



### CST20P09L P-Ch 20V Fast Switching MOSFETs

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

#### CST20P09L Product Summary

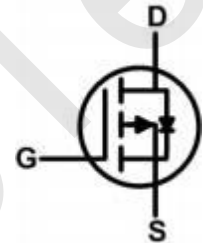
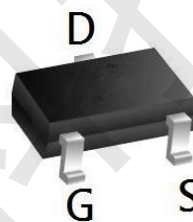


BVDSS	RDSON	ID
-20V	13mΩ	-9A

#### CST20P09L Description

The CST20P09L is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The CST20P09L meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

#### CST20P09L SOT23-3L Pin Configuration



#### CST20P09L Absolute Maximum Ratings (T<sub>A</sub> = 25°C, unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V <sub>DS</sub>	-20	V
Gate-Source Voltage		V <sub>GS</sub>	±12	V
Continuous Drain Current	T <sub>A</sub> = 25°C	I <sub>D</sub>	-9	A
	T <sub>A</sub> = 100°C		-4	
Pulsed Drain Current <sup>1</sup>		I <sub>DM</sub>	-66	A
Single Pulse Avalanche Energy <sup>2</sup>		EAS	28.8	mJ
Total Power Dissipation	T <sub>A</sub> = 25°C	P <sub>D</sub>	30	W
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

#### CST20P09L Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient <sup>3</sup>	R <sub>θJA</sub>	41.6	°C/W



### CST20P09L P-Ch 20V Fast Switching MOSFETs

#### CST20P09L Electrical Characteristics (T<sub>J</sub> = 25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static Characteristics</b>							
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	-20	-	-	V	
Gate-body Leakage current	I <sub>GSS</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±12V	-	-	±100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V	T <sub>J</sub> = 25°C	-	-	-1	μA
			T <sub>J</sub> = 100°C	-	-	-100	
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-0.4	-0.65	-1	V	
Drain-Source On-Resistance <sup>4</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8A	-	13.0	18	mΩ	
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -6A	-	17	23		
Forward Transconductance <sup>4</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -4.5V, I <sub>D</sub> = -8A	-	36	-	S	
<b>Dynamic Characteristics<sup>5</sup></b>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1MHz	-	1630	-	pF	
Output Capacitance	C <sub>oss</sub>		-	211	-		
Reverse Transfer Capacitance	C <sub>rss</sub>		-	187	-		
Gate Resistance	R <sub>g</sub>	f = 1MHz	-	10	-	Ω	
<b>Switching Characteristics<sup>5</sup></b>							
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V, I <sub>D</sub> = -8A	-	12	-	nC	
Gate-Source Charge	Q <sub>gs</sub>		-	1.8	-		
Gate-Drain Charge	Q <sub>gd</sub>		-	3.2	-		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = -4.5V, V <sub>DD</sub> = -10V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = -8A	-	17	-	ns	
Rise Time	t <sub>r</sub>		-	25.5	-		
Turn-Off Delay Time	t <sub>d(off)</sub>		-	32	-		
Fall Time	t <sub>f</sub>		-	15	-		
<b>Drain-Source Body Diode Characteristics</b>							
Diode Forward Voltage <sup>4</sup>	V <sub>SD</sub>	I <sub>S</sub> = -8A, V <sub>GS</sub> = 0V	-	-	-1.2	V	
Continuous Source Current	I <sub>S</sub>	T <sub>A</sub> = 25°C	-	-	-40	A	

#### Notes:

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub> = 150°C.
2. The EAS data shows Max. rating . The test condition is V<sub>DD</sub> = -25V, V<sub>GS</sub> = -10V, L = 0.1mH, I<sub>AS</sub> = -24A
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test..



CST20P09L Typical Characteristics

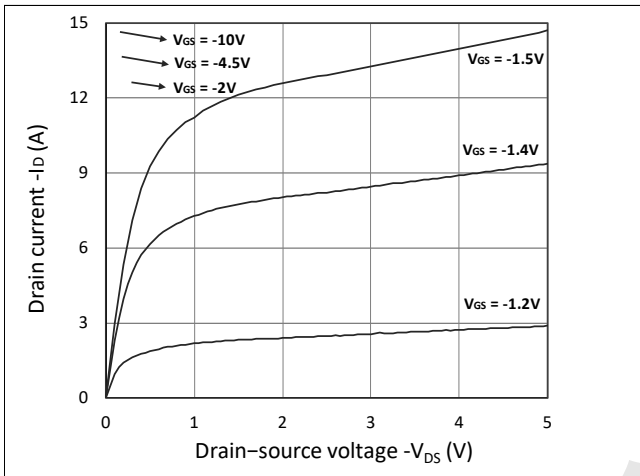


Figure 1. Output Characteristics

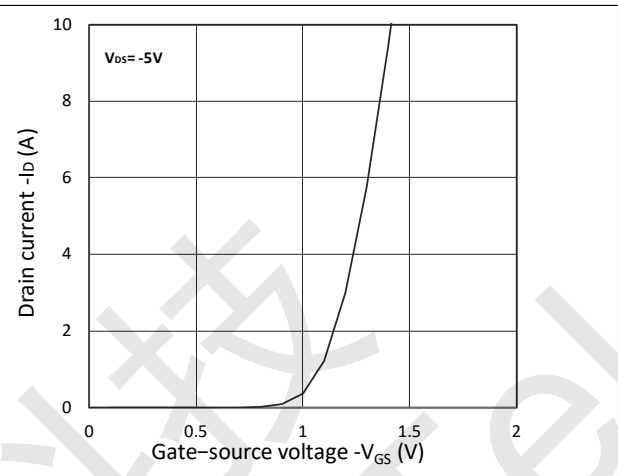


Figure 2. Transfer Characteristics

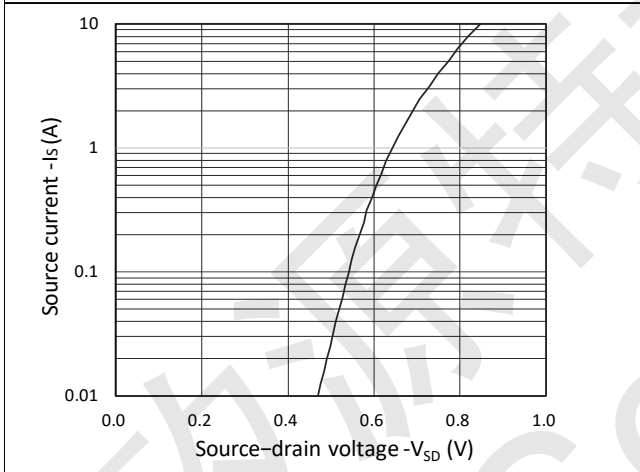


Figure 3. Forward Characteristics of Reverse

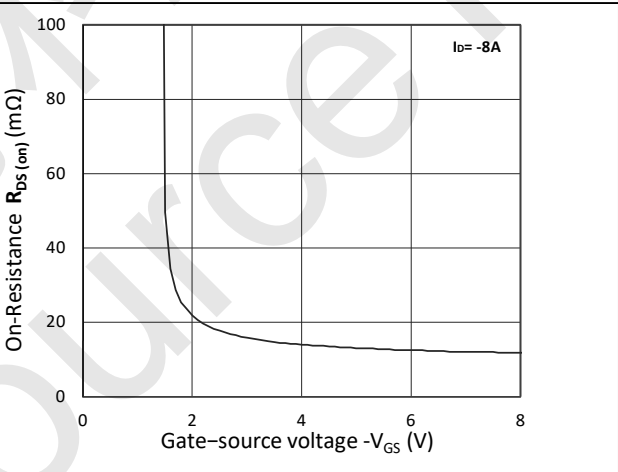


Figure 4.  $R_{DS(ON)}$  vs.  $V_{GS}$

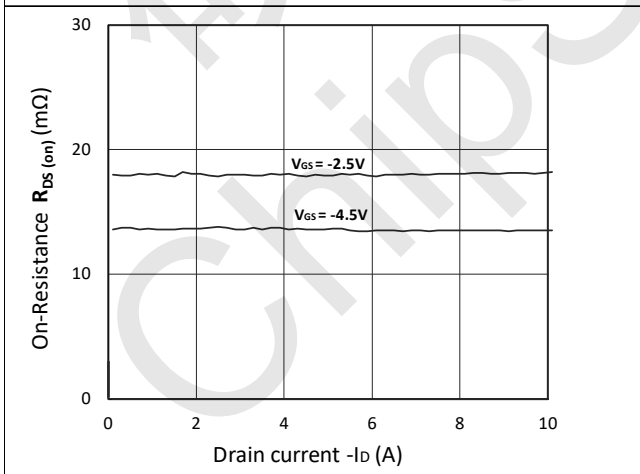


Figure 5.  $R_{DS(ON)}$  vs.  $I_D$

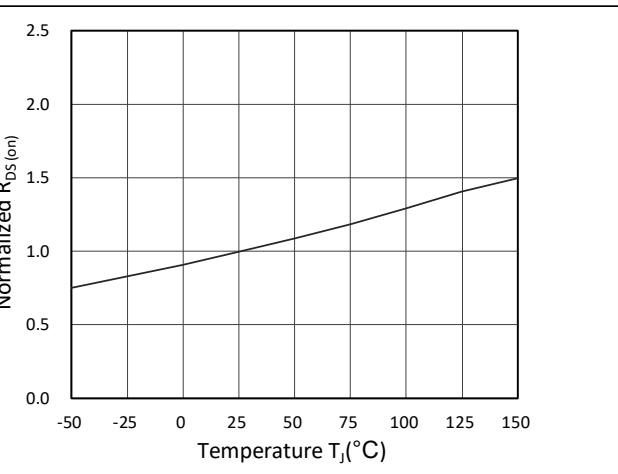


Figure 6. Normalized  $R_{DS(ON)}$  vs. Temperature



### CST20P09L P-Ch 20V Fast Switching MOSFETs

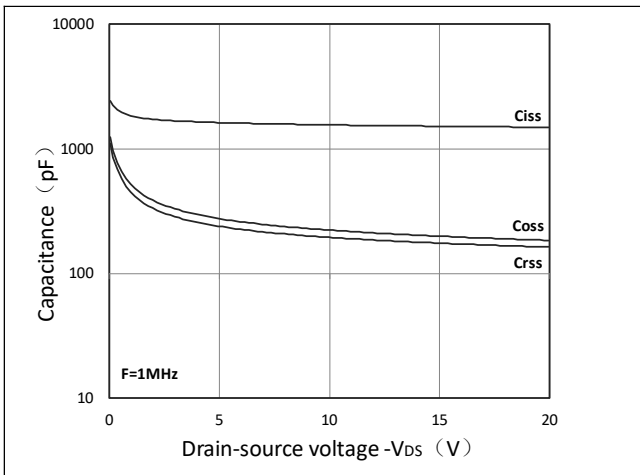


Figure 7. Capacitance Characteristics

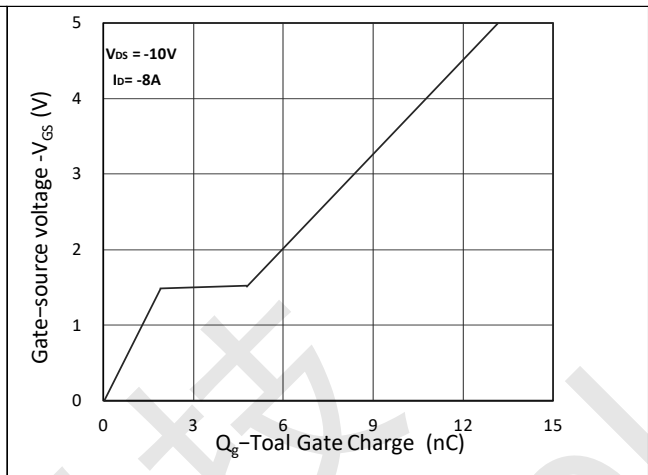


Figure 8. Gate Charge Characteristics

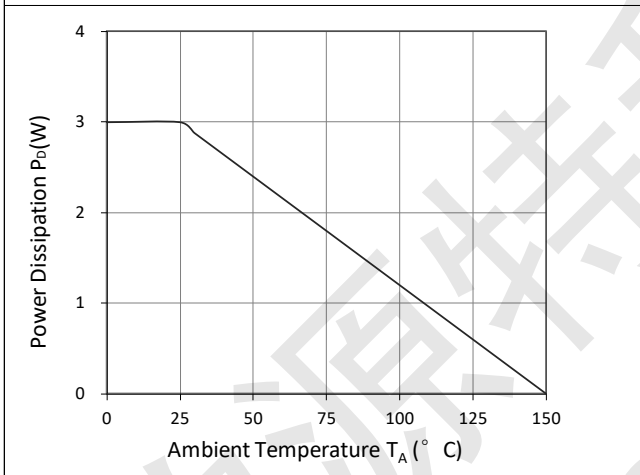


Figure 9. Power Dissipation

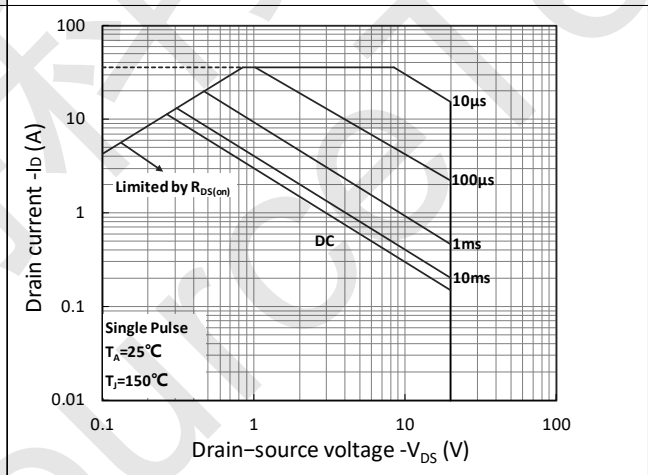


Figure 10. Safe Operating Area

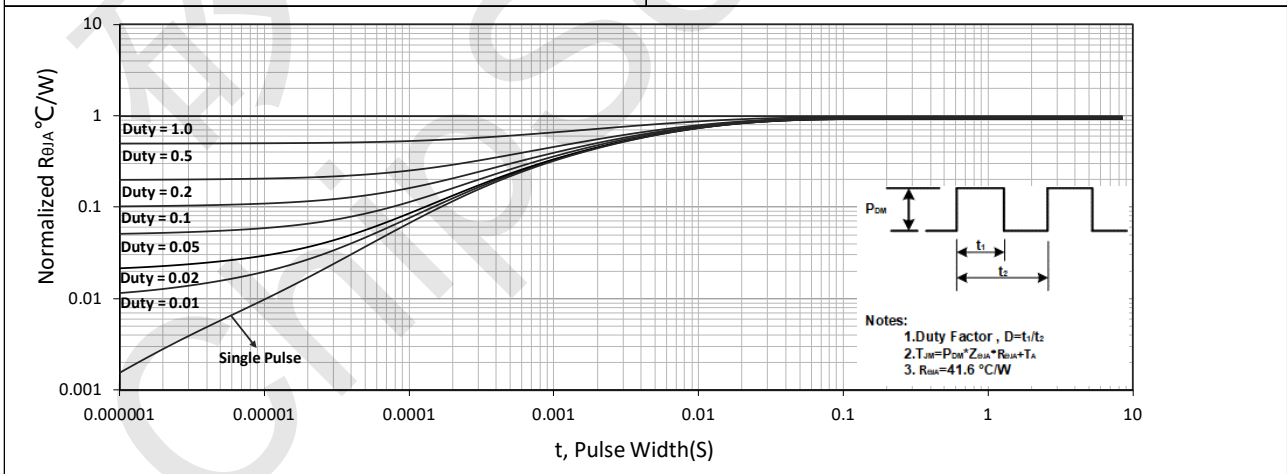
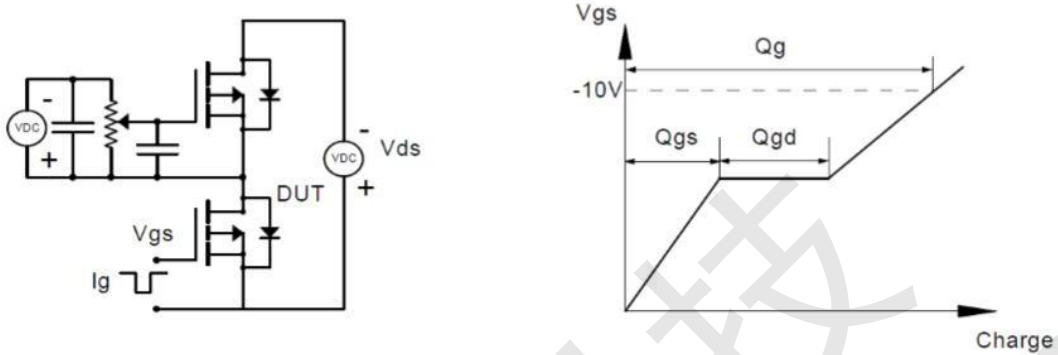


Figure 11. Normalized Maximum Transient Thermal Impedance

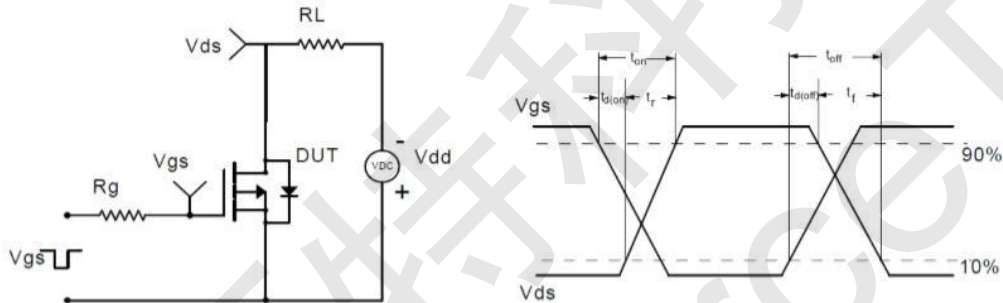


### CST20P09L Test Circuit

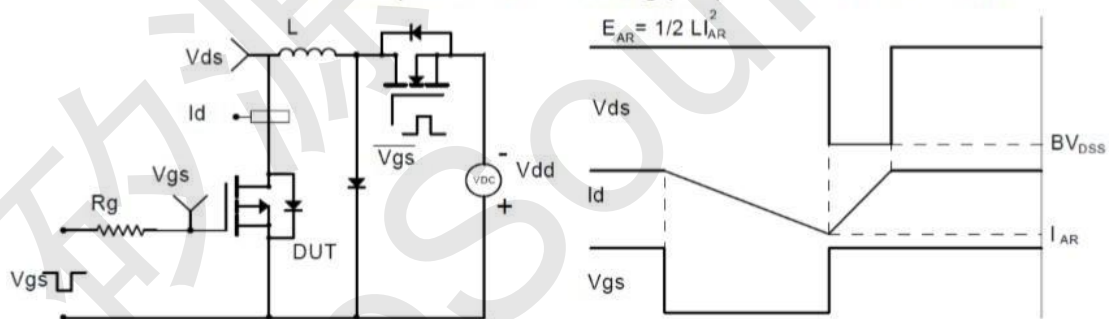
#### Gate Charge Test Circuit & Waveform



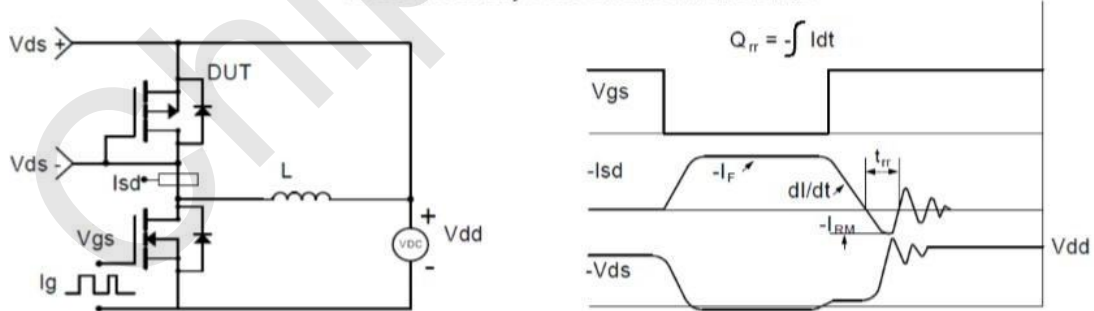
#### Resistive Switching Test Circuit & Waveforms



#### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

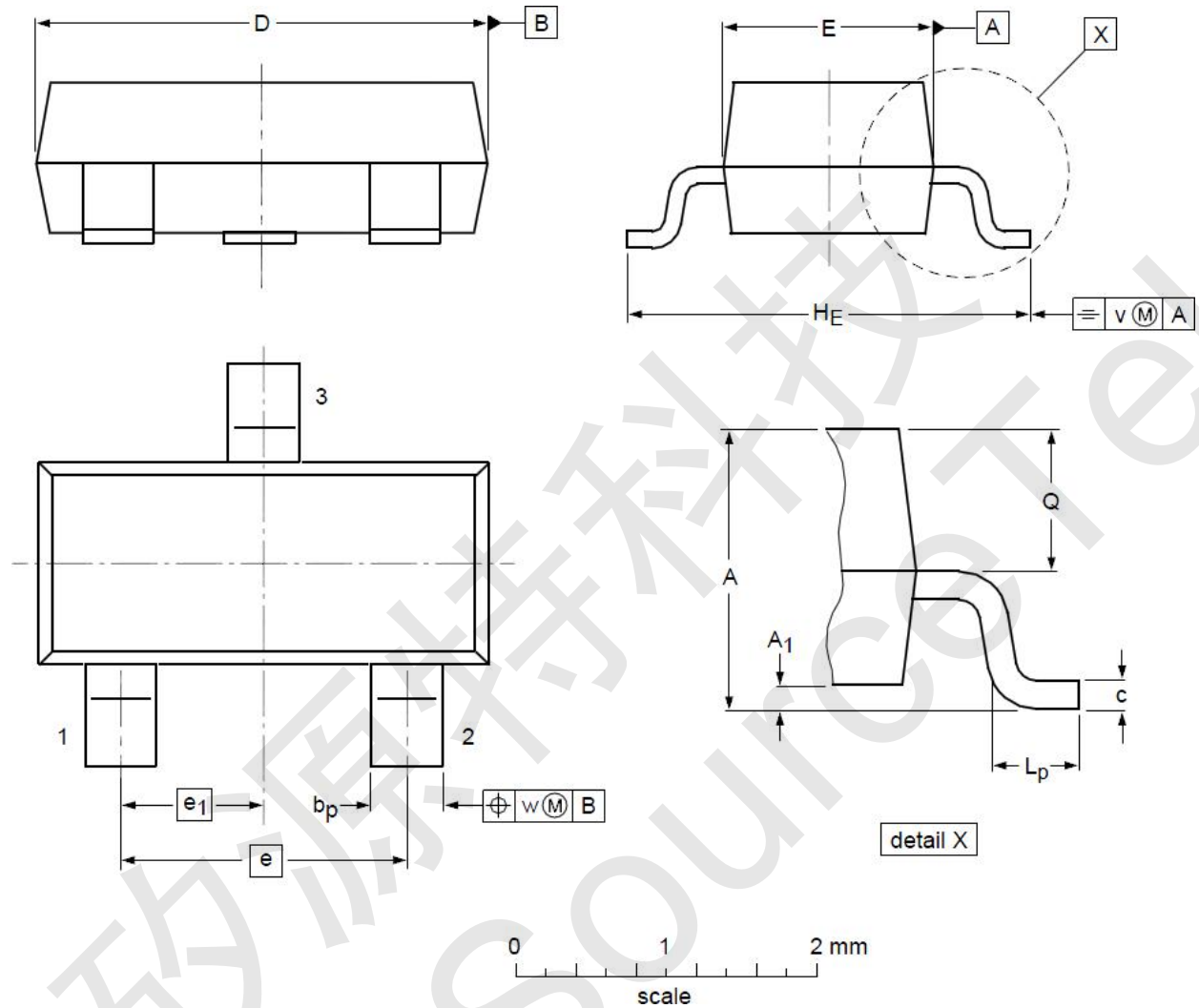


#### Diode Recovery Test Circuit & Waveforms





CST20P09L Package Mechanical Data-SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°