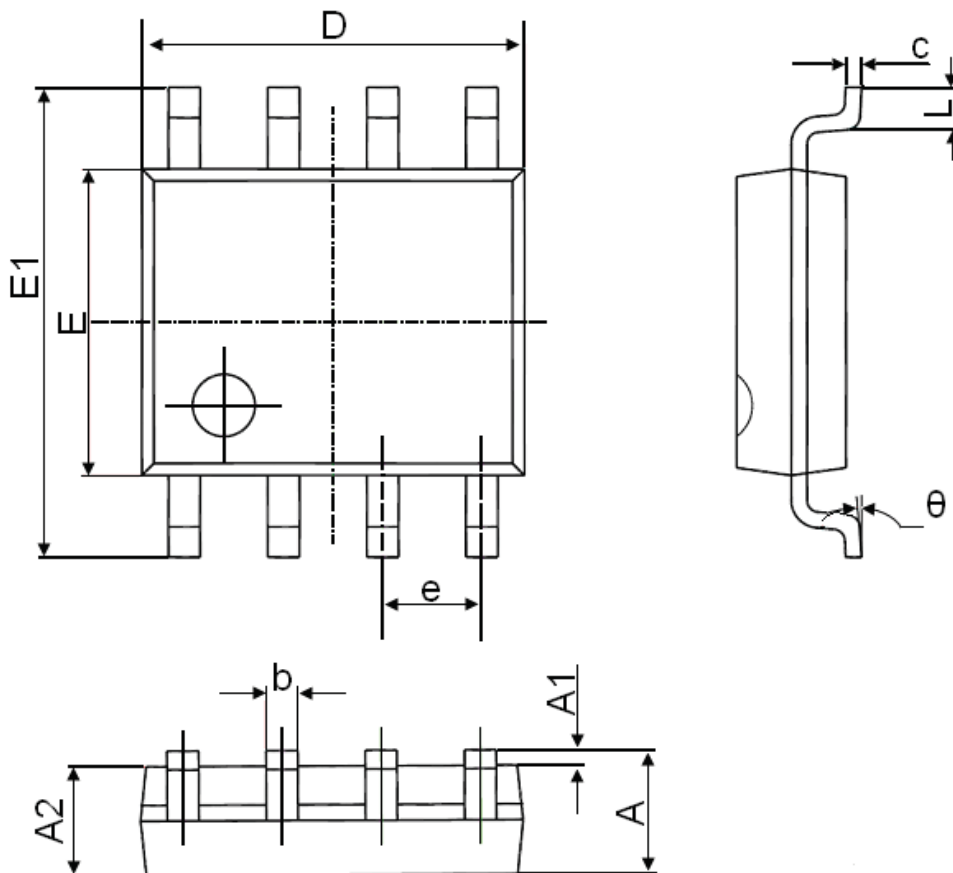


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## Marking on the body



## SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
$\theta$	0°	8°	0°	8°

Package	Tube (pcs/tube)	Tube (pcs/inner box)	Tube (pcs/cartoon)	Tape&Reel (pcs/reel)	Tape&Reel (pcs/inner box)	Tape&Reel (pcs/cartoon)
DFN5x6/DFN3x3	100	10,000	100,000	2,500	5,000	40,000
DFN1006	—	—	—	10,000	10,000	400,000
SOP-8	100	10,000	100,000	4,000	4,000	20,000
TSSOP-8	100	32,000	128,000	3,000	6,000	48,000
SOT-23-3L	—	—	—	3,000	30,000	120,000
SOT-23-6L	—	—	—	3,000	30,000	120,000
SOT-23(6R)	—	—	—	3,000	30,000	120,000
SOT-363	—	—	—	3,000	30,000	120,000
SOT-523	—	—	—	3,000	30,000	120,000
SOT223	—	—	—	2,500	2,500	20,000
TO-220	50	1,000	5,000	—	—	—
TO-220F	50	1,000	10,000	—	—	—
TO-247	30	300	1,200	—	—	—
TO-251	80	4,000	40,000	—	—	—
TO-251S(4R)	80	4,000	40,000	—	—	—
TO-252-2L(4R)	80	4,000	40,000	2,500	2,500	25,000
TO-263-2L	50	1,000	10,000	800	800	8,000
TO-3P	30	300	3,000	—	—	—
TO-92	—	—	—	1,000(袋装)	10,000	100,000



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