



PFC Device Corporation

# PRM020C03S8

## 30V Single N+P Channel MOSFET

### Major ratings and characteristics

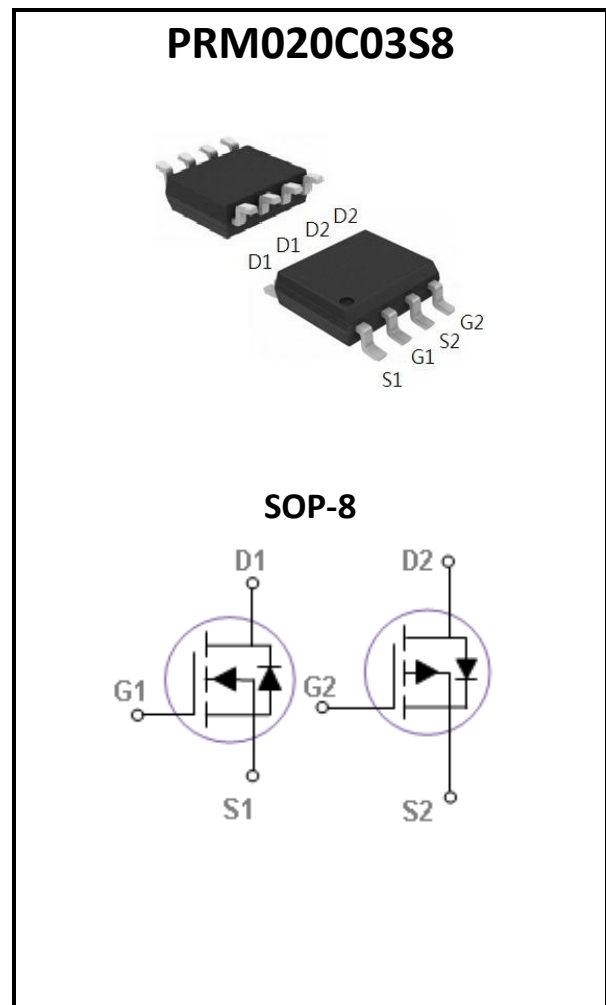
Characteristics	Values	Units
<b>N-CH</b>		
$V_{DS}$	30	V
$I_D$ ( $T_C=25^\circ\text{C}$ )	8	A
Max. $R_{DS(ON)}$ @ $V_{GS}=10\text{V}$	20	$\text{m}\Omega$
<b>P-CH</b>		
$V_{DS}$	-30	V
$I_D$ ( $T_C=25^\circ\text{C}$ )	-5.5	A
Max. $R_{DS(ON)}$ @ $V_{GS}=10\text{V}$	50	$\text{m}\Omega$
$T_J$ Operating Junction Temperature	-55 to +150	$^\circ\text{C}$

### General Description

These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

### Typical Applications

- DC Fan
- Motor Drive Applications
- Networking Half / Full Bridge Topology



### Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications

## 1. Characteristics

### Maximum Ratings Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified )

Symbol	Parameter	Rating		Units
$V_{DS}$	Drain-Source Voltage	30	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_C=25^\circ\text{C}$ )	8	-5.5	A
	Drain Current – Continuous ( $T_C=100^\circ\text{C}$ )	5	-3.5	A
$I_{DM}^1$	Drain Current – Pulsed <sup>1</sup>	32	-22	A
$E_{AS}$	Single Pulse Avalanche Energy <sup>2</sup>	14	5	mJ
$I_{AS}$	Single Pulse Avalanche Current <sup>2</sup>	17	10	A
$P_D$	Power Dissipation ( $T_C=25^\circ\text{C}$ )	2.5		W
	Power Dissipation – Derate above $25^\circ\text{C}$	0.02		W/ $^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150		$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150		$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62.5	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	25	$^\circ\text{C}/\text{W}$



## N-CH Electrical Characteristics

(  $T_J = 25^\circ\text{C}$  unless otherwise specified )

### Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=24V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

### On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=8A$	---	15	20	$m\Omega$
		$V_{GS}=4.5V, I_D=5A$	---	21	30	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.5	2.5	V
$\Delta V_{GS(th)}$	VGS(th) Temperature Coefficient		---	-4	---	$mV/^\circ\text{C}$
$g_{fs}$	Forward Transconductance	$V_{DS}=10V, I_D=3A$	---	3	---	S

### Dynamic and switching Characteristics

$Q_g$	Total Gate Charge	$V_{DS}=15V, V_{GS}=4.5V, I_D=8A$	---	4.1	6	nC
$Q_{gs}$	Gate-Source Charge		---	1	1.4	
$Q_{gd}$	Gate-Drain Charge		---	2.1	4	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=6\Omega, I_D=1A$	---	2.8	5	ns
$T_r$	Turn-On Rise Time		---	7.2	14	
$T_{d(off)}$	Turn-Off Delay Time		---	15.8	30	
$T_f$	Turn-Off Fall Time		---	4.6	9	
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$	---	345	500	pF
$C_{oss}$	Output Capacitance		---	55	80	
$C_{rss}$	Reverse Transfer Capacitance		---	32	55	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$	---	3.2	6.4	$\Omega$

### Drain-Source Diode Characteristics

$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{ Force Current}$			8	A
$I_{SM}$	Pulsed Source Current				16	A
$V_{SD}^3$	Source to Drain Diode Voltage	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $L=0.1\text{mH}, R_G=25\Omega, \text{ Starting } T_J=25^\circ\text{C}$
3. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .



2. N-CH Characteristics Curves

Ratings and Characteristics Curves

( $T_A = 25^{\circ}\text{C}$  unless otherwise specified)

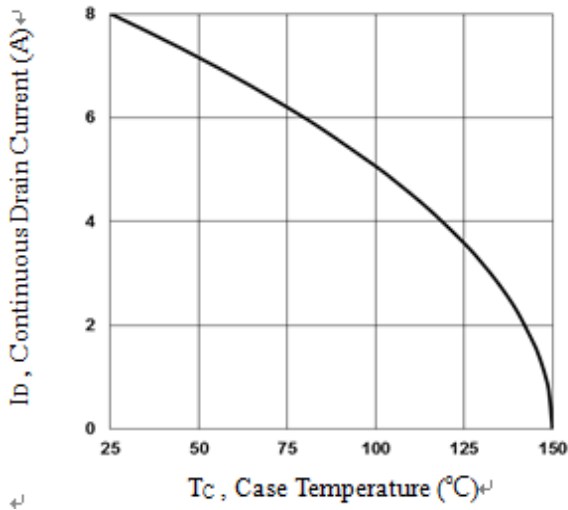


Fig.1 Continuous Drain Current vs.  $T_C$

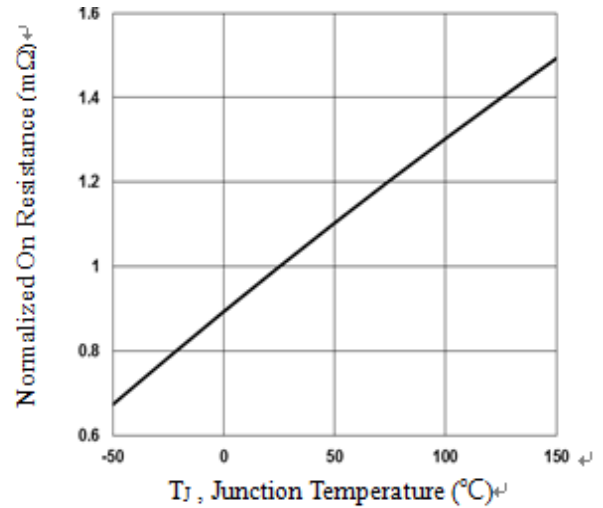


Fig.2 Normalized RDSON vs.  $T_J$

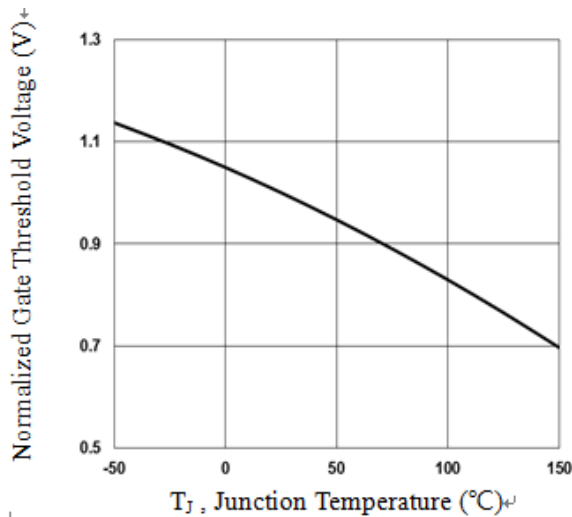


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

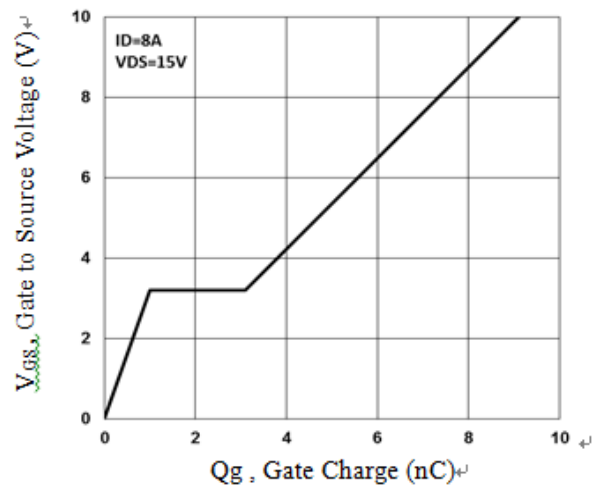


Fig.4 Gate Charge Waveform



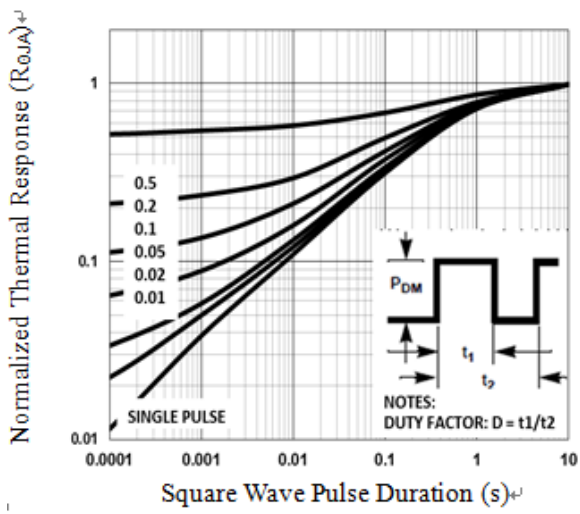


Fig.5 Normalized Transient Response

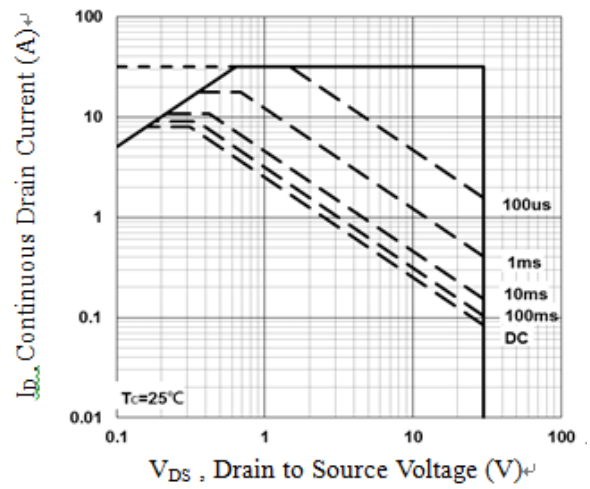


Fig.6 Maximum Safe Operation Area



## 3. P-CH Characteristics

### P-CH Electrical Characteristics ( $T_J = 25^\circ\text{C}$ unless otherwise specified )

#### Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	-30	---	---	V
$\Delta B_{V_{DSS}}/\Delta T_J$	$B_{V_{DSS}}$ Temperature Coefficient	Reference to $25^\circ\text{C}, I_D=1\text{mA}$	---	-0.03	---	$V/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=24V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	-10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

#### On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-5A$	---	40	50	$m\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	---	67	90	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.2	-1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4	---	$mV/^\circ\text{C}$
$g_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_D=-3A$	---	3.5	---	S

#### Dynamic and switching Characteristics

$Q_g$	Total Gate Charge	$V_{DS}=-15V, V_{GS}=-4.5V, I_D=-3A$	---	5.1	7	nC
$Q_{gs}$	Gate-Source Charge		---	2	3	
$Q_{gd}$	Gate-Drain Charge		---	2.2	4	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A$	---	3.4	6	ns
$T_r$	Turn-On Rise Time		---	10.8	21	
$T_{d(off)}$	Turn-Off Delay Time		---	26.9	51	
$T_f$	Turn-Off Fall Time		---	6.9	13	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	560	810	pF
$C_{oss}$	Output Capacitance		---	55	80	
$C_{riss}$	Reverse Transfer Capacitance		---	40	60	

#### Drain-Source Diode Characteristics

$I_S$	Continuous Source Current	$V_G=V_D=0V$ , Force Current			-5.5	A
$I_{SM}$	Pulsed Source Current				-11	A
$V_{SD}^1$	Source to Drain Diode Voltage	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	-1	V

Note :

1. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .



4. P-CH Characteristics Curves

Ratings and Characteristics Curves

( $T_A = 25^\circ\text{C}$  unless otherwise specified)

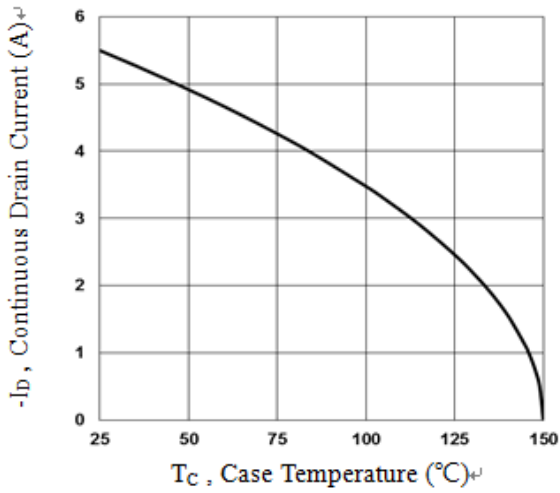


Fig.7 Continuous Drain Current vs. T<sub>C</sub>

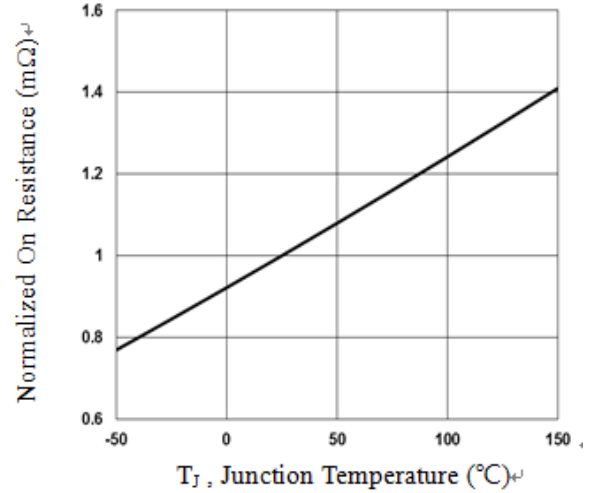


Fig.8 Normalized R<sub>DSON</sub> vs. T<sub>J</sub>

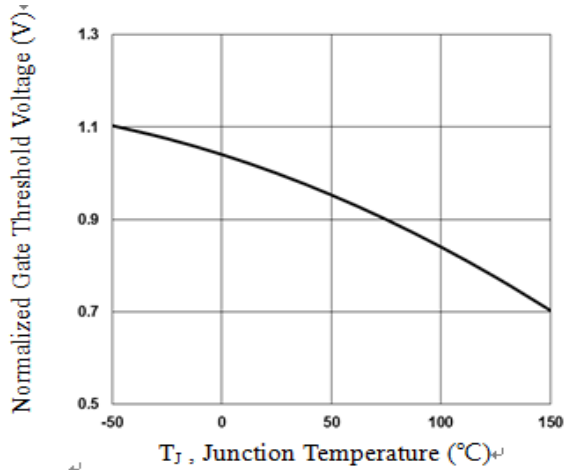


Fig.9 Normalized V<sub>th</sub> vs. T<sub>J</sub>

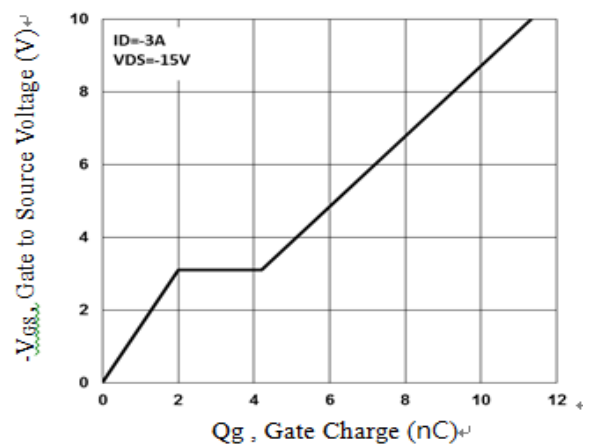


Fig.10 Gate Charge Waveform



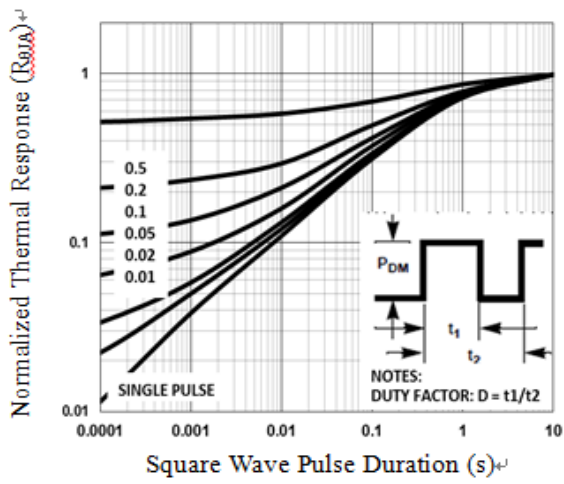


Fig.11 Normalized Transient Response

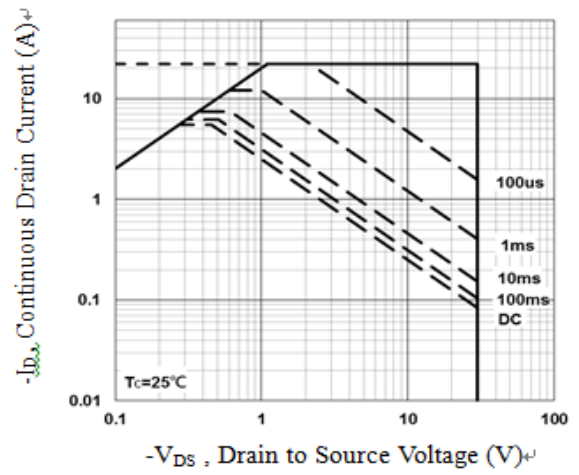


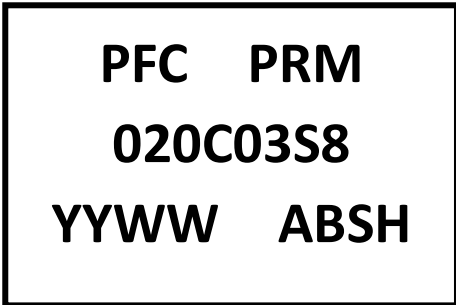
Fig.12 Maximum Safe Operation Area





5. Marking information

Top Marking Rule



PRM020C03S8 = Product Type Marking Code

YYWW = Date Code

YY = Last two digits of year

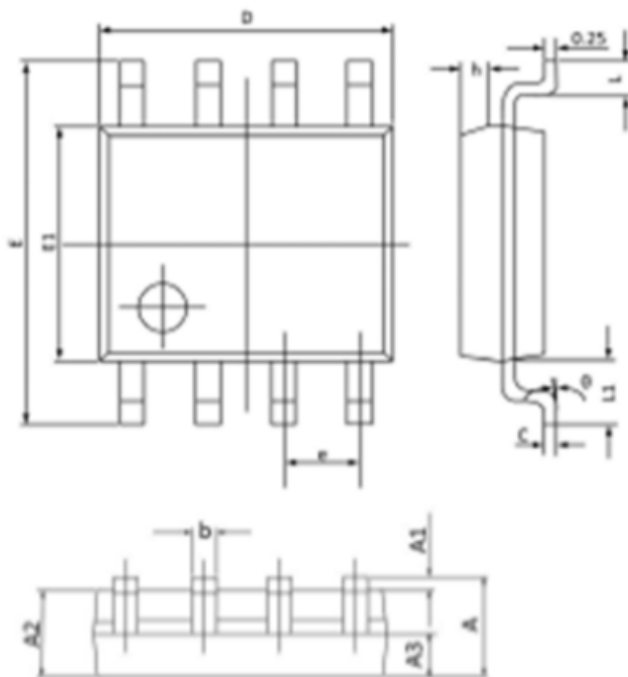
WW = Week code

ABS = Assembly code

H = Halogen Free (N/A = common molding compound)

6. Package information

Package Outline Dimensions millimeters



Dim.	Min.	Max.
A	1.35	1.75
A1	0.10	0.25
A2	1.30	---
A3	0.60	0.70
b	0.35	0.49
c	0.18	0.26
D	4.70	5.10
E	5.80	6.20
E1	3.70	4.10
e	1.27 BSC	
h	0.25	0.50
L	0.40	0.90
L1	1.05 BSC	
$\theta$	0°	8°
All Dimensions in mm		



**7. Ordering information**

Part Number	Package	Delivery mode
PRM020C03S8	SOP-8	3000 pcs / 13" diameter reel

Mechanical

- Molder Plastic: UL Flammability Classification Rating 94V-0
- Device Weight : 0.003 ounces (0.085grams) – SOP-8

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