

N-Channel 40 V MOSFET

Product summary

V_{DS} (V)	$R_{DS(on),max}$ (m Ω)	I_D (A)
40	4.6 @ $V_{GS} = 10V$	40 ⁽¹⁾

Features

- For automotive applications and AEC-Q101 compliant
- Low FOM and thermal impedance
- Fast switching speed
- 100% avalanche tested

Applications

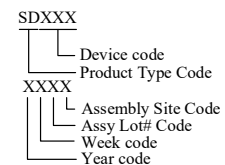
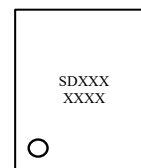
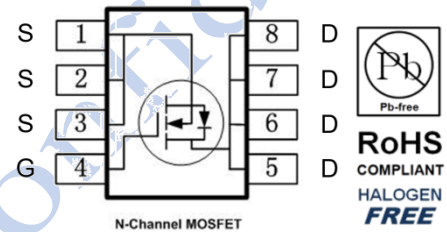
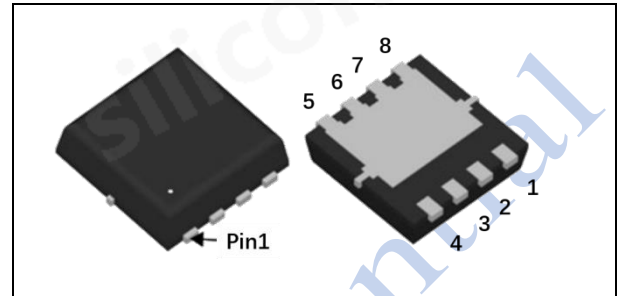
- DC/DC conversion
- Power switch
- Motor drives

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Package and ordering information

Ordering code	Package	Device code
SDA04K005RN-AA	PDFN3.3*3.3-8L	ATF

PDFN3.3*3.3-8L



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}	± 20	
Continuous drain current	$T_C = 25^\circ\text{C}$ ⁽¹⁾	40	A
	$T_C = 100^\circ\text{C}$	40	
	$T_A = 25^\circ\text{C}$ ⁽⁴⁾	16.7	
Pulsed drain current ⁽²⁾	$I_{D,pulse}$	160	
Avalanche energy, single pulse ⁽³⁾	E_{AS}	70	mJ
Power dissipation	$T_C = 25^\circ\text{C}$	38.4	W
	$T_A = 25^\circ\text{C}$ ⁽⁴⁾	2.5	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to 175	$^\circ\text{C}$

2. Thermal resistance ratings

Thermal resistance ratings				
Parameter		Symbol	Max.	Unit
Thermal resistance, junction-to-case	Steady state	$R_{\theta JC}$	3.9	°C/W
Thermal resistance, junction-to-ambient ⁽⁴⁾	Steady state	$R_{\theta JA}$	60	

3. Electrical Characteristics

Electrical characteristics (T _J = 25°C unless otherwise noted)						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Static parameter						
Drain to source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	40			V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.5	2.0	2.5	V
Gate-body leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±20 V			±100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V			1	μA
Drain-source on-resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		3.7	4.6	mΩ
		V _{GS} = 4.5 V, I _D = 10 A		5.4	6.7	
Forward transconductance ⁽⁵⁾	g _{fs}	V _{DS} = 5 V, I _D = 20 A		58		S
Gate resistance	R _g	f = 1 MHz		2.8		Ω
Dynamic ⁽⁵⁾						
Total gate charge	Q _g	V _{DS} = 20 V, I _D = 10 A, V _{GS} = 4.5 V		7.7		nC
Total gate charge	Q _g	V _{DS} = 20 V, I _D = 20 A, V _{GS} = 10 V		15.7		nC
Gate-source charge	Q _{gs}			3.6		
Gate-drain charge	Q _{gd}			3.0		
Turn-on delay time	t _{d(on)}	V _{DS} = 20 V, I _D = 20 A, V _{GS} = 10 V, R _{GEN} = 1.6 Ω		3.4		ns
Rise time	t _r			4.1		
Turn-off delay time	t _{d(off)}			7.4		
Fall time	t _f			4.8		
Input capacitance	C _{iss}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz		1102		pF
Output capacitance	C _{oss}			336		
Reverse transfer capacitance	C _{rss}			22		
Reverse Diode Characteristics ⁽⁵⁾						
Diode forward voltage	V _{SD}	V _{GS} = 0 V, I _F = 20 A		0.8	1.1	V
Reverse recovery time	t _{rr}	V _{DS} = 20 V, I _F = 20 A, di/dt = 100 A/μs		15.5		ns
Reverse recovery charge	Q _{rr}			5.2		nC

Notes

- (1) Package limited.
- (2) Pulse width limited by maximum junction temperature.
- (3) $V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, L = 10\text{ mH}$.
- (4) $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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

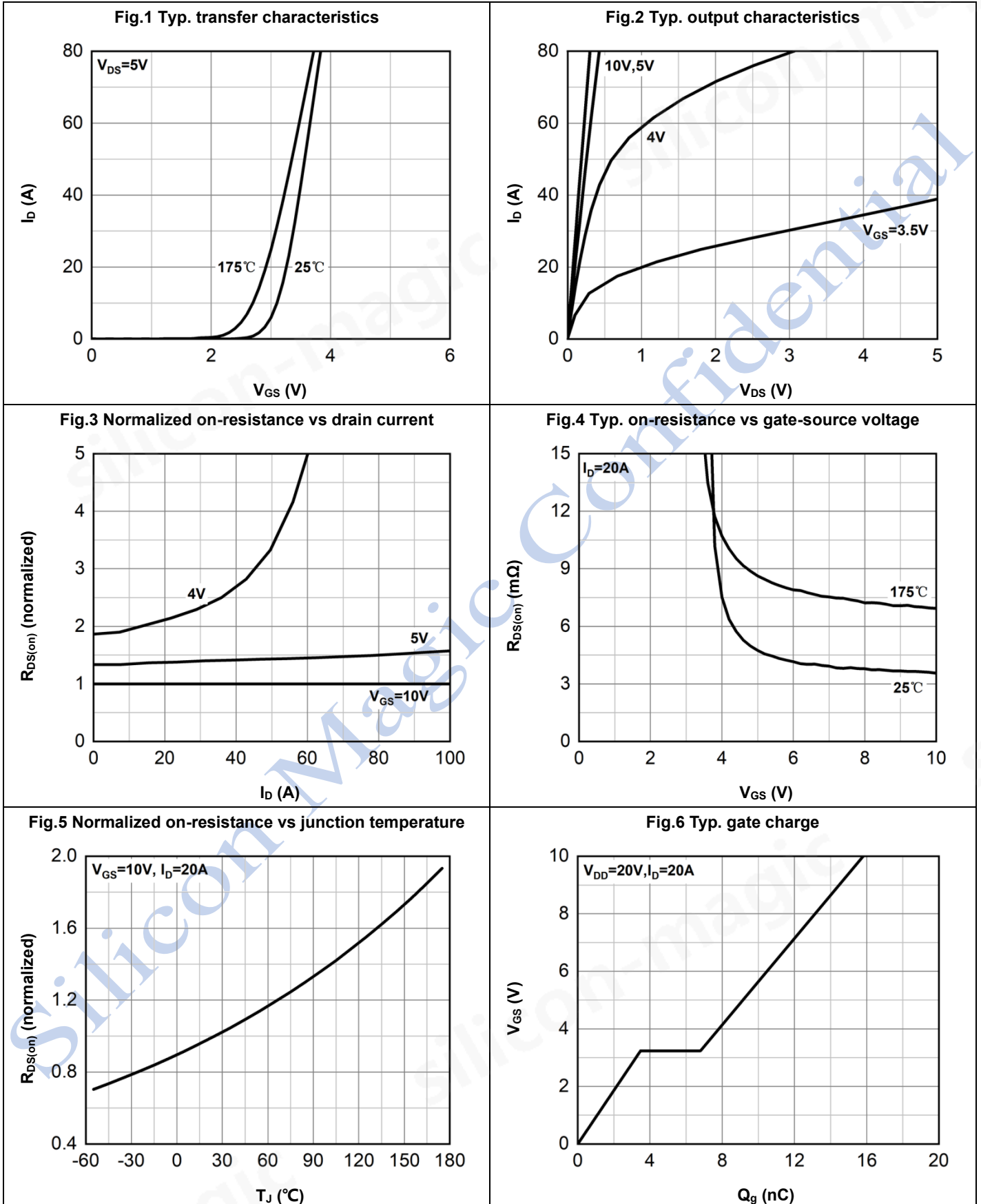


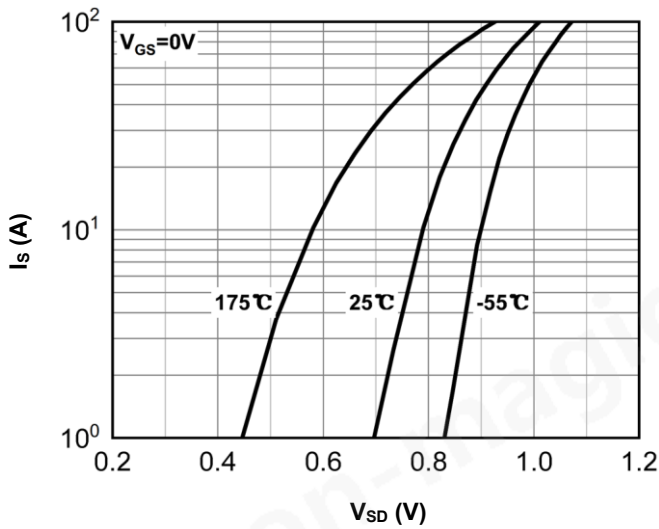
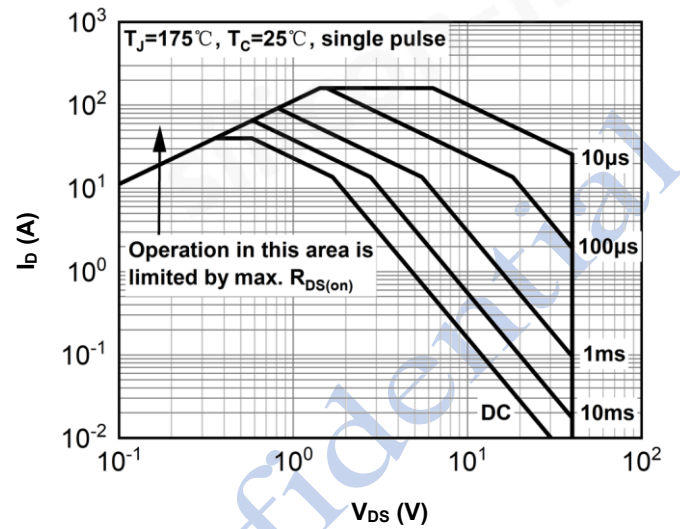
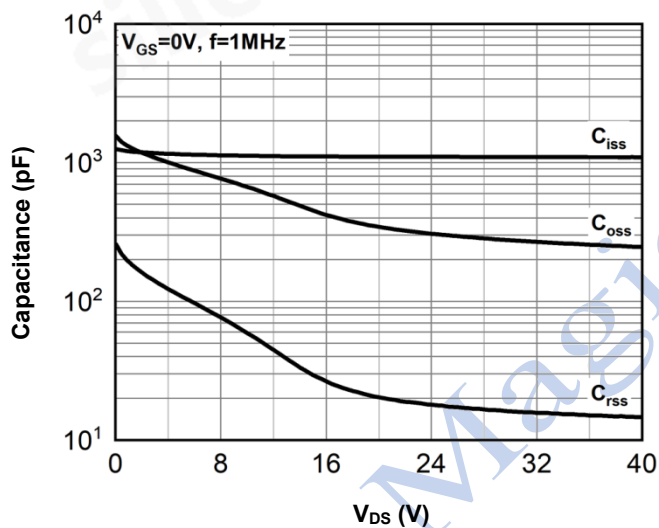
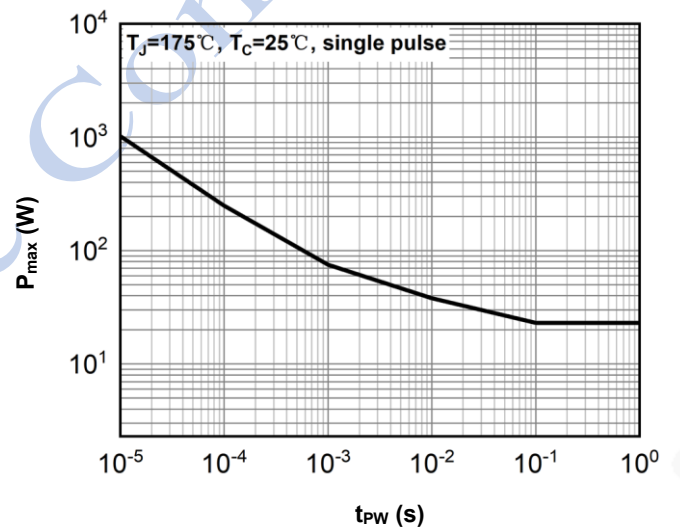
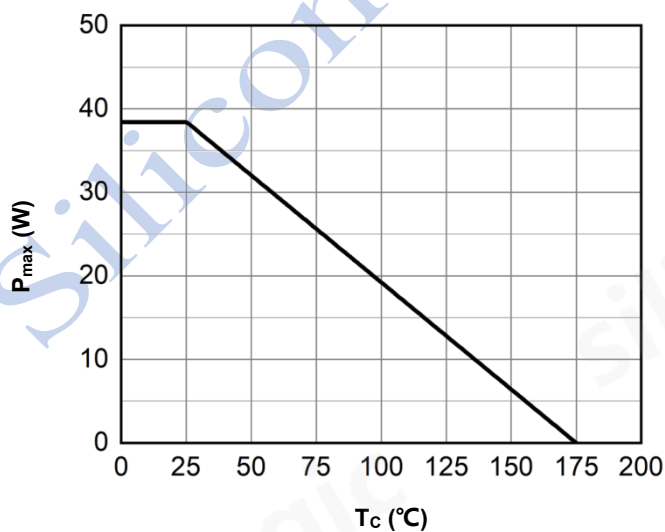
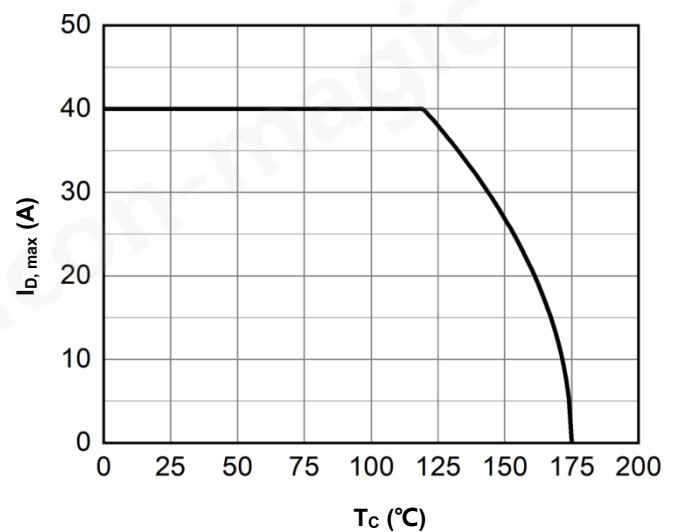
Fig.7 Typ. forward characteristics of body diode

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

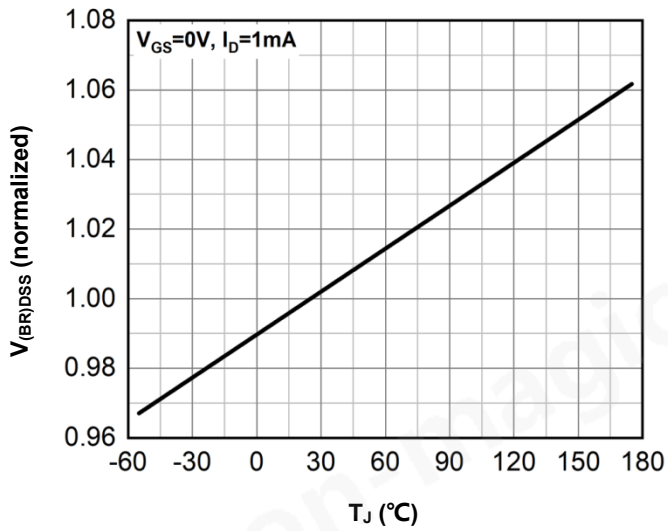


Fig.14 Normalized $V_{GS(th)}$ vs junction temperature

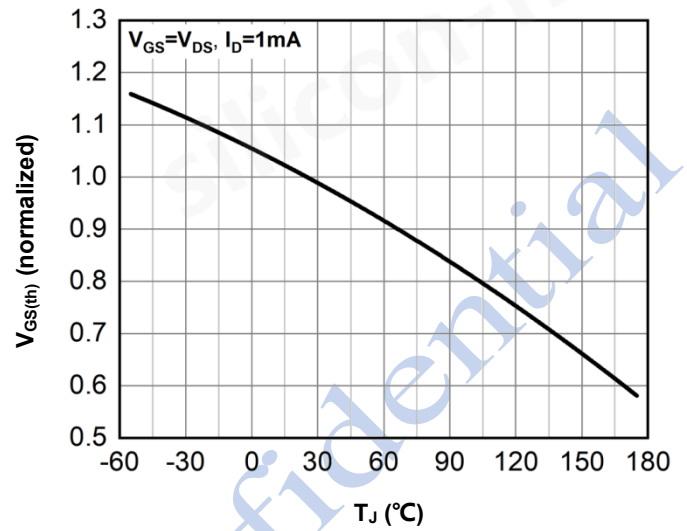
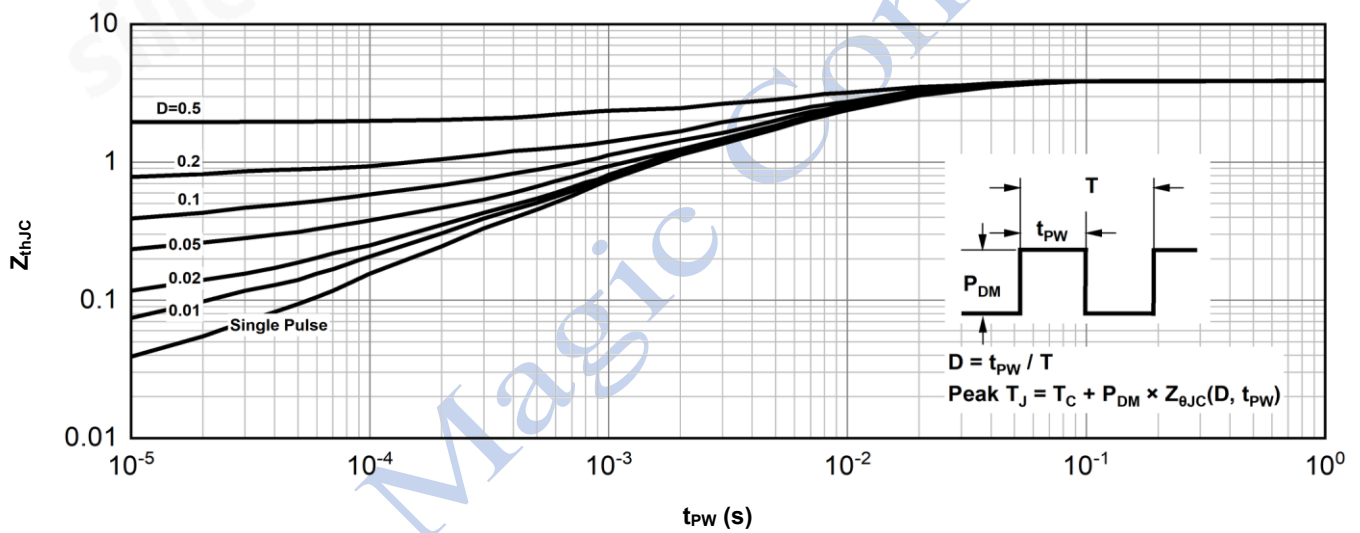
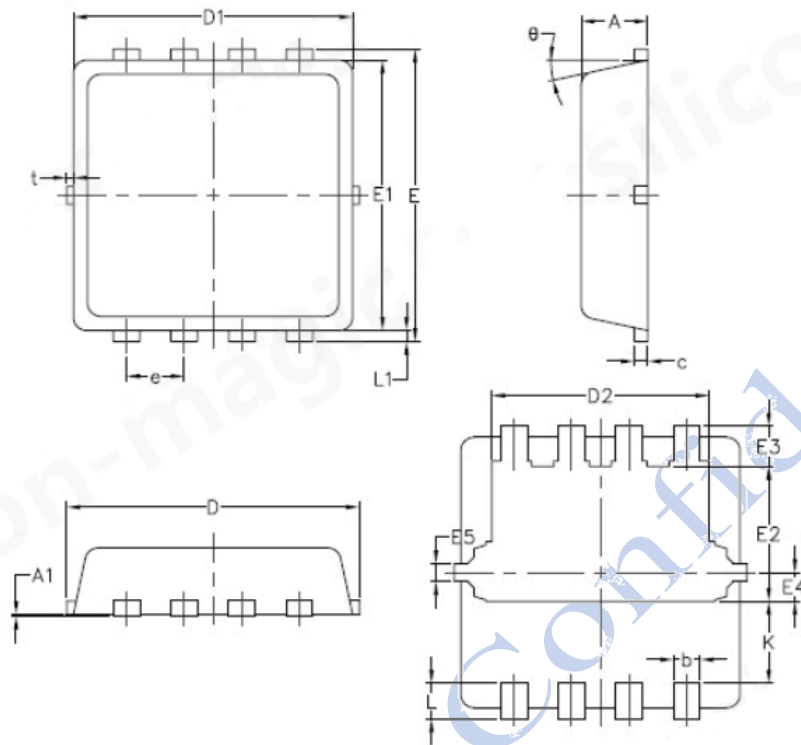


Fig.15 Transient thermal impedance from junction to case



5. Package outline dimensions



Dim	Millimeters		
	Min	Nom	Max
A	0.700	0.750	0.850
A1	—	—	0.050
b	0.200	0.300	0.400
c	0.100	0.152	0.250
D	3.150	3.300	3.450
D1	3.000	3.150	3.250
D2	2.290	2.450	2.650
E	3.150	3.300	3.450
E1	2.900	3.050	3.200
E2	1.320	1.520	1.720
E3	0.280	0.460	0.650
E4	0.180	0.330	0.480
E5	0.100	0.200	0.300
e	0.600	0.650	0.700
K	0.780	0.930	1.130
L	0.300	0.400	0.500
L1	0.060	0.125	0.200
t	0.000	0.075	0.130
θ	10°	12°	14°

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