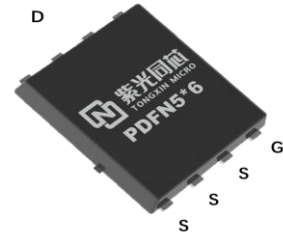


# THF1D3S40LKN2

## Datasheet

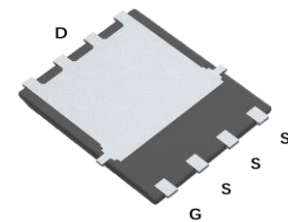
### Product Summary

Parameter	Value	Unit
$V_{DS}$	40	V
$V_{GS(th)}_{Typ}$	1.7	V
$I_D$ (@ $V_{GS} = 10V$ ) <sup>(1)</sup>	196	A
$R_{DS(ON)}_{Typ}$ (@ $V_{GS} = 10V$ )	1.1	m $\Omega$



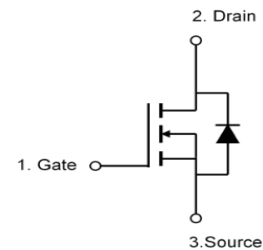
### Features

- Fast Switching
- Very low on-resistance
- Enhancement mode
- 100% Avalanche Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free and RoHS-compliant



### Typical Applications

- Load Switch
- PWM Application
- Power Management



### Product Validation

- Qualified for Industrial Applications According to The Relevant Tests of JEDEC47/20/22

# THF1D3S40LKN2

## Datasheet

### Ordering Information

Device	Package	Quantity of Pins	Marking	MSL	T <sub>J</sub> (°C)
THF1D3S40LKN2	PDFN5x6-8L	8	1D3S40LKN	1	-55 to 150

### Absolute Maximum Ratings (@ T<sub>A</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DS</sub>	40	V
Gate-to-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current <sup>(1)</sup>	I <sub>D</sub>	T <sub>C</sub> = 25°C	196
		T <sub>C</sub> = 100°C	123
Pulsed Drain Current <sup>(2)</sup>	I <sub>DM</sub>	784	A
Avalanche Current <sup>(3)</sup>	I <sub>AS</sub>	73	A
Avalanche Energy <sup>(3)</sup>	E <sub>AS</sub>	266	mJ
Power Dissipation <sup>(4)</sup>	P <sub>D</sub>	T <sub>C</sub> = 25°C	87
		T <sub>C</sub> = 100°C	35
Junction & Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

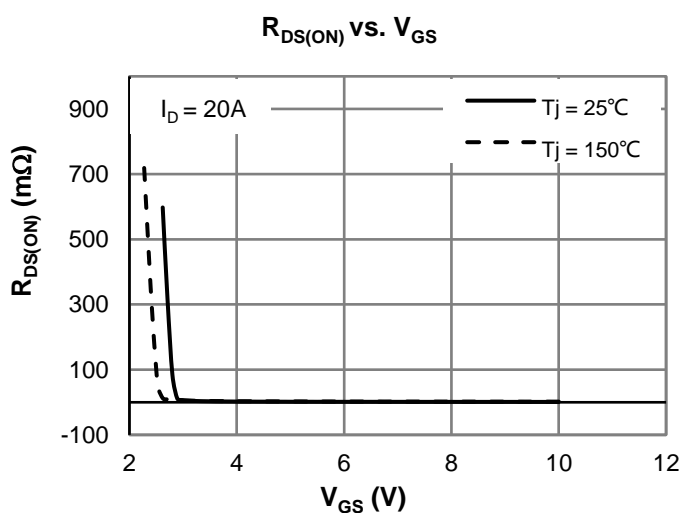


Figure 1: R<sub>DS(ON)</sub> VS. V<sub>GS</sub>

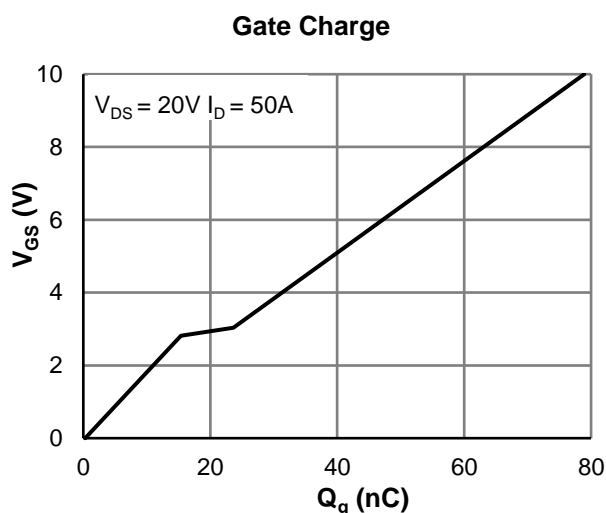


Figure 2: Gate Charge Curve

# THF1D3S40LKN2

## Datasheet

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	$\mu\text{A}$
Gate-Body Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.0	1.7	2.5	V
Static Drain-Source ON-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 50\text{A}$	-	1.1	1.3	m $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 50\text{A}$	-	2.0	2.4	
Diode Forward Voltage	$V_{SD}$	$I_S = 50\text{A}, V_{GS} = 0\text{V}$	-	0.8	1.0	V
Diode Continuous Current	$I_S$	$T_C = 25^\circ\text{C}$	-	-	138	A
<b>DYNAMIC PARAMETERS <sup>(5)</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{V},$ $V_{DS} = 20\text{V},$ $f = 1\text{MHz}$	-	6042	-	pF
Output Capacitance	$C_{oss}$		-	3217	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	60.8	-	pF
Gate Resistance	$R_g$	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$	-	1.1	-	$\Omega$
<b>SWITCHING PARAMETERS <sup>(5)</sup></b>						
Total Gate Charge (@ $V_{GS} = 10\text{V}$ )	$Q_g$	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 20\text{V}, I_D = 50\text{A}$	-	78	-	nC
Gate Source Charge	$Q_{gs}$		-	14.0	-	nC
Gate Drain Charge	$Q_{gd}$		-	8.0	-	nC
Turn-On DelayTime	$t_{D(on)}$	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}$ $I_D = 50\text{A}, R_{GEN} = 1.6\Omega$	-	8.0	-	ns
Turn-On Rise Time	$t_r$		-	9	-	ns
Turn-Off DelayTime	$t_{D(off)}$		-	33	-	ns
Turn-Off Fall Time	$t_f$		-	12	-	ns
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$	-	42	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	68.0	-	nC

### Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	45	54	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.2	1.4	$^\circ\text{C}/\text{W}$

#### Notes:

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under  $T_{J\_Max}$ .
3. This single-pulse measurement was taken under the following condition [ $L = 0.1\text{mH}, V_{GS} = 10\text{V}, V_{DS} = 40\text{V}$ ] while its value is limited by  $T_{J\_Max}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max}$ .
5. This value is guaranteed by design hence it is not included in the production test.

# THF1D3S40LKN2

## Datasheet

### Typical Electrical & Thermal Characteristics

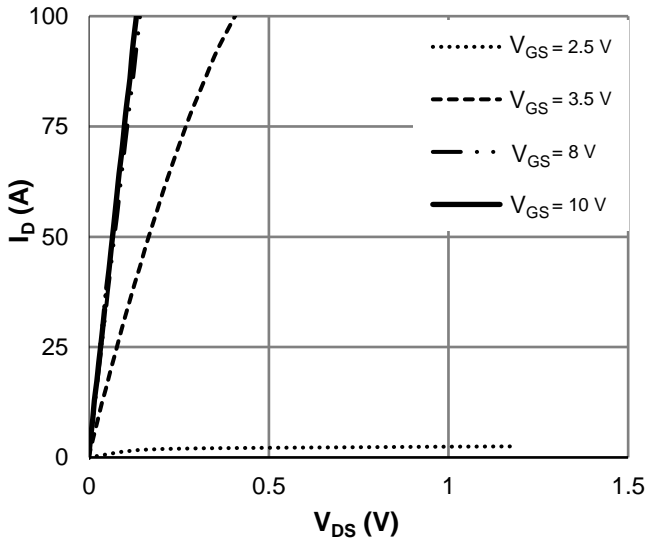


Figure 3: Saturation Characteristics

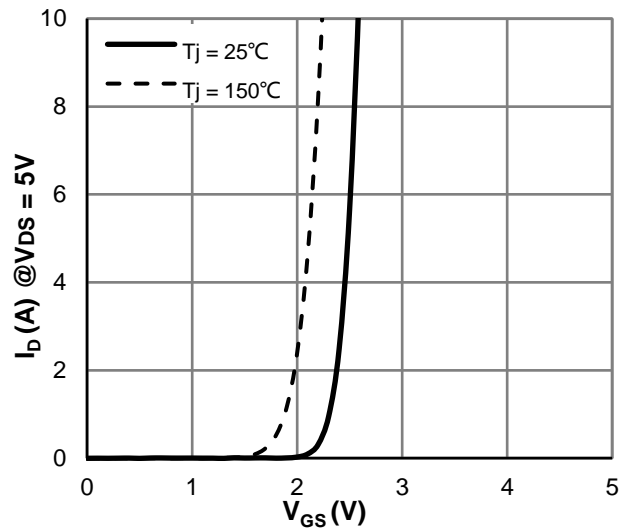


Figure 4: Transfer Characteristics

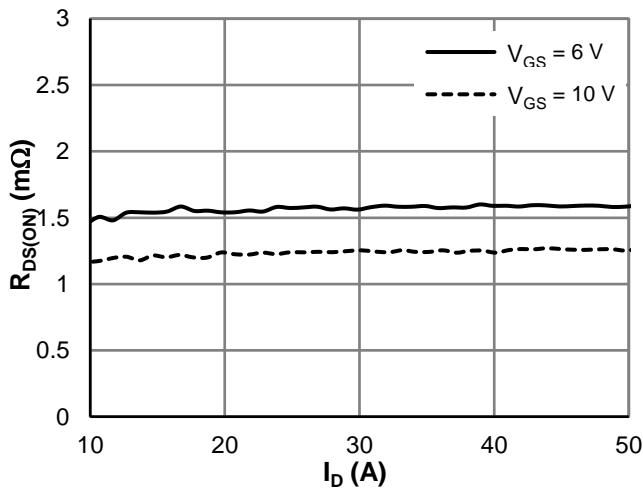


Figure 5: R\_DS(ON) vs. Drain Current

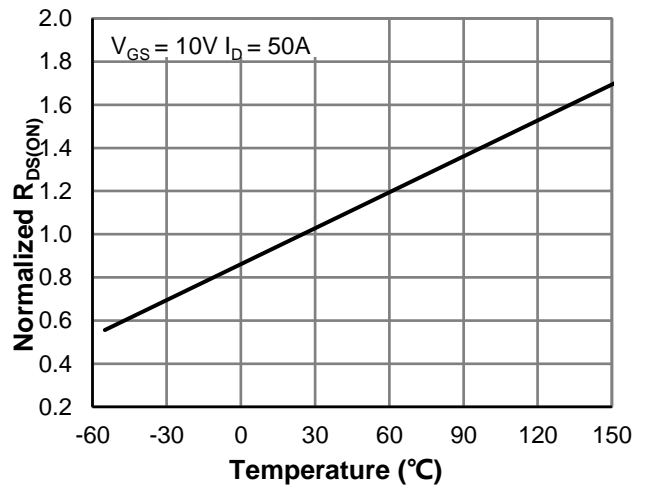


Figure 6: R\_DS(ON) vs. Junction Temperature

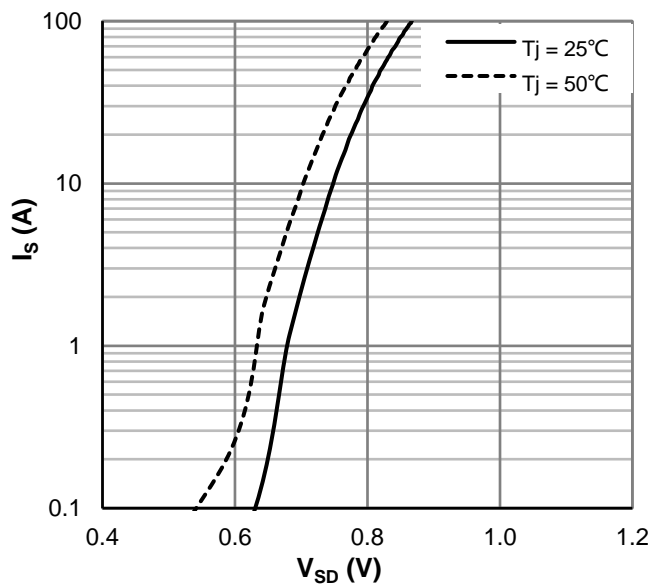


Figure 7: Body-Diode Characteristics

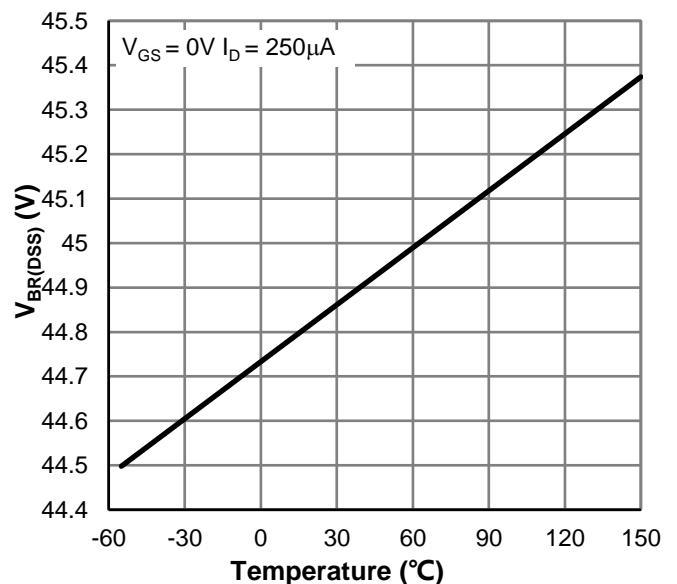


Figure 8:  $V_{BR(DSS)}$  vs. Junction Temperature

# THF1D3S40LKN2

## Datasheet

### Typical Electrical & Thermal Characteristics

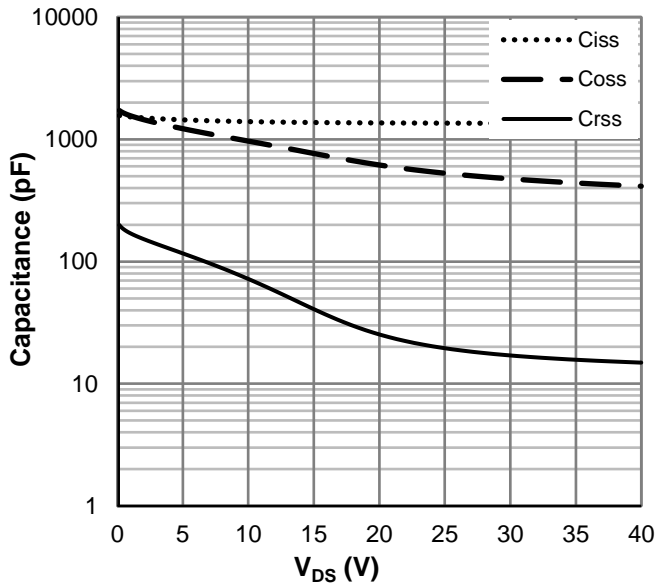


Figure 9: Capacitance Characteristics

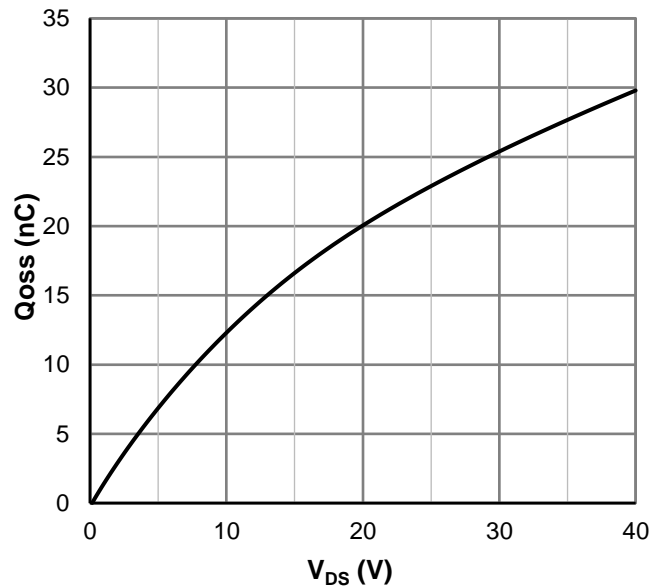


Figure 10: Coss Stored Energy

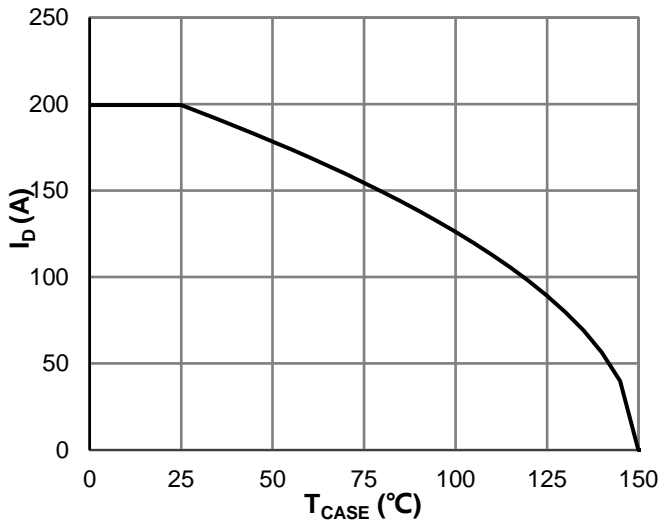


Figure 11: Current De-rating

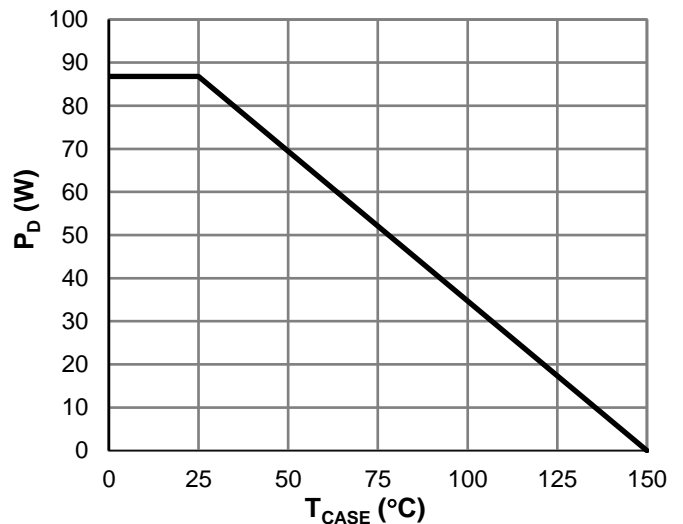


Figure 12: Power De-rating

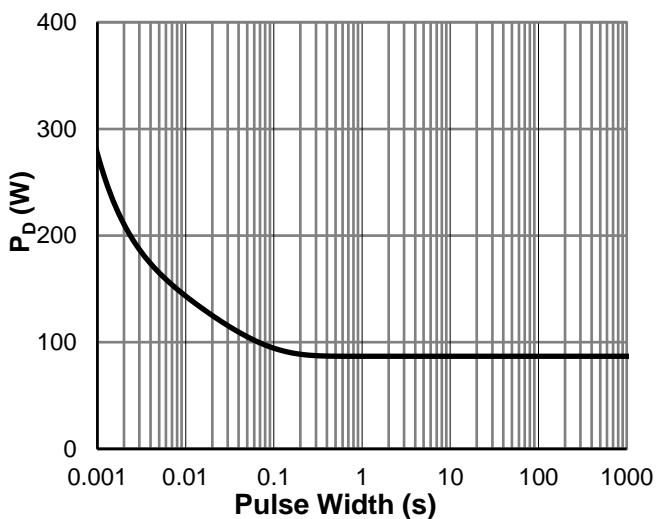


Figure 13: Single Pulse Power Rating, Junction-to-Case

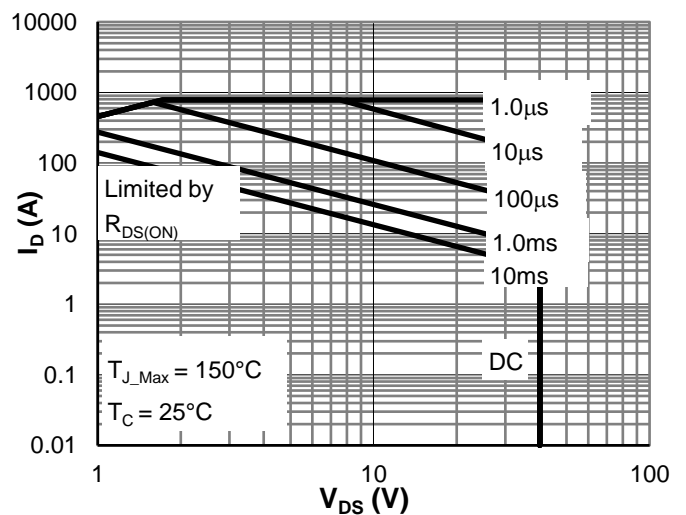


Figure 14: Maximum Safe Operating Area

# THF1D3S40LKN2

## Datasheet

### Typical Electrical & Thermal Characteristics

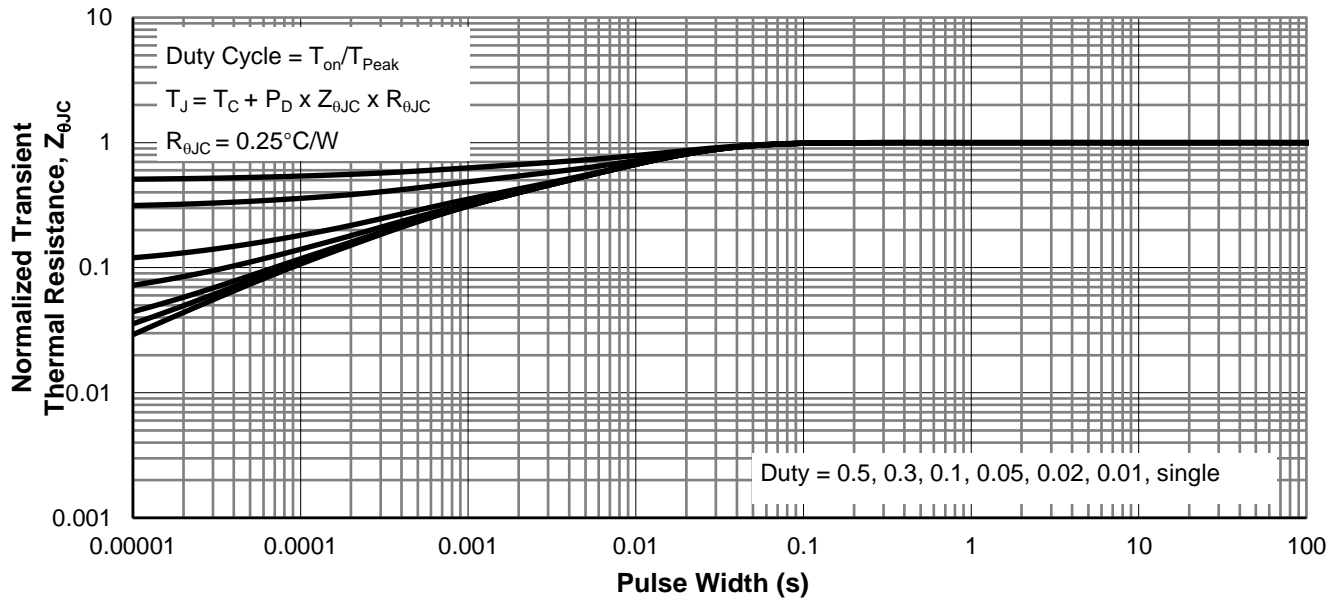


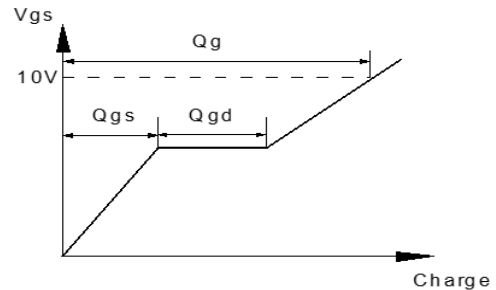
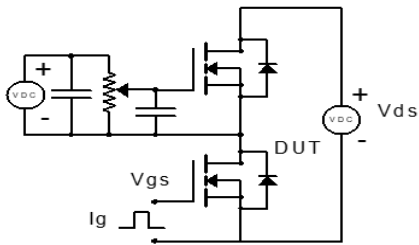
Figure 15: Normalized Maximum Transient Thermal Impedance

# THF1D3S40LKN2

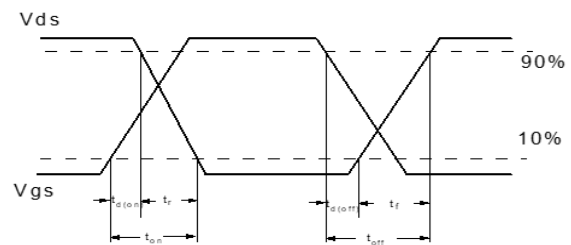
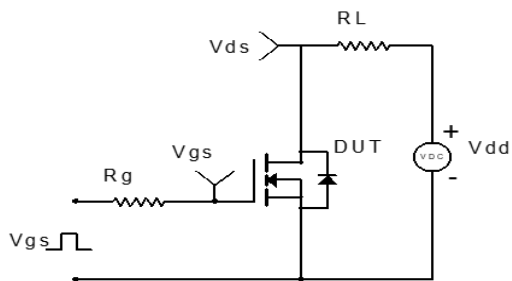
## Datasheet

### Test Condition

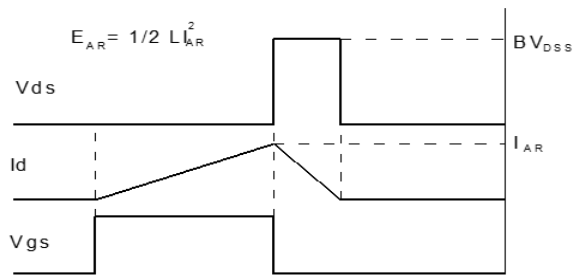
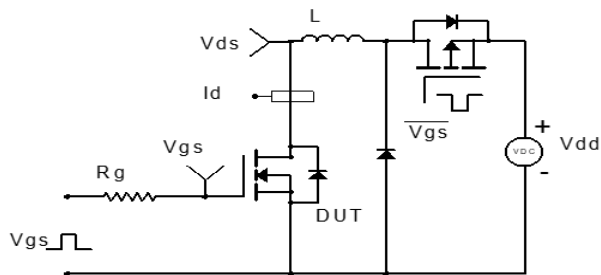
#### Gate Charge Test Circuit & Wave Form



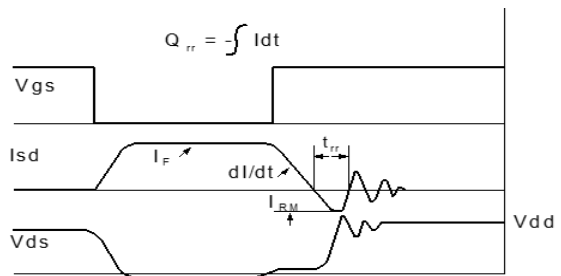
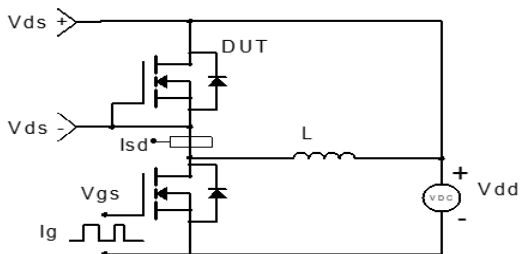
#### Resistive Switching Test Circuit & Wave Form



#### Unclamped Inductive Switching (UIS)



#### Diode Recovery Test Circuit & Wave Form

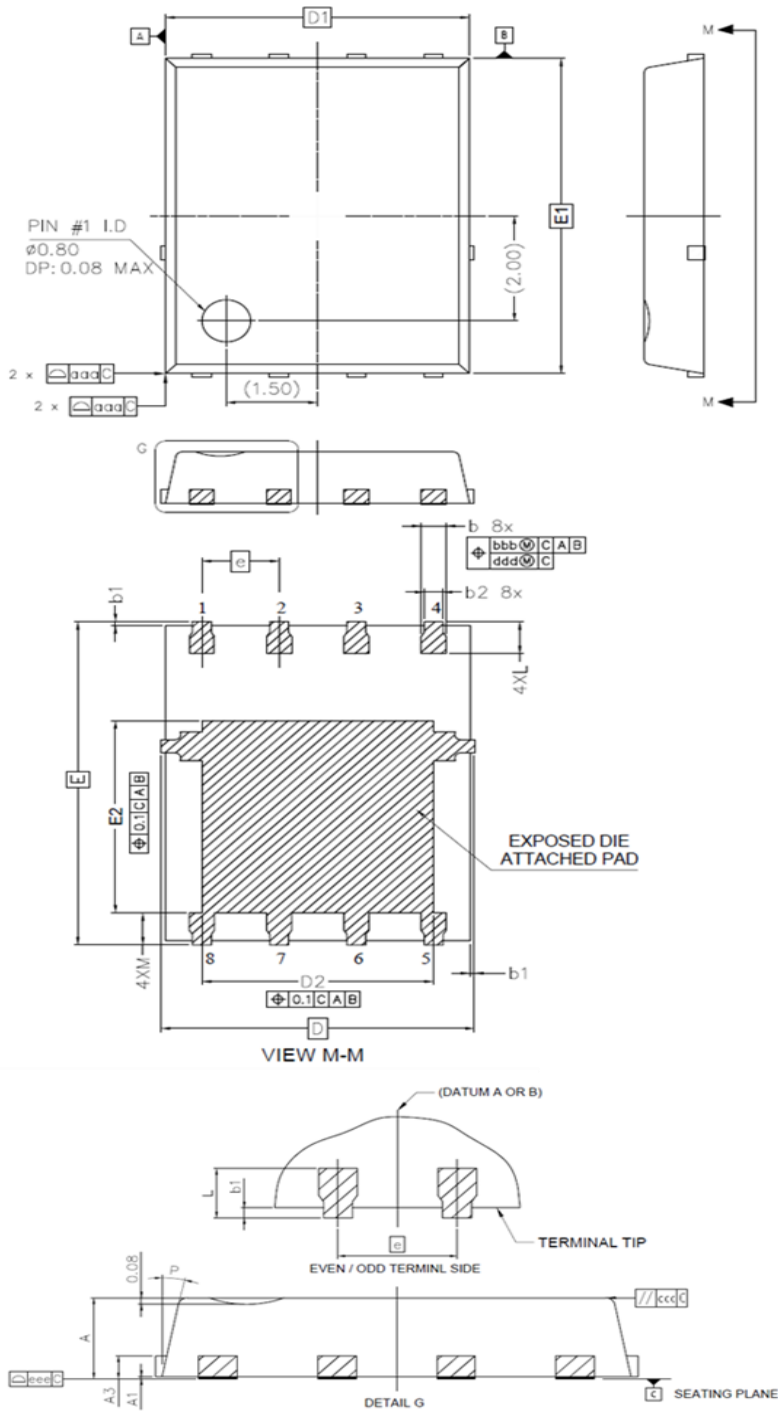


# THF1D3S40LKN2

## Datasheet

### Package Outlines

#### Package Drawing PDFN5\*6



DIM	MILLIMETERS	
	MIN	MAX
A	0.95	1.05
A1	0.00	0.05
A3	0.25 REF	
b	0.31	0.51
b1	0.03	0.13
b2	0.21	0.41
D	5.15 BSC	
D1	5.00 BSC	
D2	3.70	3.90
E	6.15 BSC	
E1	6.00 BSC	
E2	3.56	3.76
e	1.27 BSC	
L	0.51	0.71
M	0.51	0.71
P	10°	12°
aaa	0.10	
bbb	0.10	
ccc	0.10	
ddd	0.05	
eee	0.08	

# THF1D3S40LKN2

## Datasheet



### Contact US

Home Page: <https://www.tsinghuaic.com>  
Address: 106A F/1, Building B-1, Zhongguancun Dongsheng Technology Park Northern Territory,  
No.66 Xixiaokou Road, Haidian District, Beijing  
Phone: +86-10-82351818-310

Business1  
Phone: +86-10-82351818-376  
E-mail: [sales2@tsinghuaic.com](mailto:sales2@tsinghuaic.com)

### Revision History

Version	Change Description
V1.0	initial version

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