

# WinhiSemi

**VUGA053N25TA**

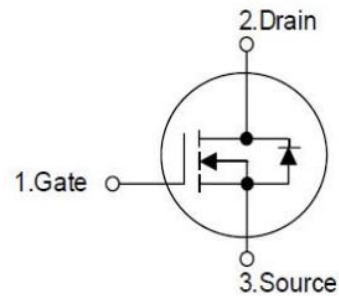
**Datasheet**

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### General Description

VUGA053N25TA N-Channel MOSFET is based on unique device design to achieve low  $R_{DS(ON)}$ , low gate charge, fast switching and excellent avalanche characteristics.

### Symbol

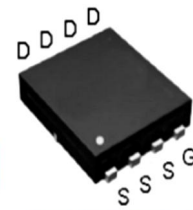


Symbol of VUGA053N25TA

### Features

- Low  $R_{DS(ON)}$  & FOM
- $R_{DS(ON)_{max}} = 10m\Omega @ V_{GS} = 4.5V$
- Extremely low switching loss
- Fast switching and soft recovery

### Package Type



Package Type of VUGA053N25TA

### Application

- Charging Circuit
- Battery Applications
- Synchronous Rectification
- High Frequency Switching

### Ordering Information

Product Name	Package	Marking
VUGA053N25TA	PDFN3.3*3.3	53N25

## Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	±8	V
Continuous Drain Current <sup>Note 1</sup> , $T_C=25^{\circ}\text{C}$	$I_D$	22	A
Pulsed Drain Current <sup>Note 2</sup>	$I_{DM}$	66	A
Max Power Dissipation <sup>Note 3</sup> , $T_C=25^{\circ}\text{C}$	$P_D$	19.4	W
Avalanche Current, Single Pulse <sup>Note 5</sup>	$I_{AS}$	27.23	A
Avalanche Energy, Single Pulse <sup>Note 5</sup>	$E_{AS}$	111.22	mJ
Operation Junction temperature	$T_J$	-55 to 150	$^{\circ}\text{C}$

## Thermal Resistance

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$		6.45		$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient <sup>Note 4</sup>	$R_{\theta JA}$		62		

Notes:

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3)  $P_D$  is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25^{\circ}\text{C}$ .
- 5)  $V_{DS}=15\text{V}$ ,  $V_{GS}=4.5\text{V}$ ,  $L=0.3\text{mH}$ ,  $R_g=25\Omega$ , starting  $T_J=25^{\circ}\text{C}$ .

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Statistic Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 8V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.4	0.6	0.9	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=5A$		8.2	10	$m\Omega$
		$V_{GS}=4.5V, I_D=15A$		8.2	10	$m\Omega$
Gate Resistance	$R_G$	$f=1MHz, \text{open drain}$		0.41		$\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{GS}=0V$		687.7		pF
Output Capacitance	$C_{oss}$	$V_{DS}=10V$		510.4		pF
Reverse Transfer Capacitance	$C_{rss}$	$f=1MHz$		55.5		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=15V$		7.3		ns
Rise Time	$t_r$	$V_{GS}=4.5V$		2.9		
Turn-off Delay Time	$t_{d(off)}$	$I_D=6A$		25.1		
Fall Time	$t_f$	$R_G=3\Omega$		8.4		
<b>Switching Characteristics</b>						
Total Gate Charge (@ $V_{GS}=8V$ )	$Q_g$	$V_{GS}=0 \text{ to } 8V$ $V_{DS}=10V$ $I_D=15A$		17.49		nC
Total Gate Charge (@ $V_{GS}=4.5V$ )	$Q_g$		10.15			
Gate to Source Charge	$Q_{gs}$		1.15			
Gate to Drain Charge	$Q_{gd}$		3.13			
<b>Reverse Diode Characteristics</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=12A$		0.82	1.2	V
Reverse Recovery Time	$t_{rr}$	$V_{DS}=10V$		28.74		ns
Reverse Recovery Charge	$Q_{rr}$	$I_F=12A$		17.03		nC
Peak Reverse Recovery Current	$I_{rrm}$	$di/dt=100A/\mu s$		1.05		A

Typical Performance Characteristics

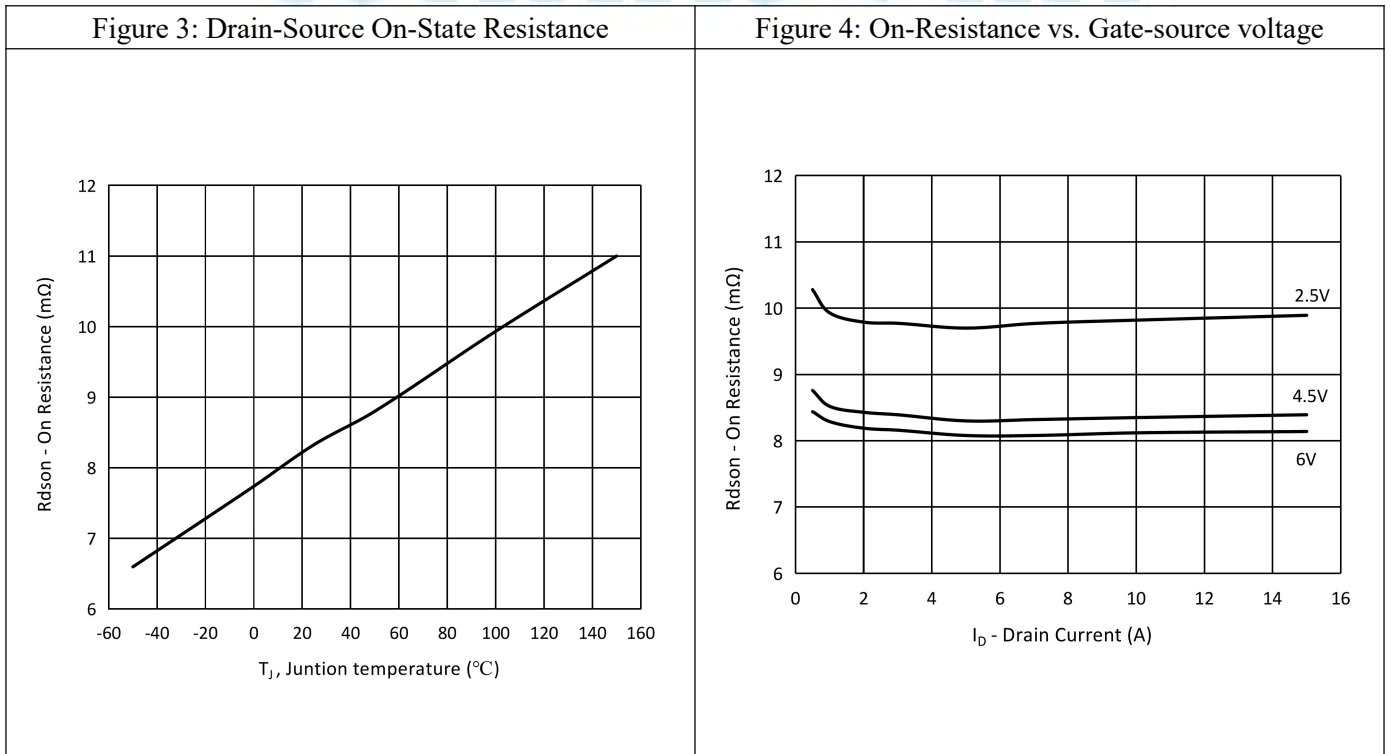
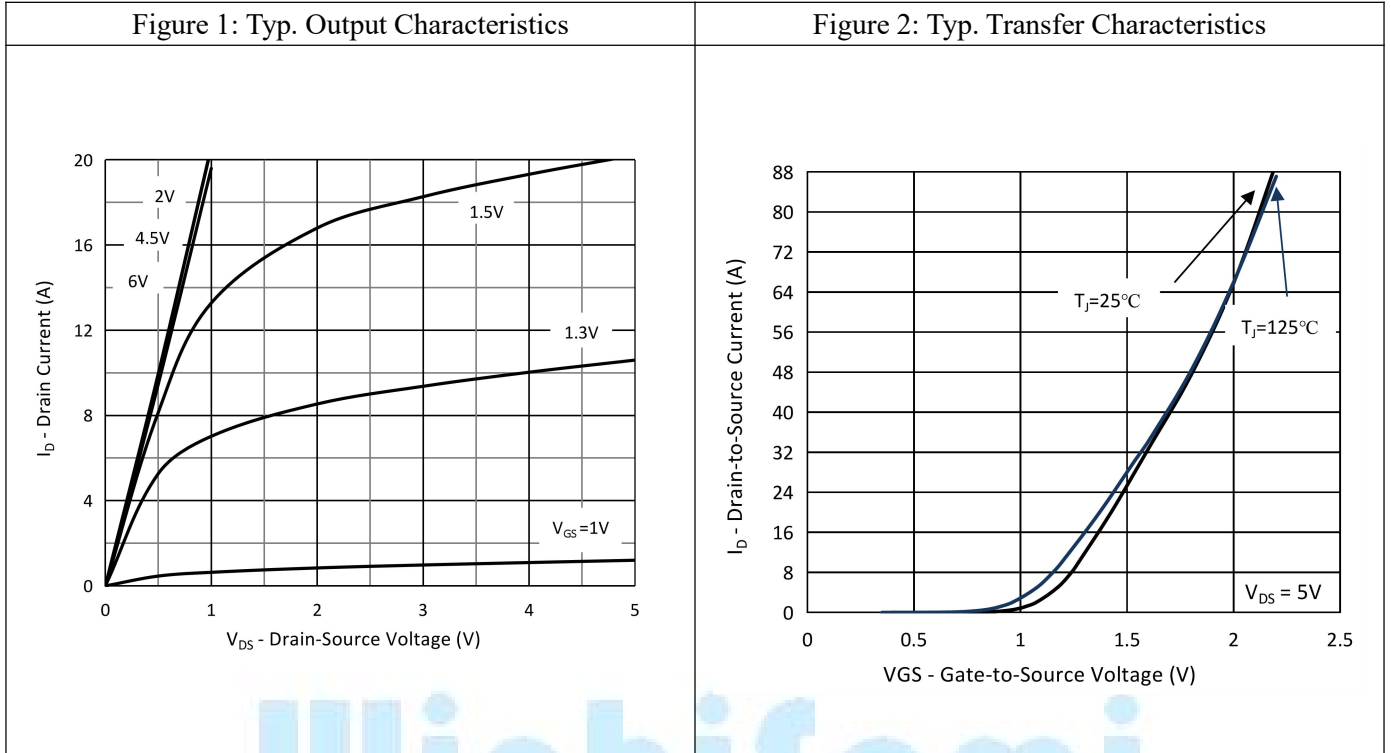


Figure 5: Typ. Capacitances

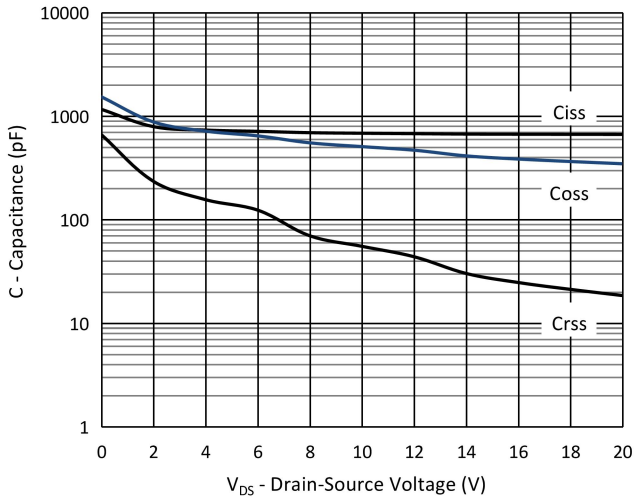


Figure 6: Gate Charge Characteristics

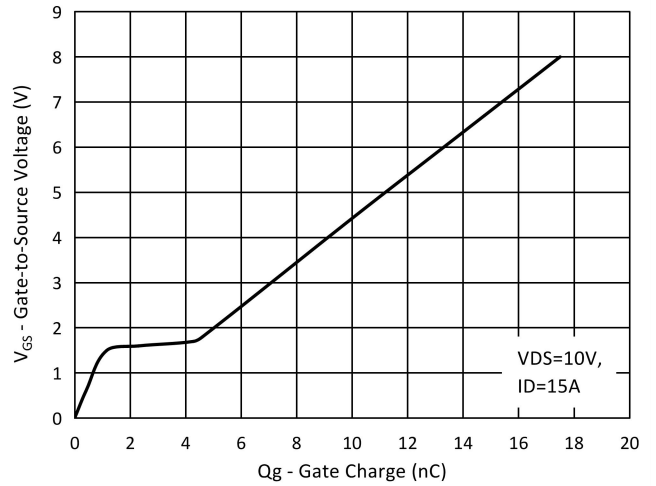


Figure 7: Forward Characteristics of Body Diode

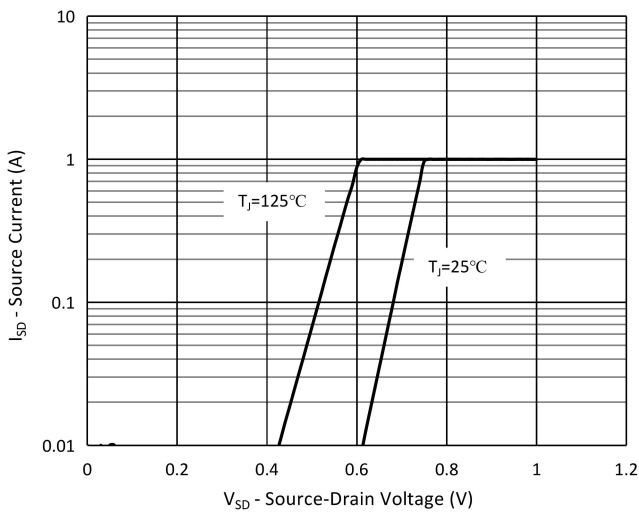


Figure 8: Safe Operating Area

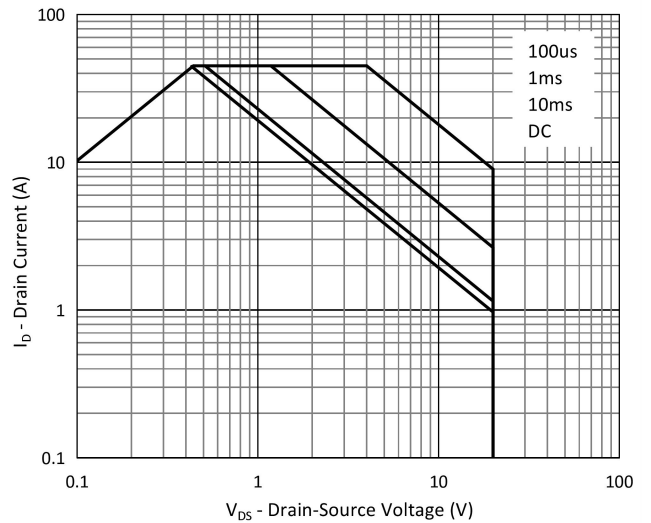


Figure 9: Power De-rating

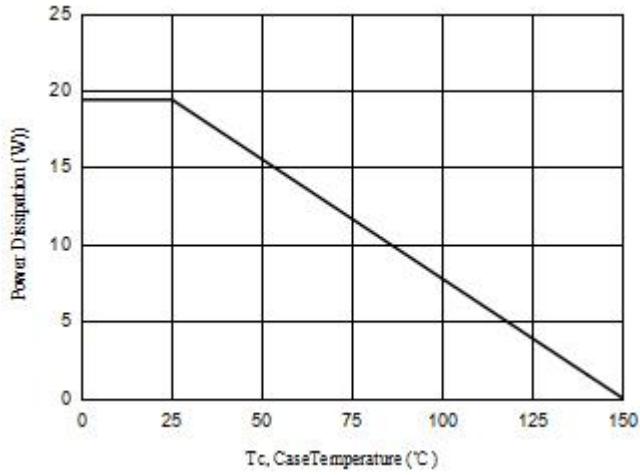


Figure 10: Current De-rating

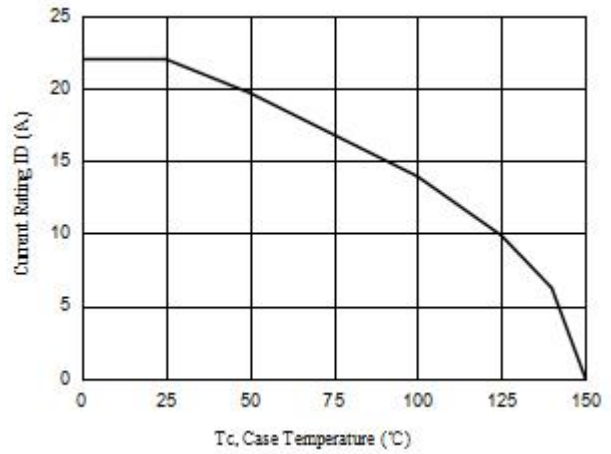


Figure 11: Single pulse power rating, Junction to case

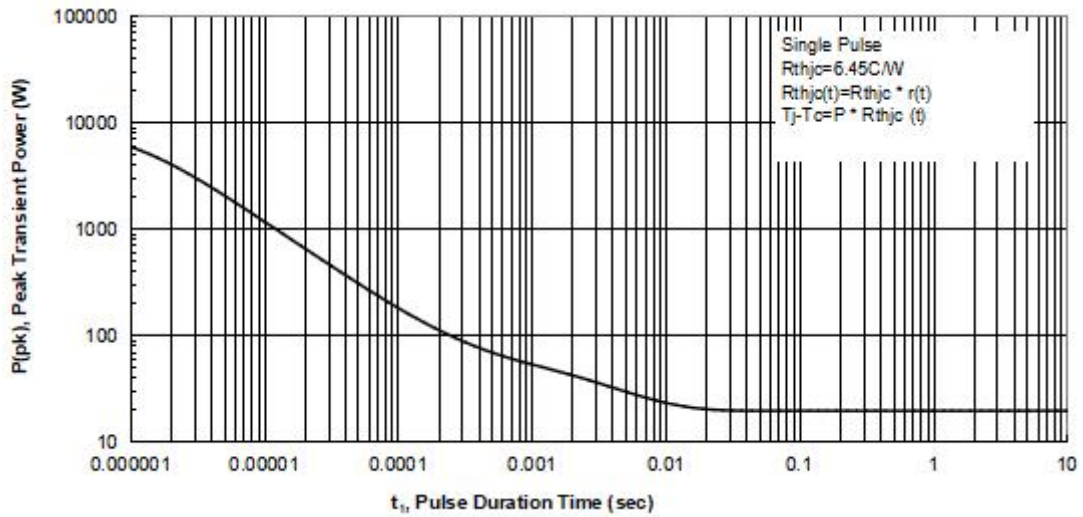
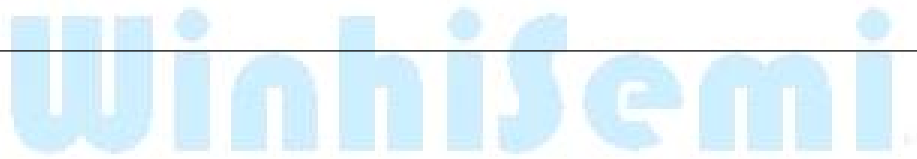
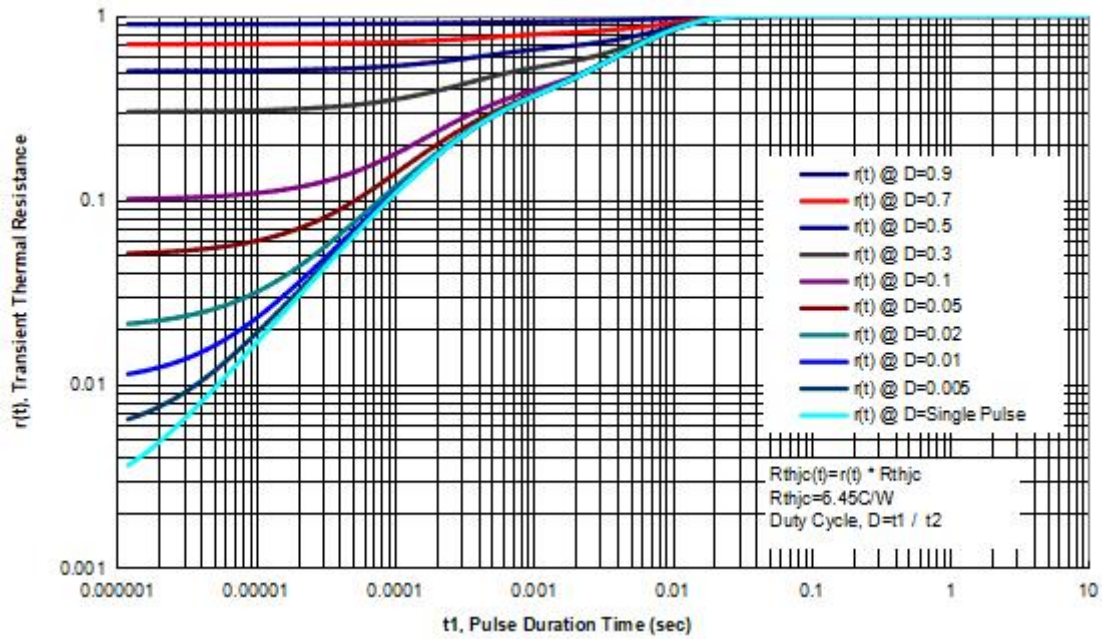
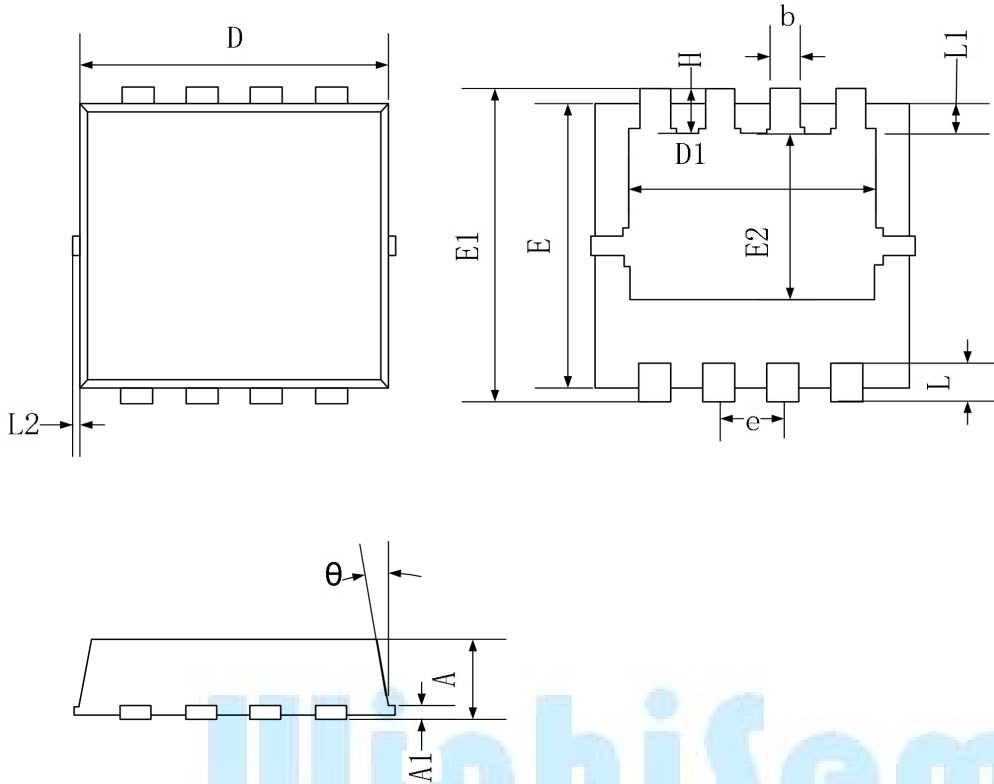


Figure 12: Max transient thermal impedance





**Mechanical Dimensions (PDFN3.3\*3.3 Unit:mm)**



SYMBOL	MILLIMETERS	
	MIN	MAX
A	0.70	0.90
A1	0.10	0.25
D	2.90	3.25
D1	2.25	2.69
E	2.90	3.20
E1	3.00	3.60
E2	1.35	2.20
b	0.20	0.40
e	0.65BSC	
L	0.30	0.50
L1	0.13BSC	
L2	0.00	0.20
H	0.15	0.65
θ	0°	14°

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