

20V P-Channel Enhancement Mode MOSFET

Description

The NP2307MR uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

General Features

- ◆ $V_{DS} = -20V$, $I_D = -6A$
 $R_{DS(ON)}(Typ.) = 25m\Omega$ @ $V_{GS} = -2.5V$
 $R_{DS(ON)}(Typ.) = 20m\Omega$ @ $V_{GS} = -4.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

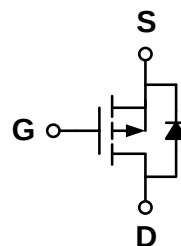
Application

- ◆ PWM applications
- ◆ Load switch

Package

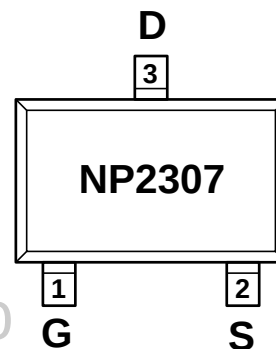
- ◆ SOT-23-3L

Schematic diagram



Marking and pin assignment

SOT-23-3L
(TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP2307MR-G	-55°C to +150°C	SOT-23-3L	3000

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

parameter		symbol	limit	unit
Drain-source voltage		V_{DS}	-20	V
Gate-source voltage		V_{GS}	±12	V
Continuous Drain Current	TC=25°C	I_D	-6	A
	TC=70°C		-4	
Pulsed Drain Current ^C		I_{DP}	-24	A
power dissipation ^B	TC=25°C	P_D	1.4	W
	TC=70°C		0.9	
Junction and Storage Temperature Range		T_J, T_{SGT}	-55—150	°C

Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-20	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-20V, V _{GS} =0V	-	-	-1	μA
Gate-body leakage	I _{GSS}	V _{DS} =0V, V _{GS} =±12V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.5	-0.7	-1.0	V
Drain-source on-state resistance	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-6A	-	20	25	mΩ
		V _{GS} =-2.5V, I _D =-5A	-	25	30	
		V _{GS} =-1.8V, I _D =-3A		38	45	
Forward transconductance	g _{FS}	V _{DS} =-5V, I _D =-6A	-	8	-	S
Dynamic Characteristics						
Input capacitance	C _{ISS}	V _{DS} =-10V ,V _{GS} =0V f=1.0MHz	-	2100	-	pF
Output capacitance	C _{OSS}		-	498	-	
Reverse transfer capacitance	C _{RSS}		-	300	-	
Switching Characteristics						
Turn-on delay time	t _{D(ON)}	V _{DD} =-10V I _D =-2.8A V _{GEN} =-4.5V R _L =10ohm R _{GEN} =-6ohm	-	25	-	ns
Rise time	tr		-	30	-	
Turn-off delay time	t _{D(OFF)}		-	70	-	
Fall time	tf		-	50	-	
Total gate charge	Qg	V _{DS} =-10V,I _D =-6A V _{GS} =-4.5V	-	17	-	nC
Gate-source charge	Qgs		-	4.1	-	
Gate-drain charge	Qgd		-	4.3	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V _{SD}	V _{GS} =0V,I _S =-1.25A	-	-0.81	-1.2	V

Thermal Characteristics

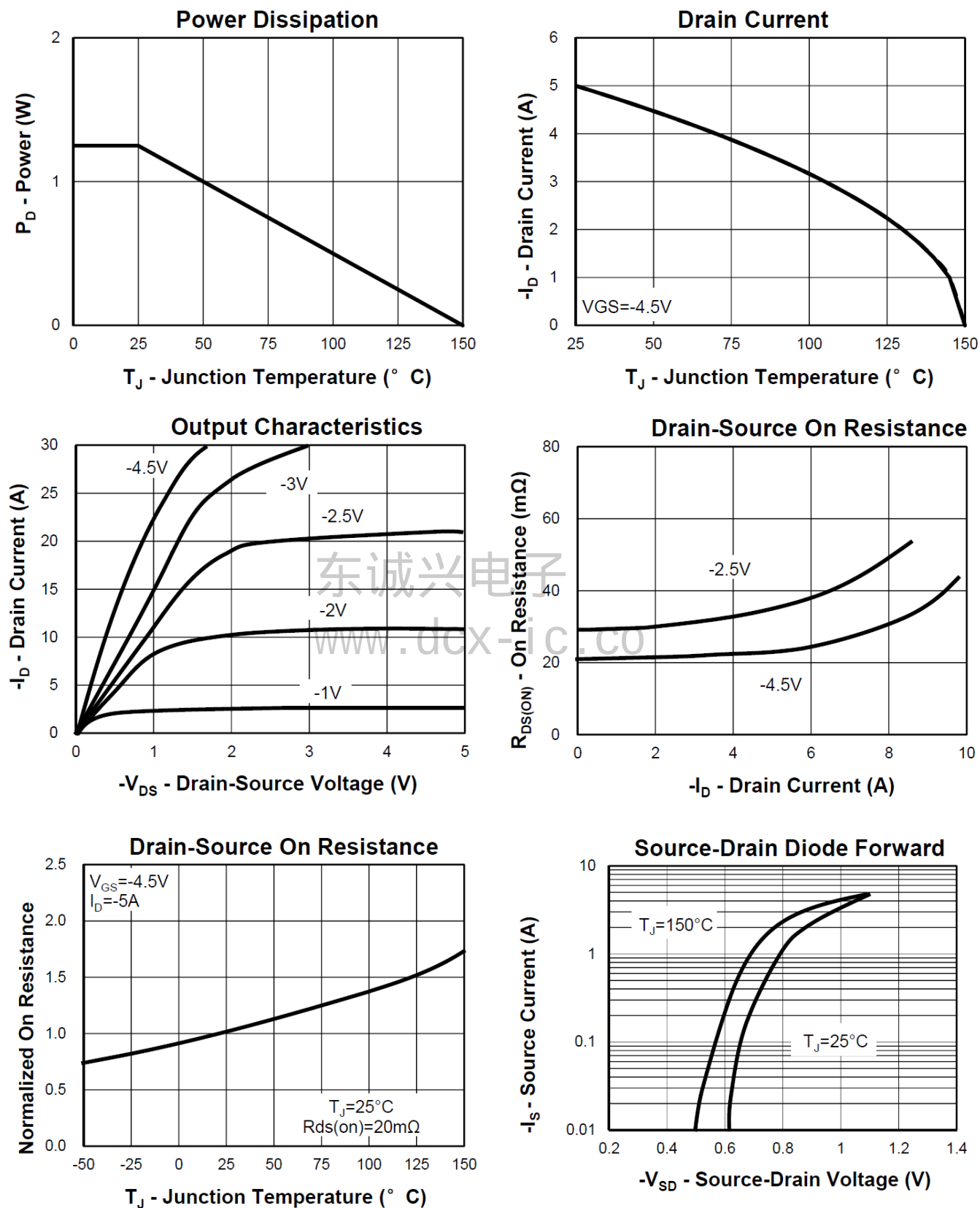
Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^A	$t \leq 10s$	70	90	$^{\circ}C/W$
Maximum Junction-to-Ambient ^{A D}	Steady-State	100	125	
Maximum Junction-to-Lead	Steady-State	62	80	

A. 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.

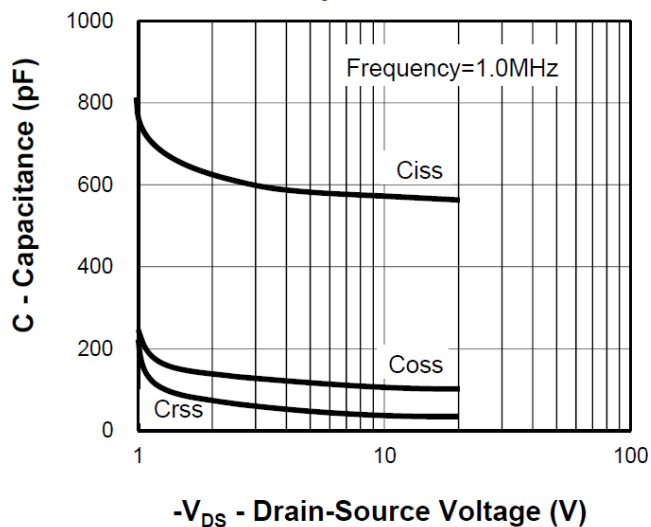
B. The power dissipation P_D is based on $T_{J(MAX)}=150^{\circ}C$, using $\leq 10s$ junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^{\circ}C$. Ratings are based on low frequency and duty

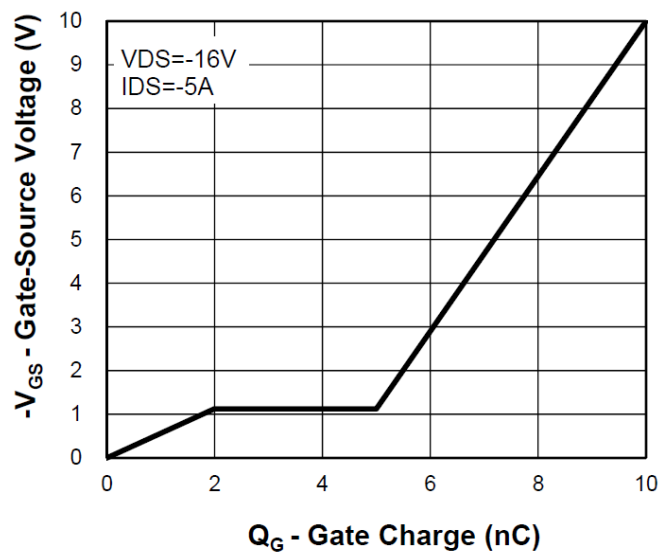
Typical Performance Characteristics



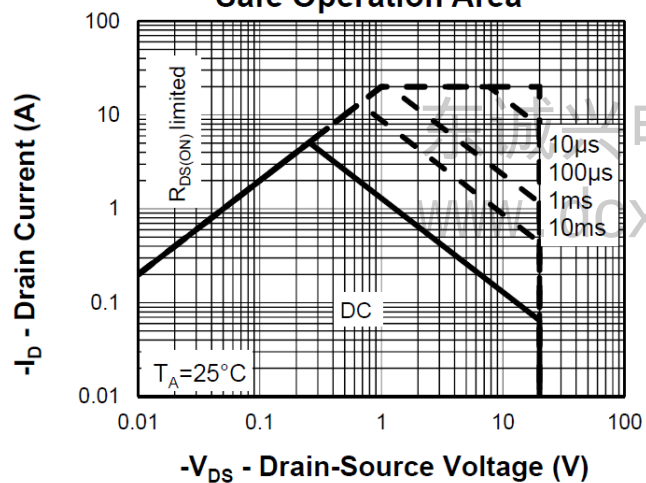
Capacitance



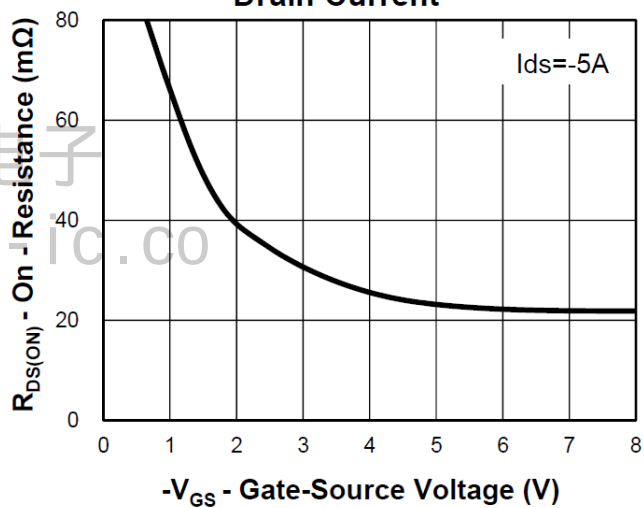
Gate Charge



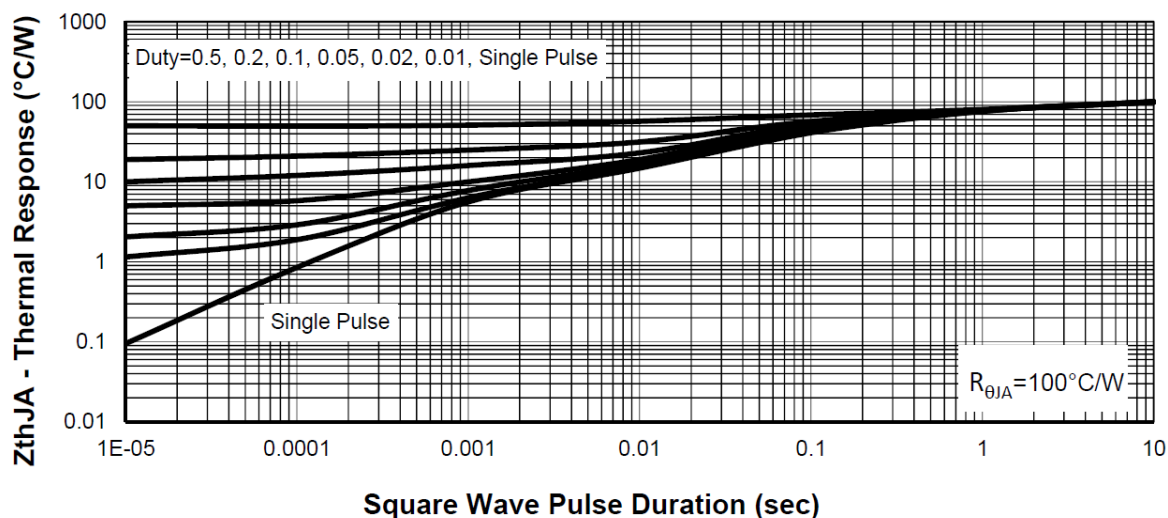
Safe Operation Area



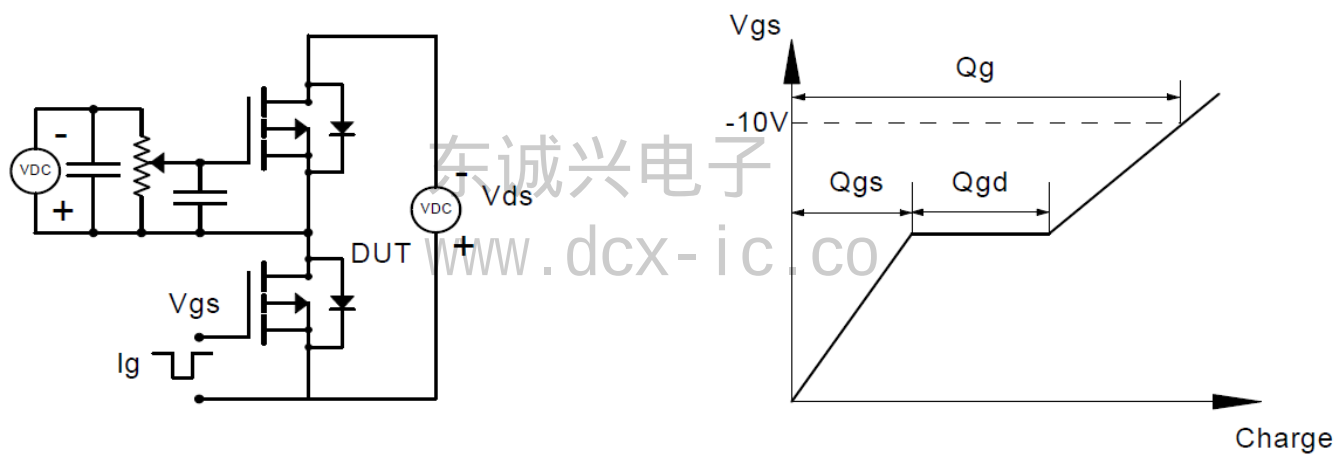
Drain Current



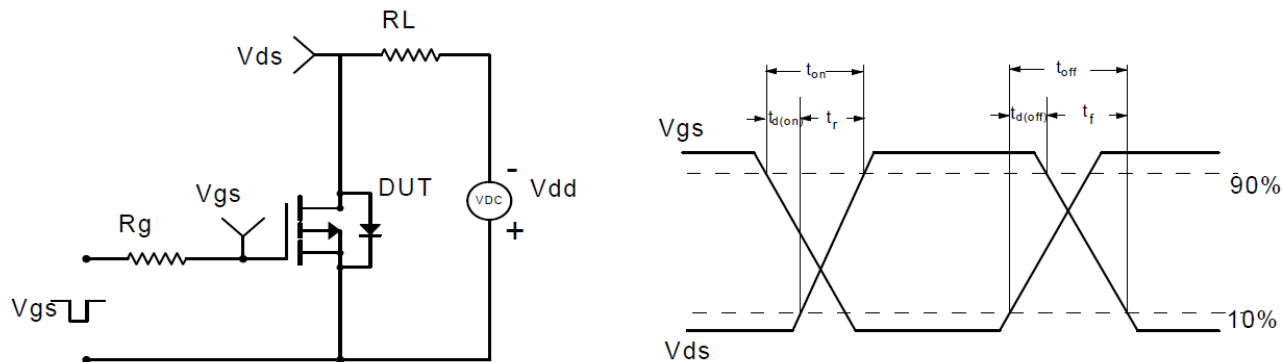
Thermal Transient Impedance



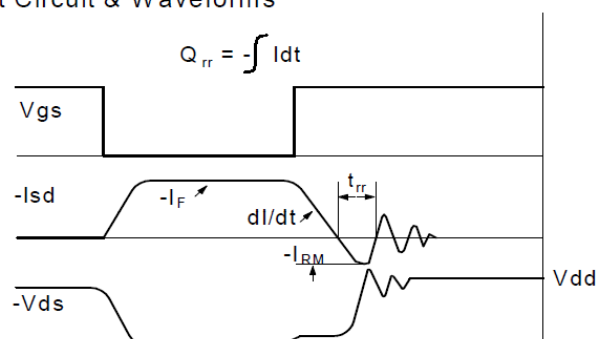
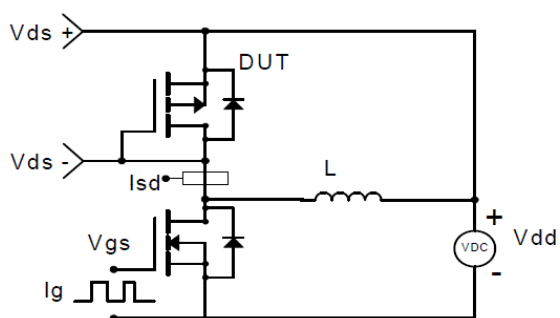
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



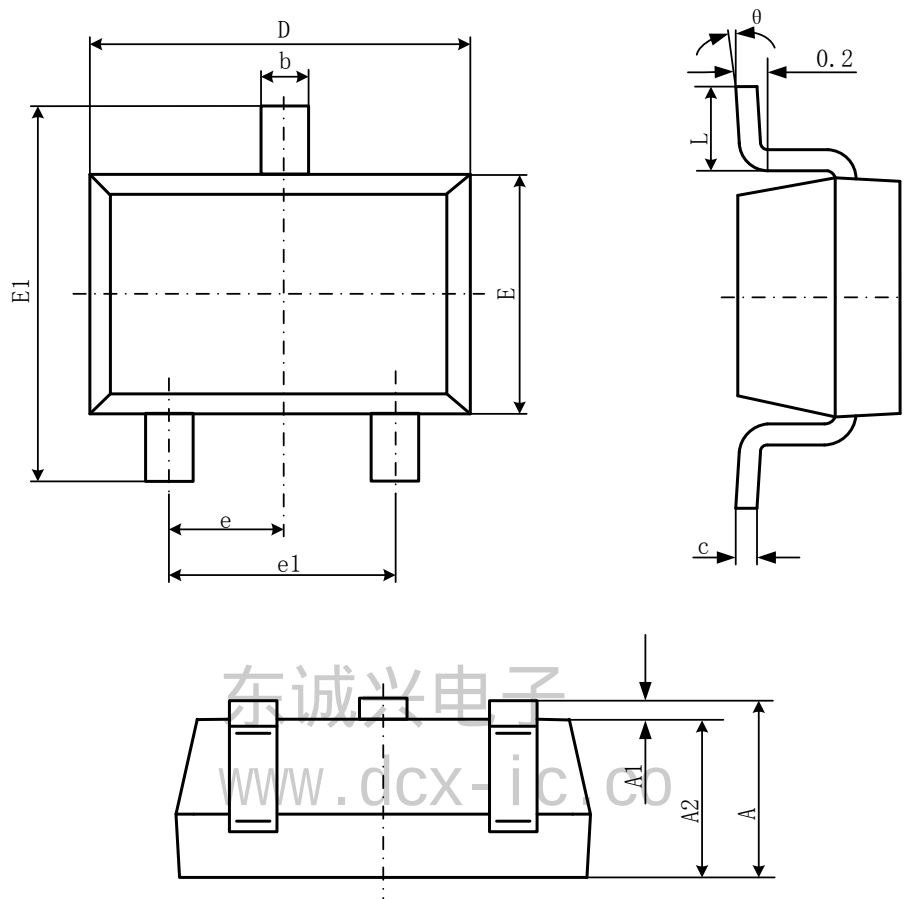
Diode Recovery Test Circuit & Waveforms



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Package Information

- 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
θ	0°	8°	0°	8°