



## Description

The SQ4470EY uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



SOP-8

## General Features

$V_{DS} = 60V$   $I_D = 10A$

$R_{DS(ON)} < 13m\Omega$  @  $V_{GS}=10V$

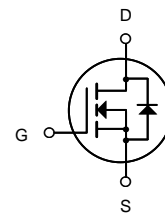
$R_{DS(ON)} < 15m\Omega$  @  $V_{GS}=4.5V$

## Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
SQ4470EY	SOP-8	HXY MOSFET	3000

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

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current-Continuous	10	A
$I_D(100^{\circ}C)$	Drain Current-Continuous( $T_c=100^{\circ}C$ )	8.5	A
$I_{DM}$	Pulsed Drain Current	30	A
$P_D$	Maximum Power Dissipation	3	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^{\circ}C$



**Electrical Characteristics (TC=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.9	1.3	1.8	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$	-	10	13	m $\Omega$
		$V_{GS}=4.5V, I_D=5A$	-	11.5	15	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=12A$	40	-	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V,$ $F=1.0MHz$	-	4100	-	PF
Output Capacitance	$C_{oss}$		-	298	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	229	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, R_L=1\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	8.5	-	nS
Turn-on Rise Time	$t_r$		-	7	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	40	-	nS
Turn-Off Fall Time	$t_f$		-	15	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=10A,$ $V_{GS}=10V$	-	93	-	nC
Gate-Source Charge	$Q_{gs}$		-	9.7	-	nC
Gate-Drain Charge	$Q_{gd}$		-	20	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=10A$	-	-	1.2	V
Diode Forward Current	$I_S$		-	-	10	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ C, I_F=10A$ $di/dt = 100A/\mu s$ (Note 3)	-	32	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	45	-	nC

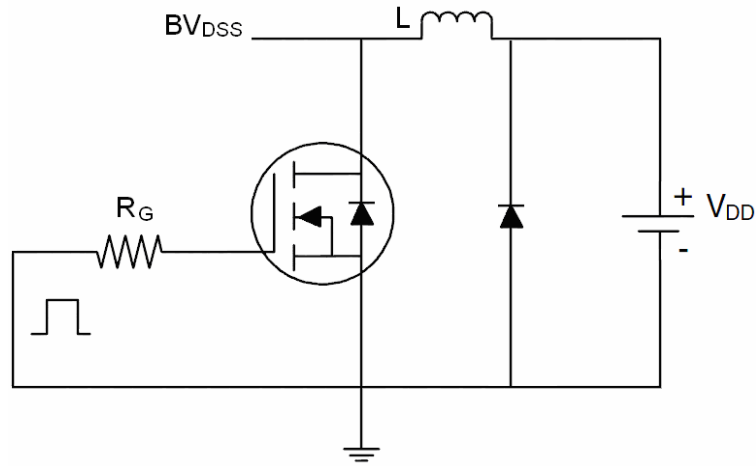
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ C$ . The value in any given application depends on the user's specific board design.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

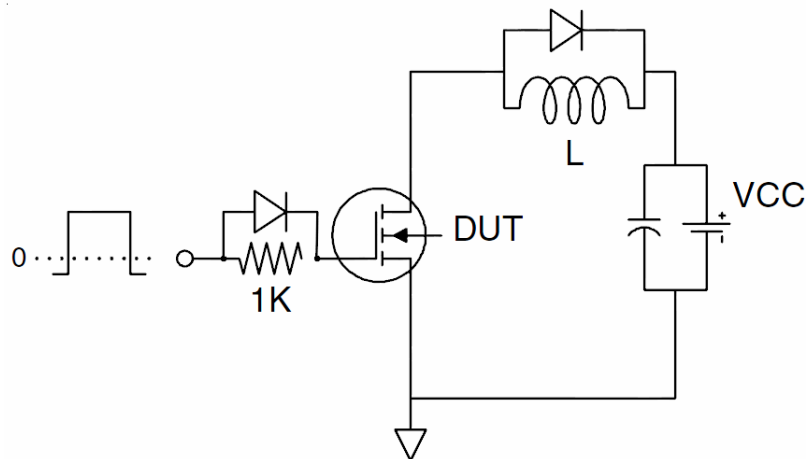


## Test Circuit

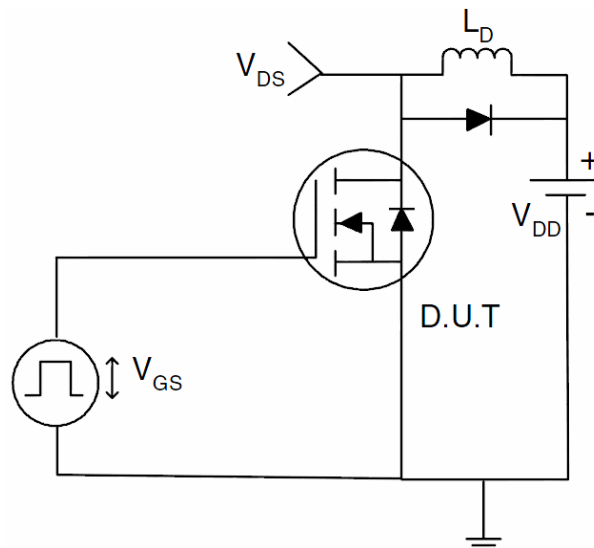
### 1) $E_{AS}$ test Circuit



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit





### Typical Electrical and Thermal Characteristics (Curves)

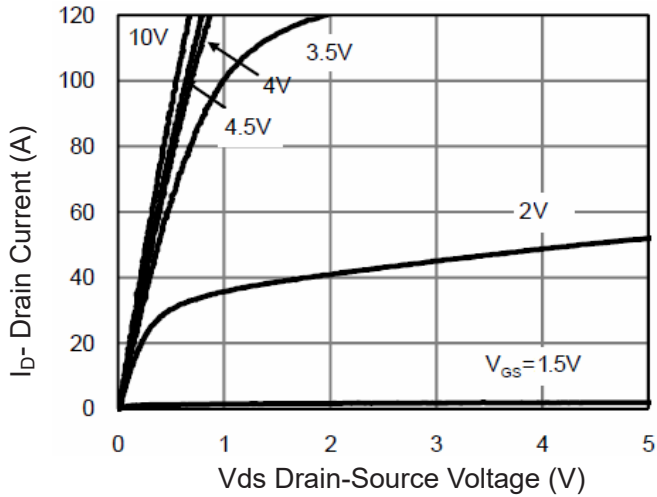


Figure 1 Output Characteristics

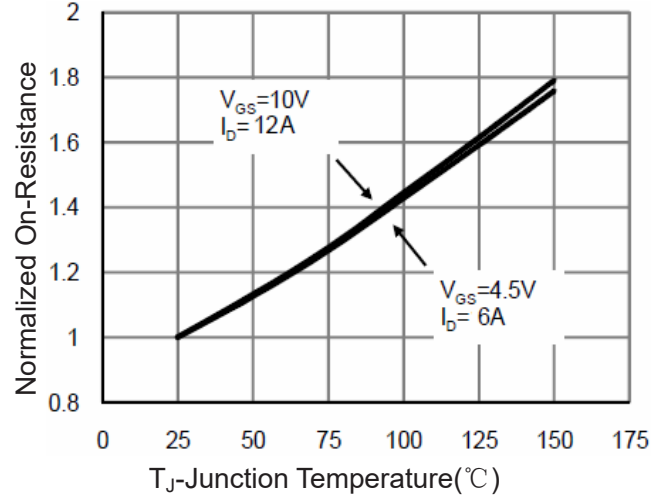


Figure 4  $R_{dson}$ -Junction Temperature

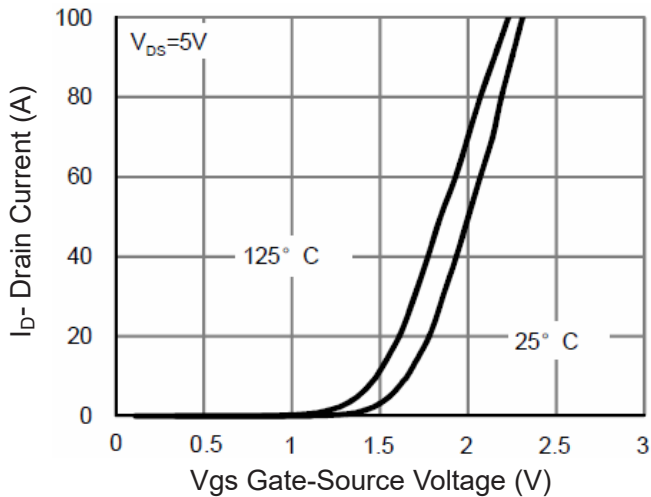


Figure 2 Transfer Characteristics

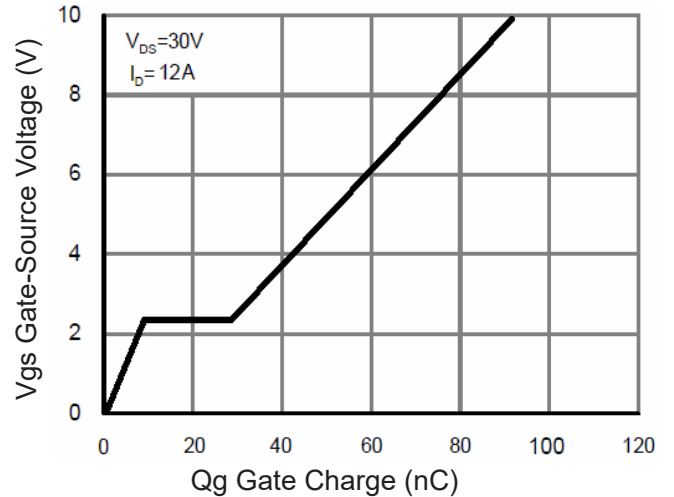


Figure 5 Gate Charge

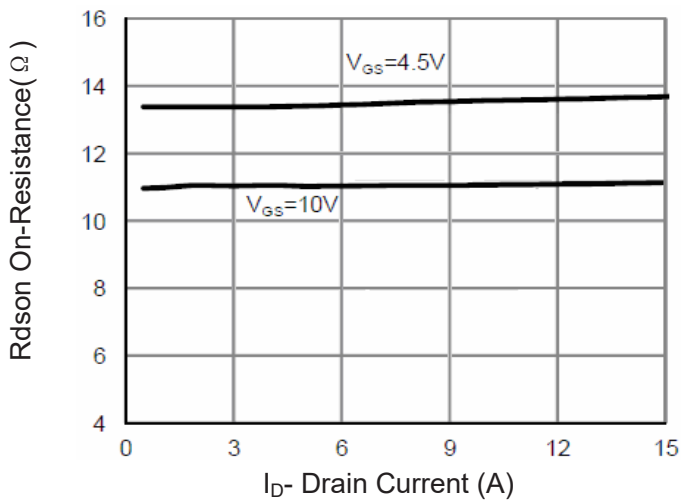


Figure 3  $R_{dson}$ - Drain Current

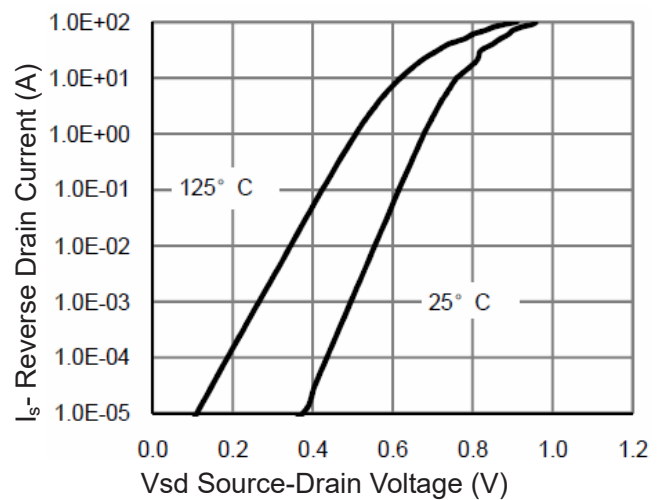


Figure 6 Source- Drain Diode Forward

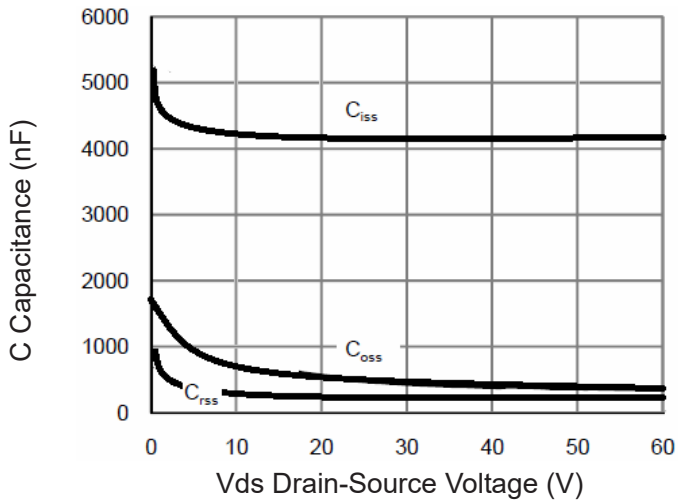


Figure 7 Capacitance vs Vds

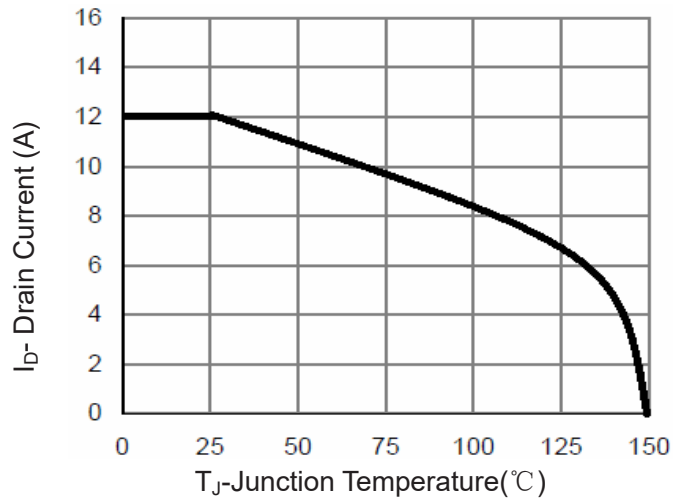


Figure 9 Current De-rating

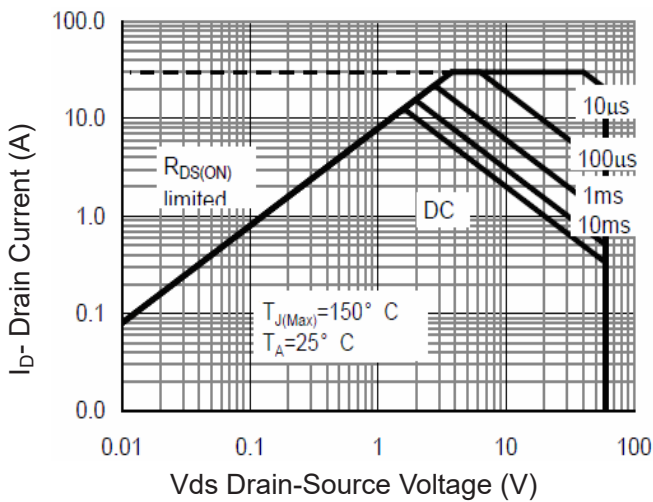


Figure 8 Safe Operation Area

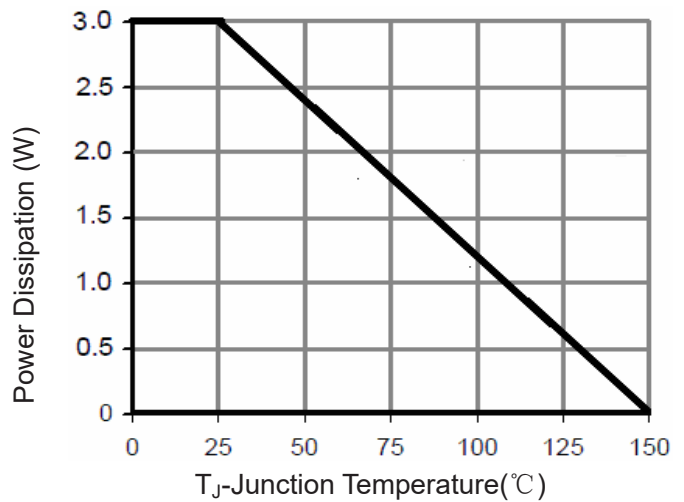


Figure 10 Power De-rating

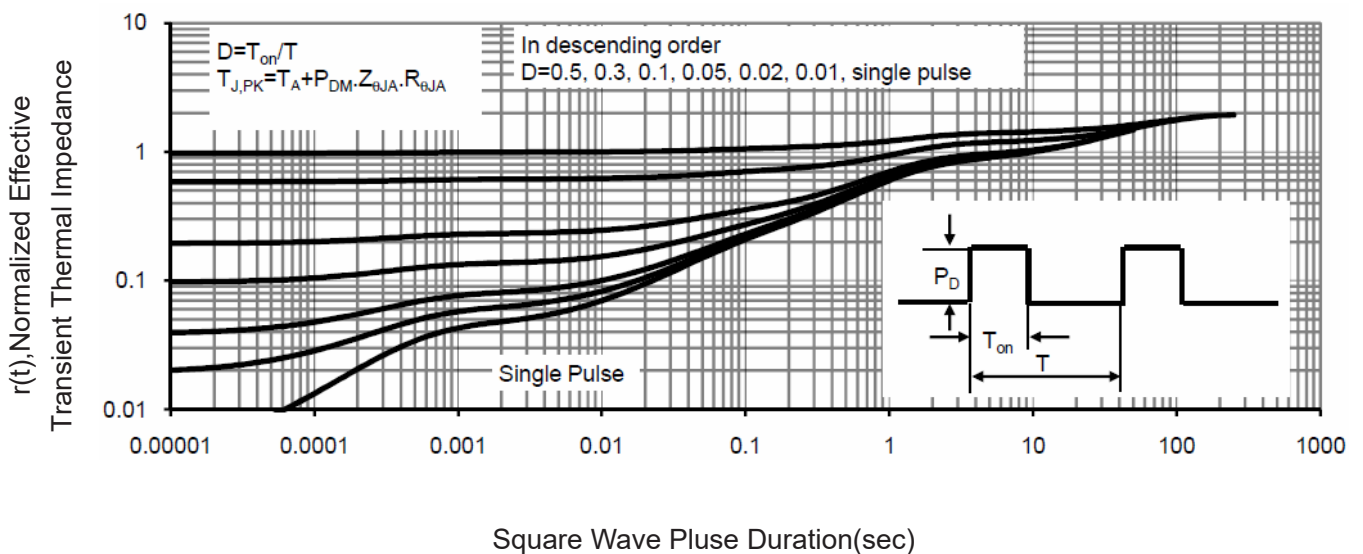
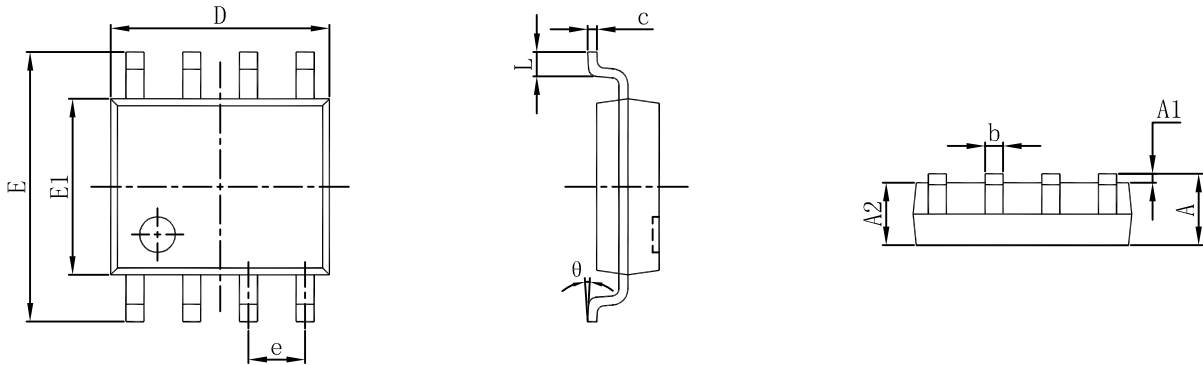


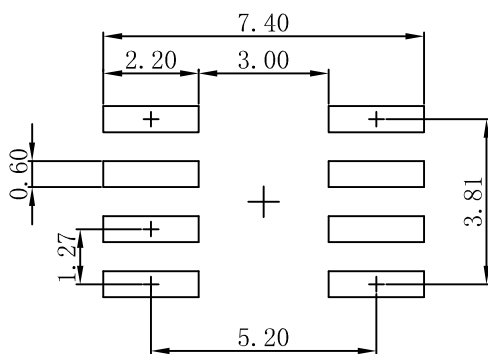
Figure 11 Normalized Maximum Transient Thermal Impedance



### SOP-8 Package Outline Dimensions



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	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.



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