

# N-Channel 40V MOSFET

## Product summary


$V_{DS}$ (V)	$R_{DS(on),max}$ (m $\Omega$ )	$I_D$ (A)
40	0.9 @ $V_{GS} = 10V$	305 <sup>(1)</sup>

## Features

- Low  $R_{DS(on)}$  trench technology
- Low thermal impedance
- Fast switching speed
- 100% avalanche tested

## Applications

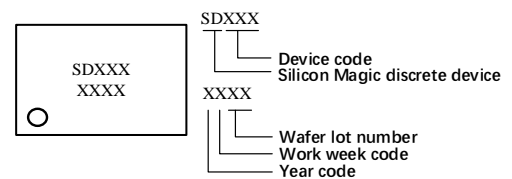
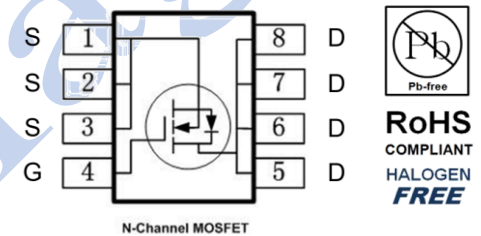
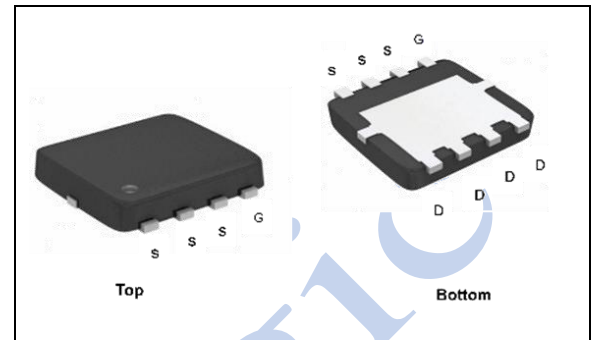
- DC/DC conversion
- Power switch
- Motor drives

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## Package and ordering information

Ordering code	Package	Device code
SDH04N0P9C-AA	PDFN5*6-8L	AGU

### DFN5\*6-8L



## 1. Maximum ratings

Absolute maximum ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-source voltage		$V_{DS}$	40	V
Gate-source voltage		$V_{GS}$	$\pm 20$	
Continuous drain current	$T_C = 25^\circ\text{C}$ <sup>(1)</sup>	$I_D$	305	A
	$T_C = 100^\circ\text{C}$		193	
	$T_A = 25^\circ\text{C}$ <sup>(4)</sup>		42	
Pulsed drain current <sup>(2)</sup>		$I_{D,pulse}$	1220	
Avalanche energy, single pulse <sup>(3)</sup>		$E_{AS}$	560	mJ
Power dissipation	$T_C = 25^\circ\text{C}$	$P_D$	139	W
	$T_A = 25^\circ\text{C}$ <sup>(4)</sup>		2.7	
Operating junction and storage temperature range		$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$

## 2. Thermal resistance ratings

Thermal resistance ratings						
Parameter		Symbol	Max.	Unit		
Thermal resistance, junction-to-case	Steady state	$R_{\theta JC}$	0.9	°C/W		
Thermal resistance, junction-to-ambient <sup>(4)</sup>	Steady state	$R_{\theta JA}$	45			

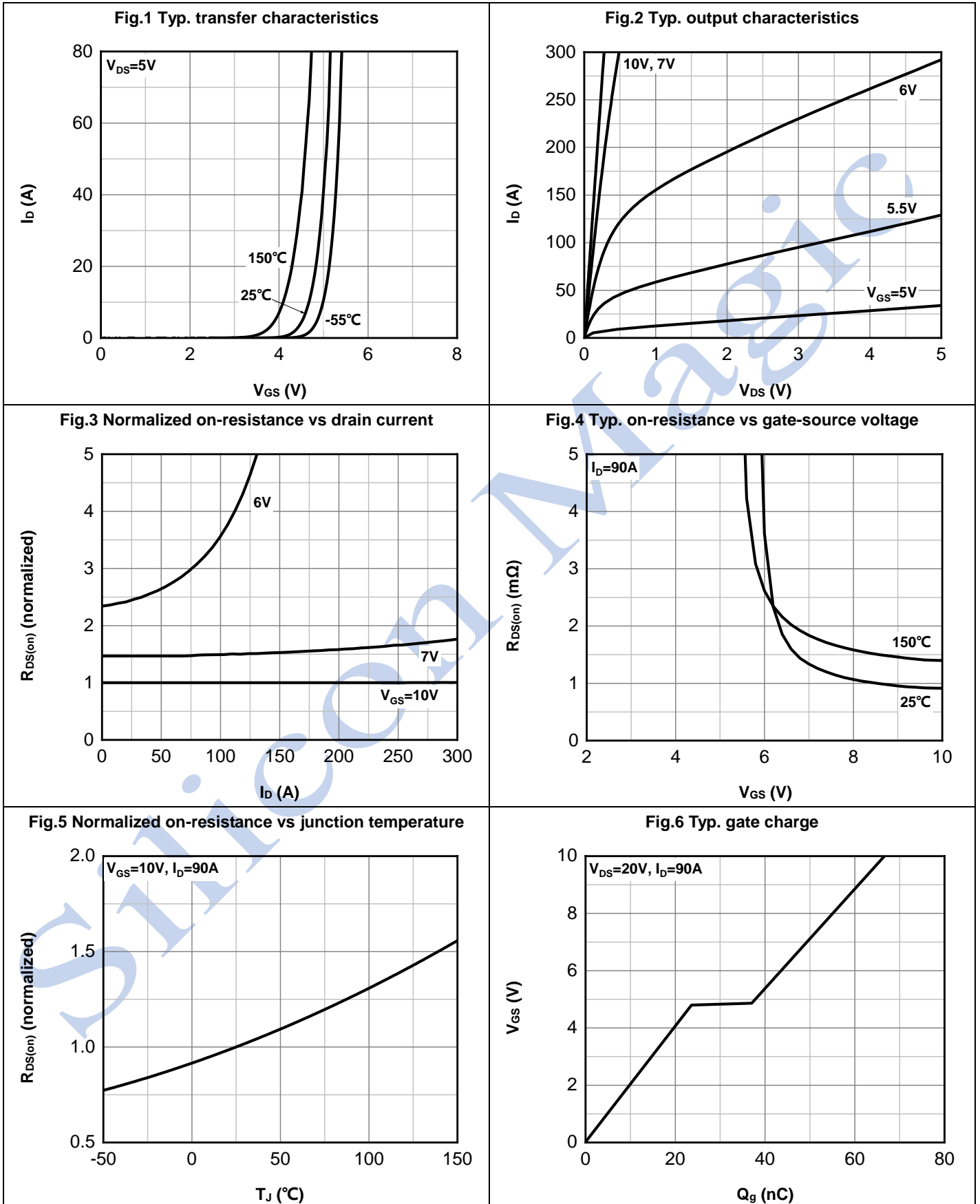
## 3. Electrical Characteristics

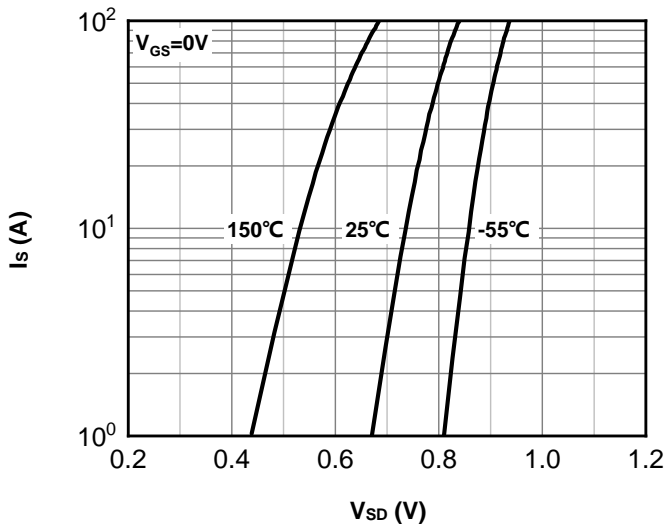
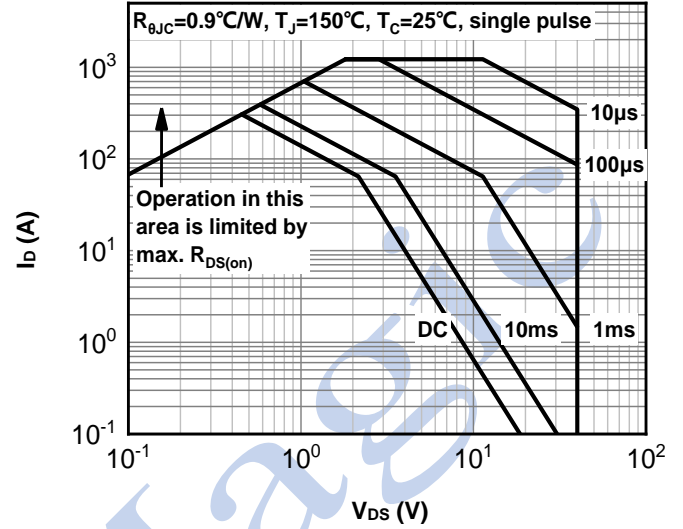
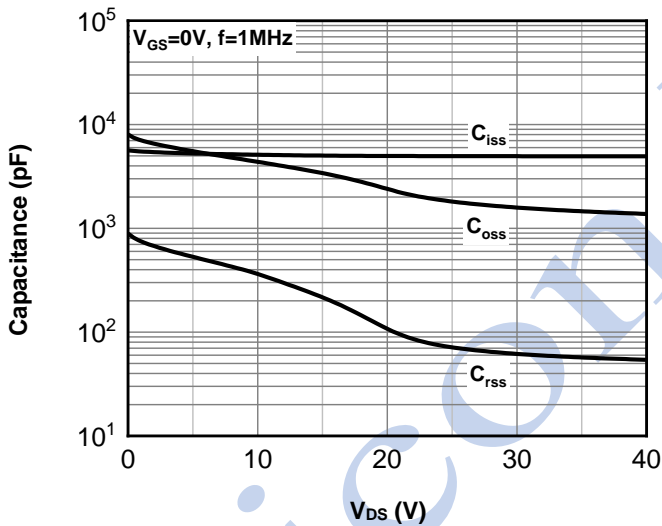
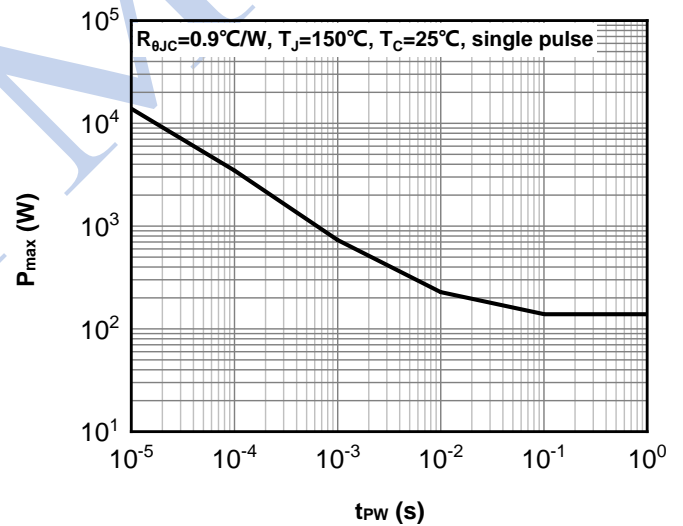
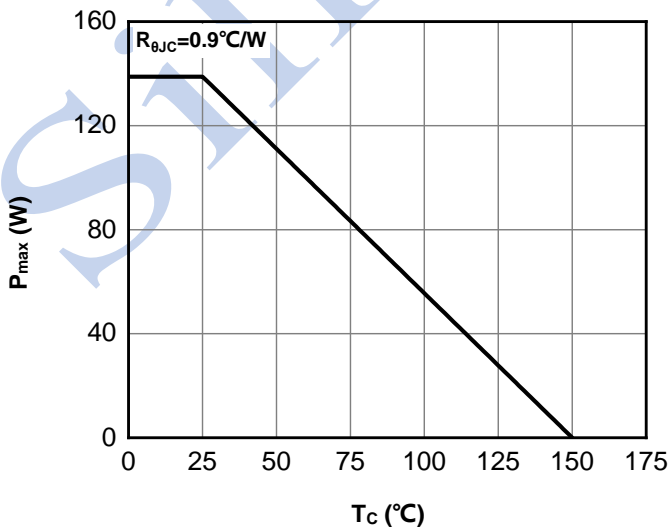
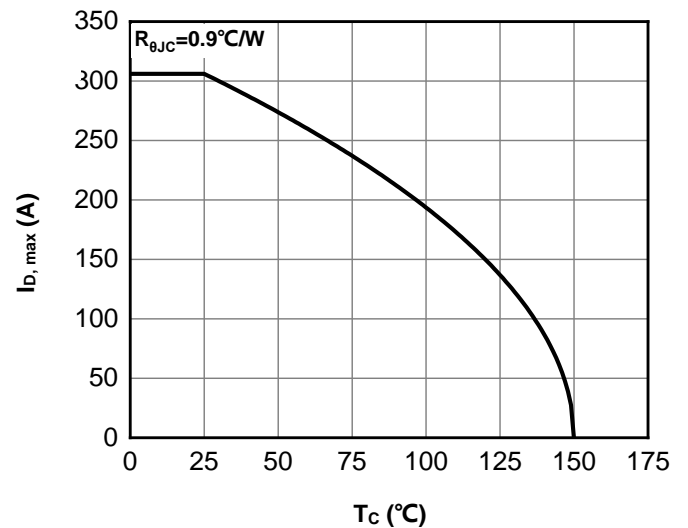
Electrical characteristics (T <sub>J</sub> = 25°C unless otherwise noted)						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Static parameter						
Drain to source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA	40			V
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.2	3	3.8	V
Gate-body leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V			1	μA
Drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 90 A		0.75	0.9	mΩ
Forward transconductance <sup>(5)</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 90 A		350		S
Gate resistance	R <sub>g</sub>	f = 1 MHz		3		Ω
Dynamic <sup>(5)</sup>						
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 90 A, V <sub>GS</sub> = 10 V		66		nC
Gate-source charge	Q <sub>gs</sub>			24		
Gate-drain charge	Q <sub>gd</sub>			13		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 90 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 4.7 Ω		46		ns
Rise time	t <sub>r</sub>			106		
Turn-off delay time	t <sub>d(off)</sub>			79		
Fall time	t <sub>f</sub>			30		
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, f = 1 MHz		5010		pF
Output capacitance	C <sub>oss</sub>			2430		
Reverse transfer capacitance	C <sub>rss</sub>			86		
Reverse Diode Characteristics <sup>(5)</sup>						
Diode forward voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>F</sub> = 90 A		0.8	1.1	V
Reverse recovery time	t <sub>rr</sub>	V <sub>DS</sub> = 20 V, I <sub>F</sub> = 90 A, di/dt = 100 A/μs		67		ns
Reverse recovery charge	Q <sub>rr</sub>			64		nC

### Notes

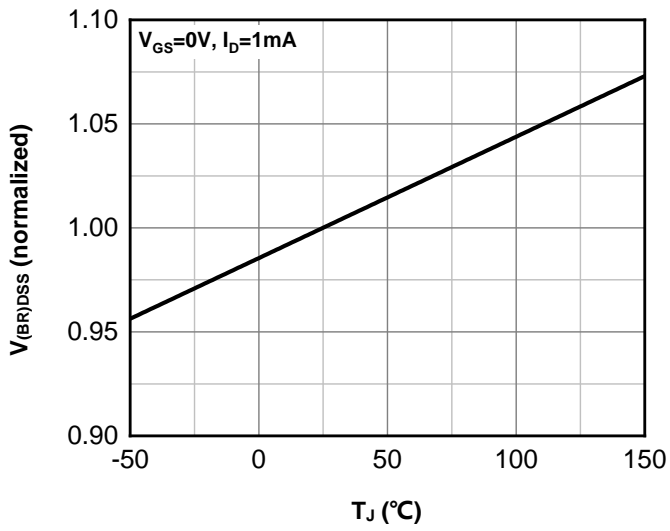
- (1) Limited by maximum junction temperature.
- (2) Pulse width limited by maximum junction temperature.
- (3)  $V_{DS} = 40\text{ V}, V_{GS} = 10\text{ V}, L = 0.3\text{ mH}$ .
- (4)  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5x1.5 in. board of FR-4 material.
- (5) Guaranteed by design, not subject to production testing.

#### 4. Electrical characteristics diagrams

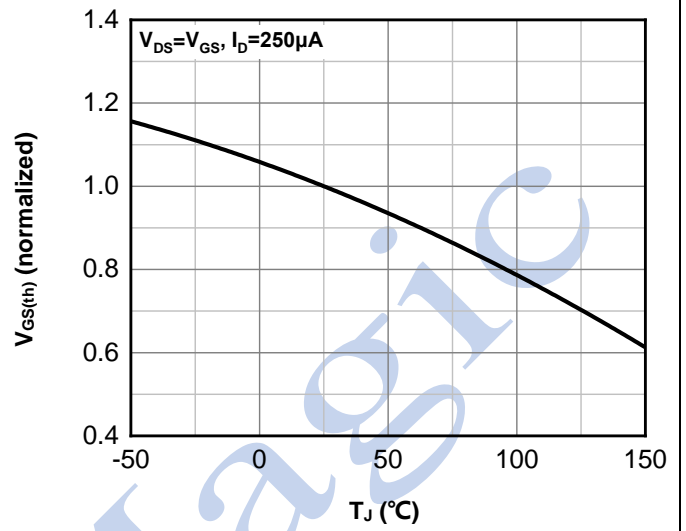


**Fig.7 Typ. forward characteristics of body diode**

**Fig.8 Safe operating area**

**Fig.9 Typ. Capacitance**

**Fig.10 Single pulse maximum power dissipation**

**Fig.11 Max. power dissipation vs case temperature**

**Fig.12 Max. continuous drain current vs case temperature**


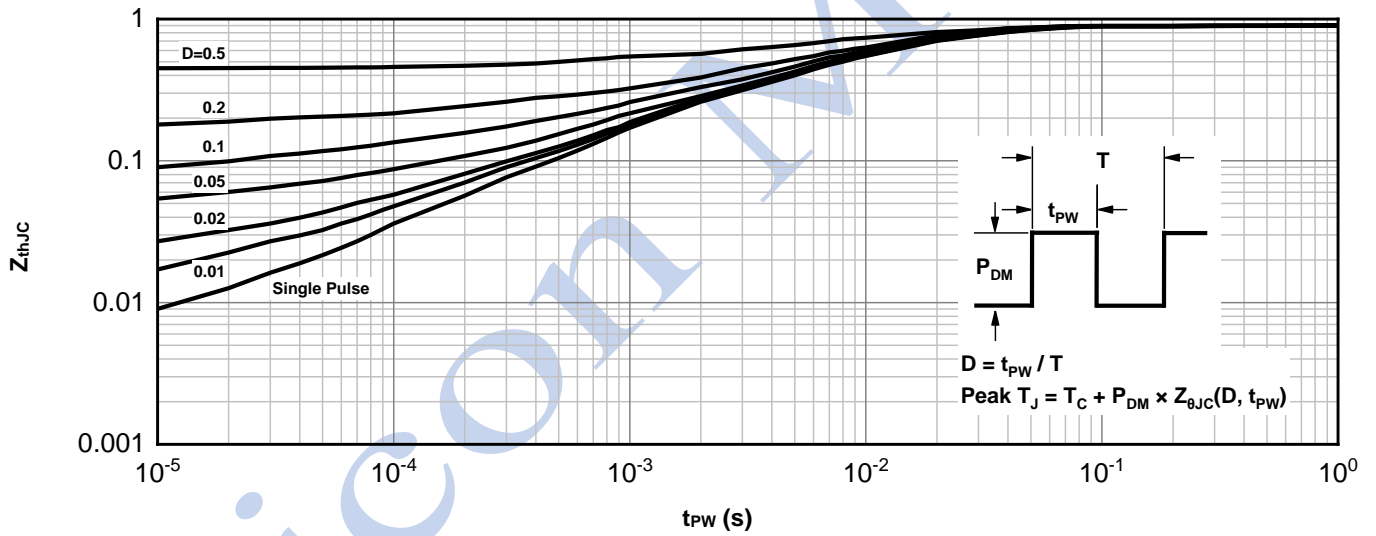
**Fig.13 Normalized  $V_{(BR)DSS}$  vs junction temperature**



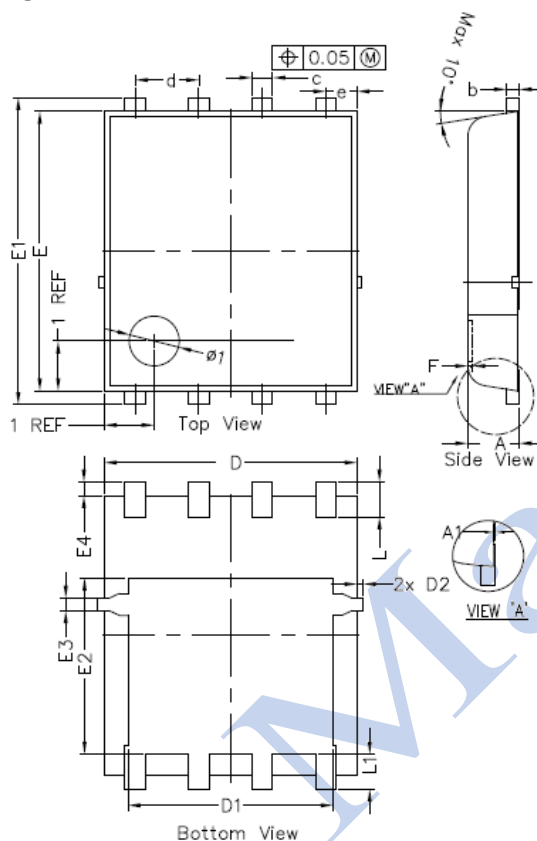
**Fig.14 Normalized  $V_{GS(th)}$  vs junction temperature**



**Fig.15 Transient thermal impedance from junction to case**



## 5. Package outline dimensions



Dim	Millimeters		
	Min	Nom	Max
A	0.900	1.000	1.100
A1	0.000	---	0.050
b	0.246	0.254	0.312
c	0.310	0.410	0.510
d	1.27BSC		
D	4.950	5.050	5.150
D1	4.000	4.100	4.200
D2	---	---	0.125
e	0.62BSC		
E	5.500	5.600	5.700
E1	6.050	6.150	6.250
E2	3.425	3.525	3.625
E3	0.150	0.250	0.350
E4	0.175	0.275	0.375
F	---	---	0.100
L	0.500	0.600	0.700
L1	0.600	0.700	0.800

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