

## 60V N-Channel Enhancement Mode MOSFET

### Description

The HX2310 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

- ◆  $V_{DS} = 60V$   $I_D = 3A$   
 $R_{DS(ON)} < 90m\Omega$  @  $V_{GS} = 10V$  (Typ: 76m  $\Omega$ )  
 $R_{DS(ON)} < 100m\Omega$  @  $V_{GS} = 4.5V$  (Typ: 88m  $\Omega$ )
- ◆ High density cell design for ultra low  $R_{dson}$ .
- ◆ Fully characterized avalanche voltage and current.
- ◆ Low gate to drain charge to reduce switching losses.

### Application

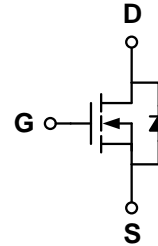
- ◆ Power switching application.
- ◆ Hard switched and high frequency circuits.
- ◆ Uninterruptible power supply.

### Package

- ◆ SOT-23

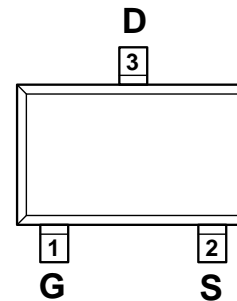


### Schematic diagram



### Marking and pin assignment

SOT-23  
(TOP VIEW)



### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
HX2310	-55°C to +150°C	SOT-23	3000

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit	
Drain-source voltage	$V_{DS}$	60	V	
Gate-source voltage	$V_{GS}$	$\pm 20$	V	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	$I_D$	T <sub>C</sub> =25°C	3	A
		T <sub>C</sub> =70°C	2	
		T <sub>A</sub> =25°C	1.6 <sup>b,c</sup>	
		T <sub>A</sub> =70°C	1.3 <sup>b,c</sup>	
Continuous Source-Drain Diode Current	$I_S$	T <sub>C</sub> =25°C	2.1	
		T <sub>A</sub> =25°C	1 <sup>b,c</sup>	
Pulsed Drain Current (t = 300 $\mu$ s)	$I_{DM}$	12		
Maximum power dissipation	$P_D$	2.5	W	

	$T_C=70^\circ\text{C}$		1.6	
	$T_A=25^\circ\text{C}$		1.25 <sup>b,c</sup>	
	$T_A=70^\circ\text{C}$		0.8 <sup>b,c</sup>	
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55—150	$^\circ\text{C}$

## Thermal Characteristics

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	$t \leq 5 \text{ s}$	$R_{\theta JA}$	100	130	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	Steady State	$R_{\theta JF}$	60	75	

Notes:

- a:  $T_C = 25^\circ\text{C}$ .      b: Surface mounted on 1" x 1" FR4 board.  
 c:  $t = 5 \text{ s}$ .          d: Maximum under steady state conditions is  $175^\circ\text{C/W}$ .

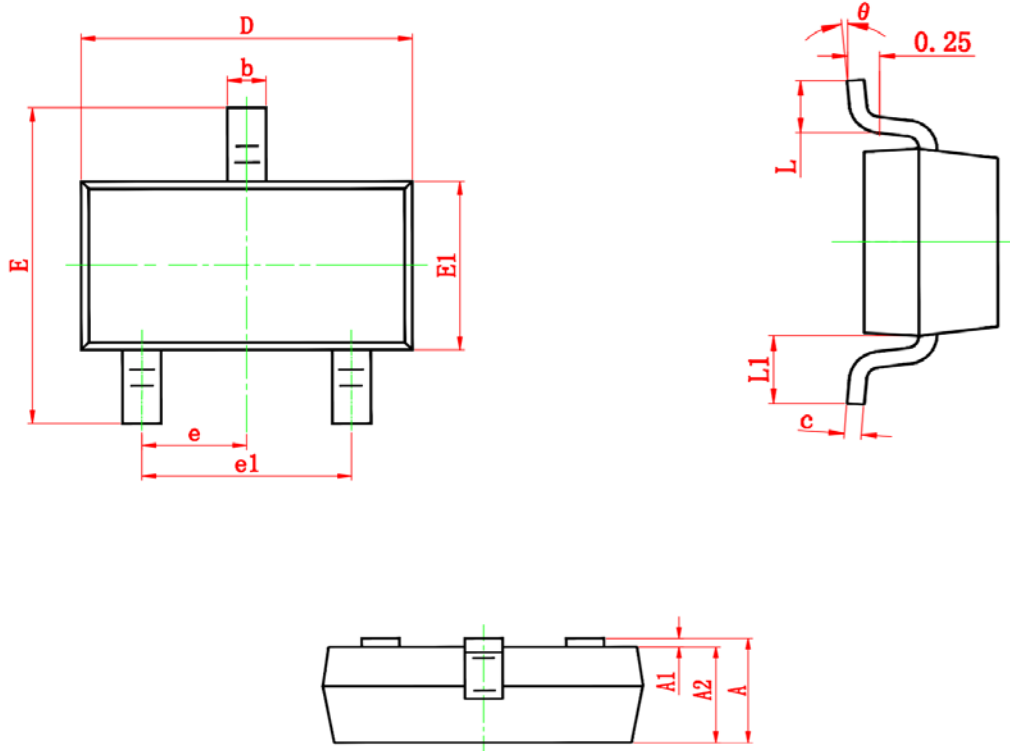
## Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	60	-	-	V
BVDSS Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}, I_D=1\text{mA}$		33		$\text{mV}/^\circ\text{C}$
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=60\text{V}, V_{GS}=0\text{V}$	-	-	1	$\mu\text{A}$
		$T_J=85^\circ\text{C}$	-	-	30	
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.2	1.9	2.5	V
Drain-source on-state resistance <sup>1</sup>	$R_{DS(ON)}$	$V_{GS}=10\text{V}, I_D=3\text{A}$	-	78	90	m $\Omega$
		$V_{GS}=4.5\text{V}, I_D=2\text{A}$		88	100	
On Status Drain Current	$I_{D(ON)}$	$V_{DS}=10\text{V}, V_{GS}=10\text{V}$	3	-	-	A
<b>Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$I_{SD}=1\text{A}, V_{GS}=0\text{V}$	-	0.75	1.1	V
Diode Continuous Forward Current	$I_S$		-	-	3	A
Reverse Recovery Time	$t_{rr}$	$I_F=1.5\text{A},$ $dI/dt=100\text{A}/\mu\text{s}$	-	15	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	12	-	nC
<b>Dynamic Characteristics<sup>2</sup></b>						
Gate Resistance	$R_G$	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	-	2.0	-	$\Omega$
Input capacitance	$C_{ISS}$	$V_{GS}=0\text{V}, V_{DS}=25\text{V}$ $f=1.0\text{MHz}$	-	175	-	pF
Output capacitance	$C_{OSS}$		-	21	-	
Reverse transfer capacitance	$C_{RSS}$		-	13	-	
Turn-on delay time	$t_{D(ON)}$	$V_{GS}=10\text{V}, V_{DD}=30\text{V},$ $R_L=4.7\Omega, I_D=1.5\text{A},$ $R_G=3.3\Omega$	-	15	-	ns
Turn-on Rise time	$t_r$		-	16	-	
Turn-off delay time	$t_{D(OFF)}$		-	10	-	
Turn-off Fall time	$t_f$		-	10	-	

Total gate charge	$Q_g$	$V_{GS}=10V, I_D=2A$ $V_{DS}=30V$	-	4.1	nC
Gate-source charge	$Q_{gs}$			0.8	
Gate-drain charge	$Q_{gd}$		-	1	

### Package Information

- SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
$\theta$	0°	8°	0°	8°