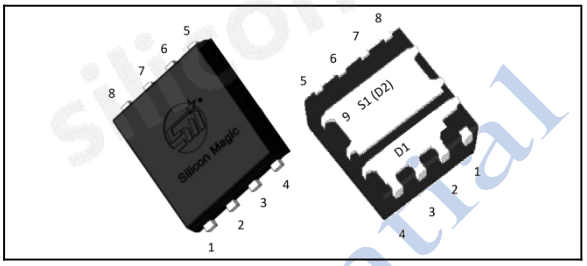
Preliminary Specification: Subject to Change without Notice

Dual Asymmetric N-Channel 30 V MOSFET

Product summary

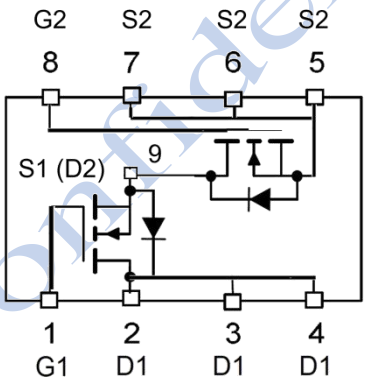
	V_{DS} (V)	$R_{DS(on),max}$ (mΩ)	I_D (A)
Q1	30	5.5 @ V_{GS} = 10V 7.2 @ V_{GS} = 4.5V	40 (1)
Q2	30	1.7 @ V_{GS} = 10V 2.0 @ V_{GS} = 4.5V	80 (1)

PDFN5*6-D_A1



Features

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



Pb-free
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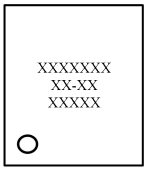
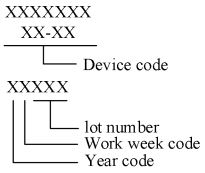
Applications

- DC/DC conversion
- Power switch
- Motor drives





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Package and ordering information

Ordering code	Package	Device code
SMN03L1P1NN-AA	PDFN5*6-D_A1	N03L1P1NN-AA

1. Maximum ratings

Absolute maximum ratings (T_A = 25℃ unless otherwise noted)

Parameter		Symbol	Q1 Limit	Q2 Limit	Unit
Drain-source voltage		V_{DS}	30	30	V
Gate-source voltage		V_{GS}	±20	±20	
Continuous drain current	T_C=25℃ (1)	I_D	56	140	A
	T_C=100℃		40	80	
	T_A=25℃ (4)		14.5	27.3	
Pulsed drain current(2)		$I_{D,pulse}$	160	320	
Avalanche energy, single pulse(3)		E_{AS}	22	160	mJ
Power dissipation	T_C=25℃	P_D	50	104.1	W
	T_A=25℃ (4)		1.9	2	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to 150	-55 to 150	℃

2. Thermal resistance ratings

Thermal resistance ratings					
Parameter		**Symbol**	**Q1 Max.**	**Q2 Max.**	**Unit**
Thermal resistance, junction-to-case	Steady state	$R_{\theta JC}$	2.5	1.2	°C/W
Thermal resistance, junction-to-ambient (4)	Steady state	$R_{\theta JA}$	65	60	

3. Q1 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 = 1 mA	30			V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	1.0	1.6	2.2	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} = 30 V, V_{GS} = 0 V			1	μA
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		4.6	5.5	mΩ
		V_{GS} = 4.5 V, I_D = 10 A		6.0	7.2	
Forward transconductance(5)	g_{fs}	V_{DS} = 5 V, I_D = 20 A		61		S
Gate resistance	R_g	f = 1 MHz		1.1		Ω
Dynamic(5)						
Total gate charge	Q_g	V_{DS} = 15 V, I_D = 10 A, V_{GS} = 4.5 V		5.8		nC
Total gate charge	Q_g	V_{DS} = 15 V, I_D = 20 A, V_{GS} = 10 V		12.4		nC
Gate-source charge	Q_{gs}			2.7		
Gate-drain charge	Q_{gd}			2.1		
Turn-on delay time	$t_{d(on)}$	V_{DS} = 15 V, I_D = 20 A, V_{GS} = 10 V, R_{GEN} = 1.6 Ω		1.8		ns
Rise time	t_r			1.8		
Turn-off delay time	$t_{d(off)}$			4.6		
Fall time	t_f			2.3		
Input capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		947		pF
Output capacitance	C_{oss}			388		
Reverse transfer capacitance	C_{rss}			16		
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} = 15 V, I_F = 20 A, di/dt = 100 A/μs		22		ns
Reverse recovery charge	Q_{rr}			11		nC

Notes

(1) Silicon limited. (The package-limited current is 40 A for Q1 and 80 A for Q2 respectively)

(2) Pulse width limited by maximum junction temperature.

(3) V_{DS} = 15 V, V_{GS} = 10 V, L = 1 mH.

(4) $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 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. Q2 Electrical Characteristics

Electrical characteristics (T_J = 25℃ 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 = 1 mA	30			V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	1.0	1.6	2.2	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} = 30 V, V_{GS} = 0 V			1	μA
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 60 A		1.4	1.7	mΩ
		V_{GS} = 4.5 V, I_D = 30 A		1.7	2.0	
Forward transconductance[5]	g_{fs}	V_{DS} = 5 V, I_D = 60 A		212		S
Gate resistance	R_g	f = 1 MHz		1.6		Ω
Dynamic[5]						
Total gate charge	Q_g	V_{DS} = 15 V, I_D = 30 A, V_{GS} = 4.5 V		30.2		nC
Total gate charge	Q_g	V_{DS} = 15 V, I_D = 60 A, V_{GS} = 10 V		65.2		nC
Gate-source charge	Q_{gs}			15.2		
Gate-drain charge	Q_{gd}			7.7		
Turn-on delay time	$t_{d(on)}$	V_{DS} = 15 V, I_D = 60 A, V_{GS} = 10 V, R_{GEN} = 1.6 Ω		9.7		ns
Rise time	t_r			5.4		
Turn-off delay time	$t_{d(off)}$			27.3		
Fall time	t_f			6.9		
Input capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		5011		pF
Output capacitance	C_{oss}			1683		
Reverse transfer capacitance	C_{rss}			68		
Reverse Diode Characteristics[5]						
Diode forward voltage	V_{SD}	V_{GS} = 0 V, I_F = 60 A		0.8	1.1	V
Reverse recovery time	t_{rr}	V_{DS} = 15 V, I_F = 60 A, di/dt = 100 A/μs		48		ns
Reverse recovery charge	Q_{rr}			38		nC

Notes

(5) Guaranteed by design, not subject to production testing.

5. Q1 Electrical characteristics diagrams

Fig.1 Typ. transfer characteristics

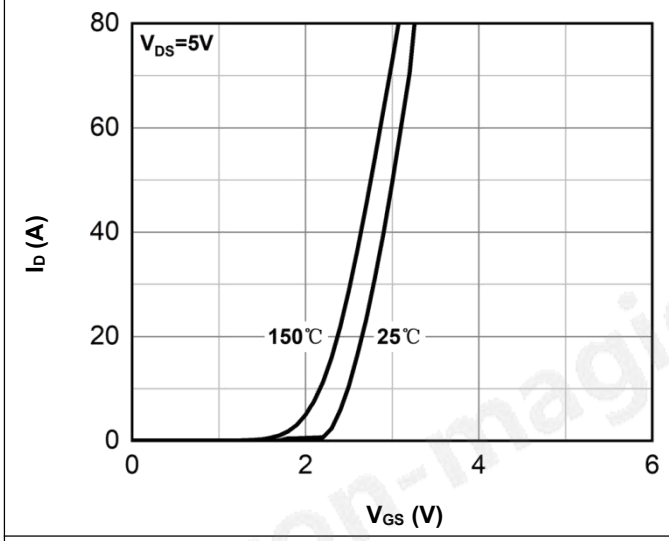


Fig.2 Typ. output characteristics

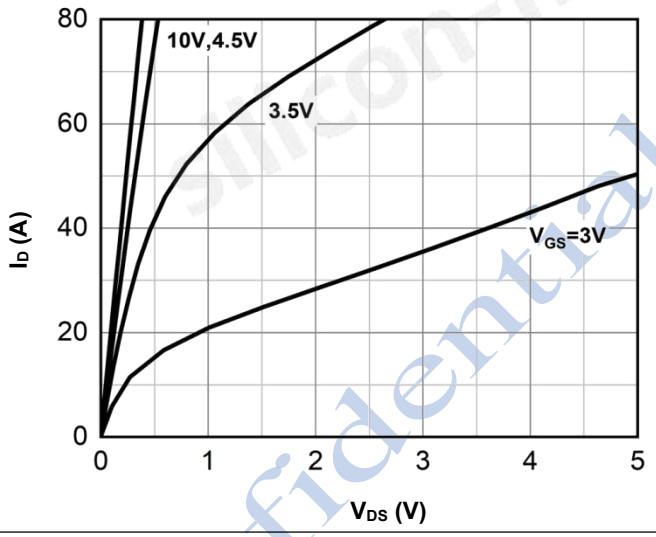


Fig.3 Normalized on-resistance vs drain current

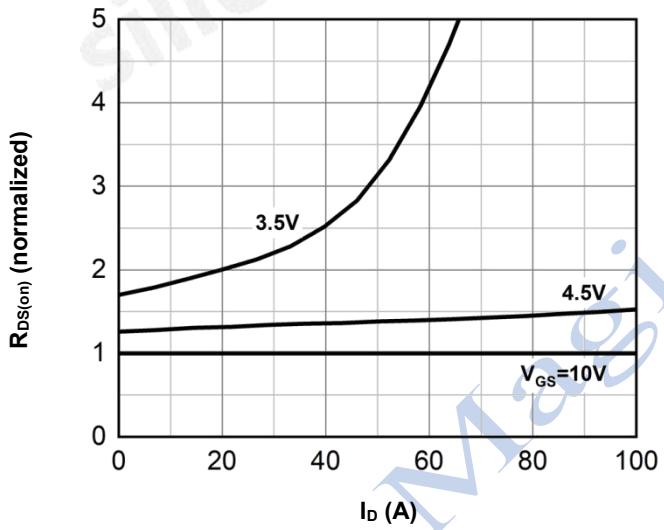


Fig.4 Typ. on-resistance vs gate-source voltage

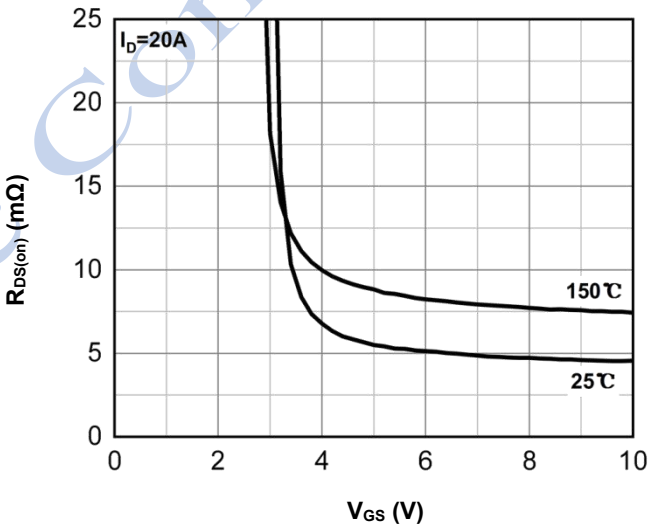


Fig.5 Normalized on-resistance vs junction temperature

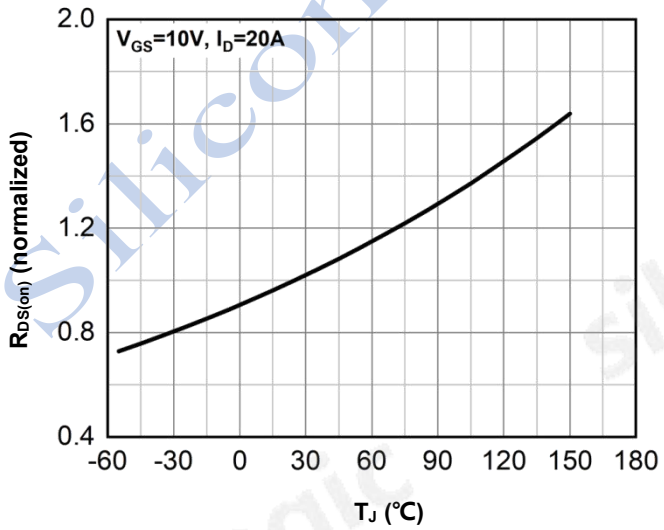


Fig.6 Typ. gate charge

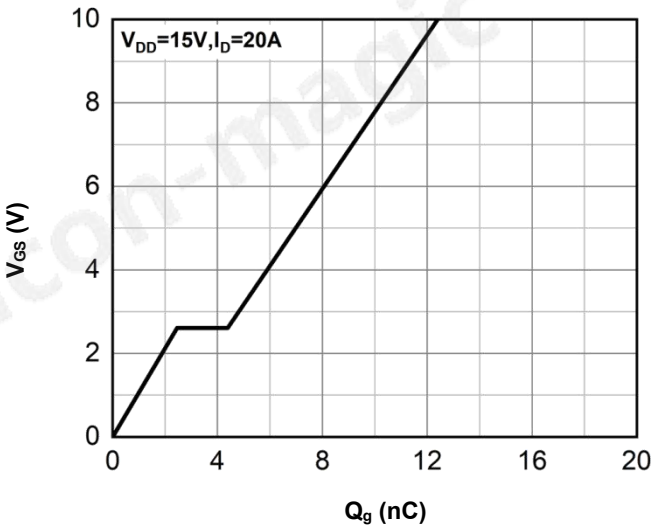


Fig.7 Typ. forward characteristics of body diode

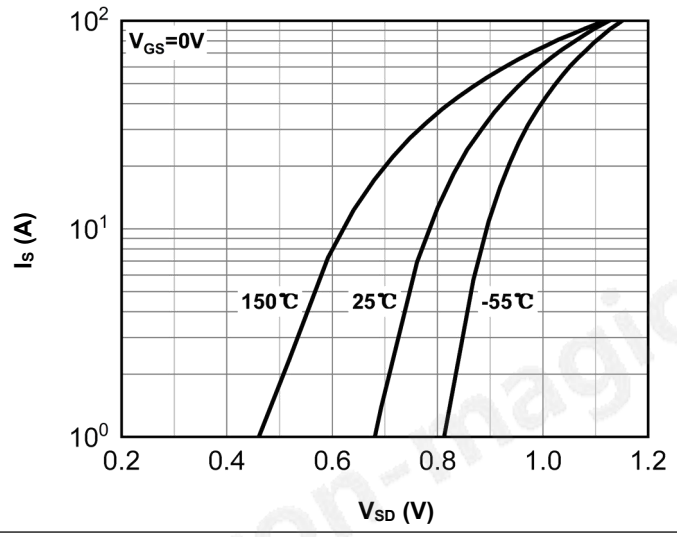


Fig.8 Safe operating area

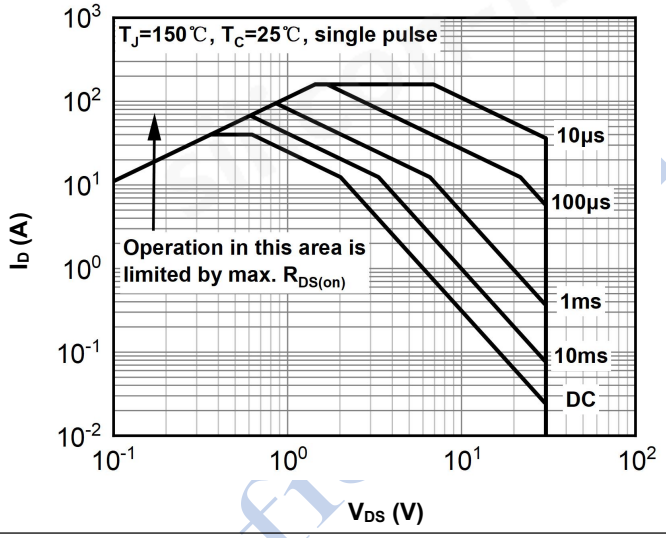


Fig.9 Typ. Capacitance

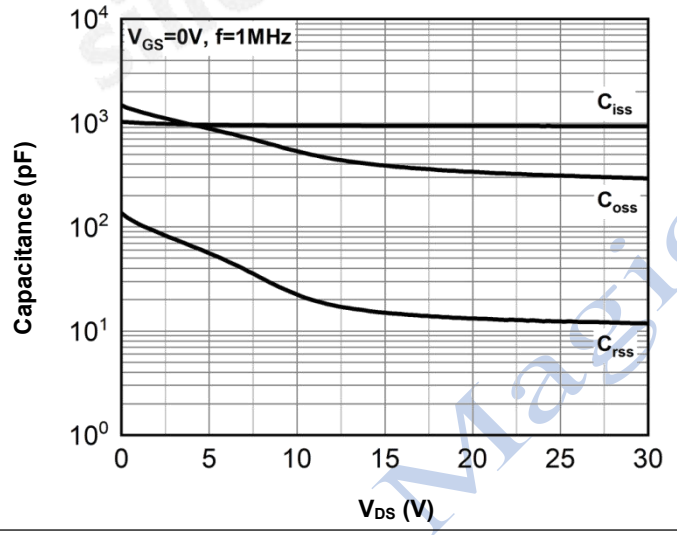


Fig.10 Single pulse maximum power dissipation

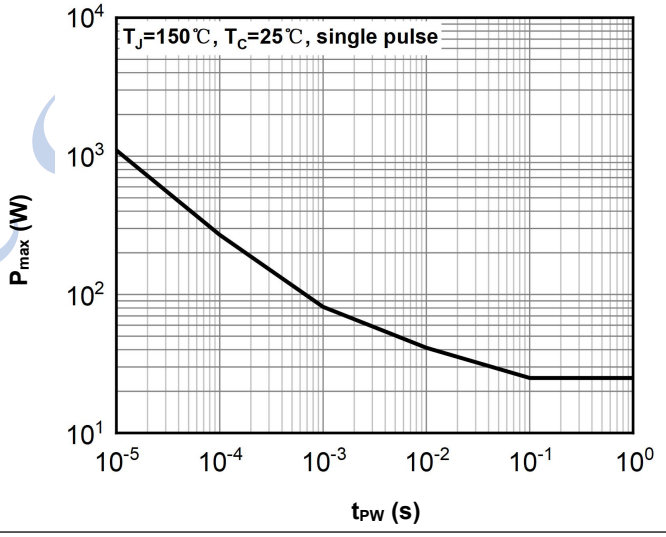


Fig.11 Max. power dissipation vs case temperature

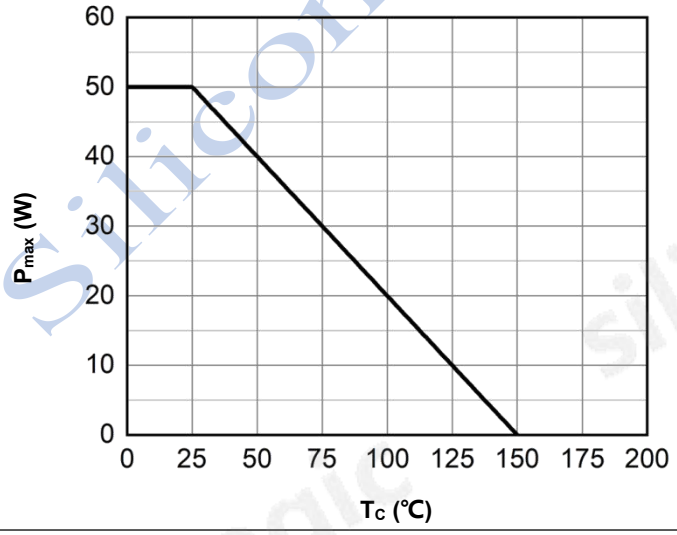


Fig.12 Max. continuous drain current vs case temperature

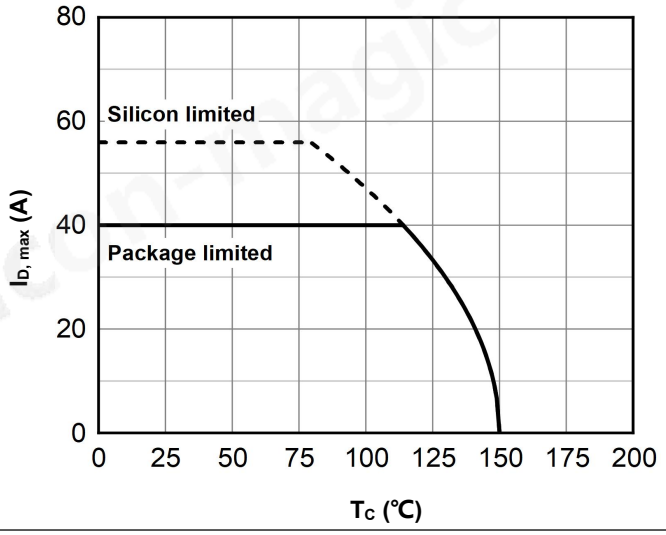


Fig.13 Normalized $V_{(BR)DSS}$ vs junction temperature

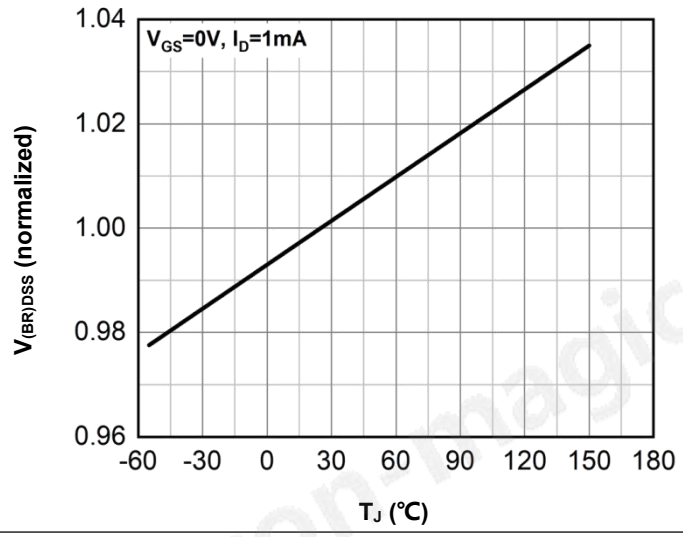


Fig.14 Normalized $V_{GS(th)}$ vs junction temperature

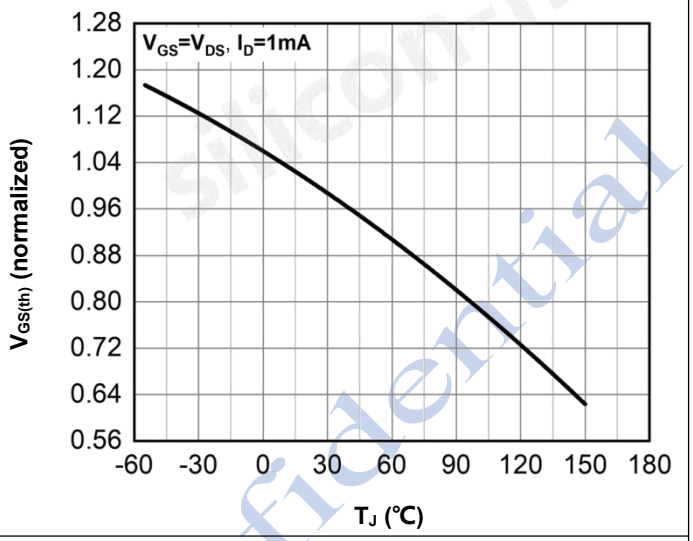
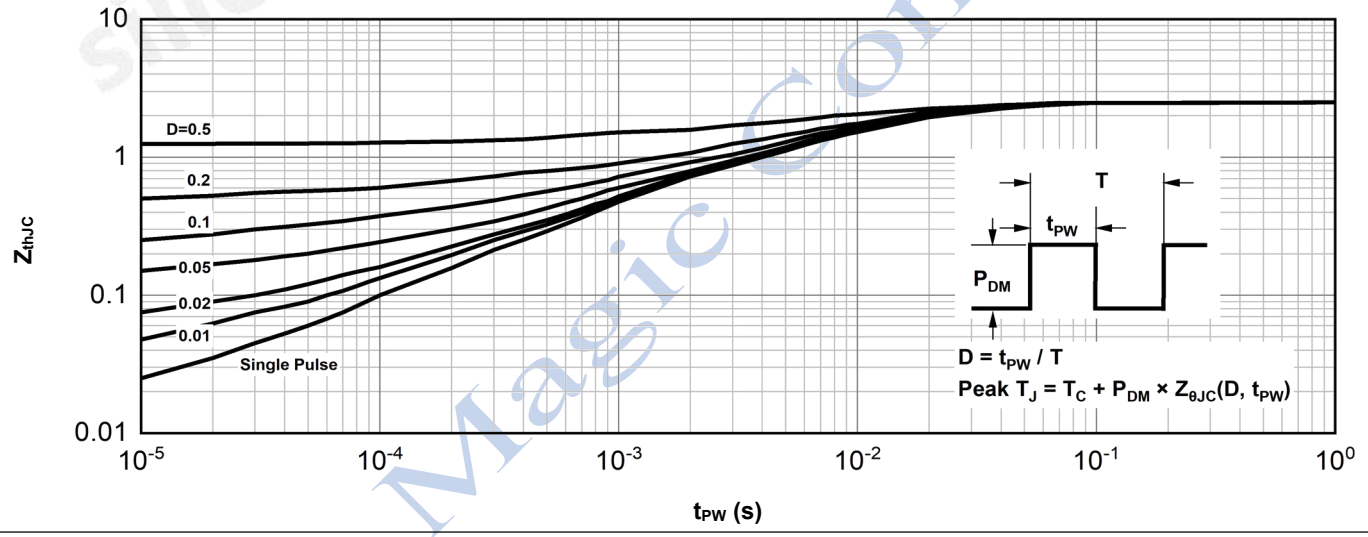


Fig.15 Transient thermal impedance from junction to case



6. Q2 Electrical characteristics diagrams

Fig.1 Typ. transfer characteristics

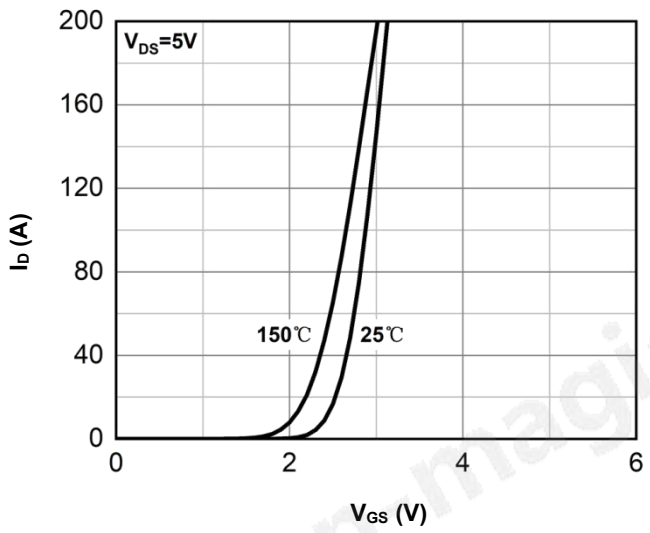


Fig.2 Typ. output characteristics

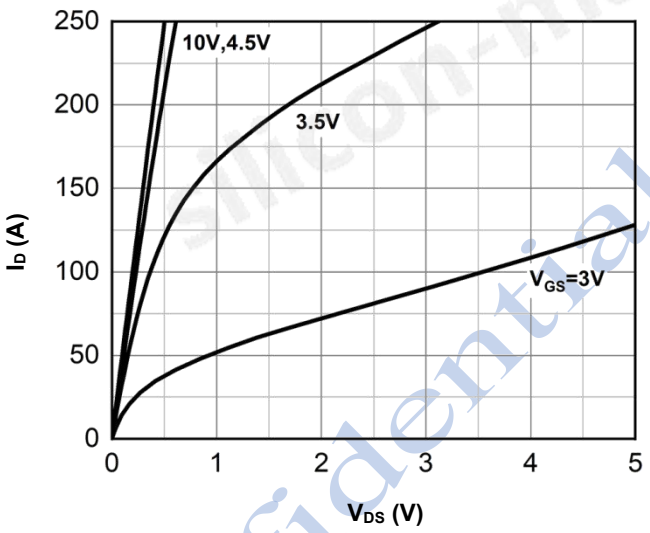


Fig.3 Normalized on-resistance vs drain current

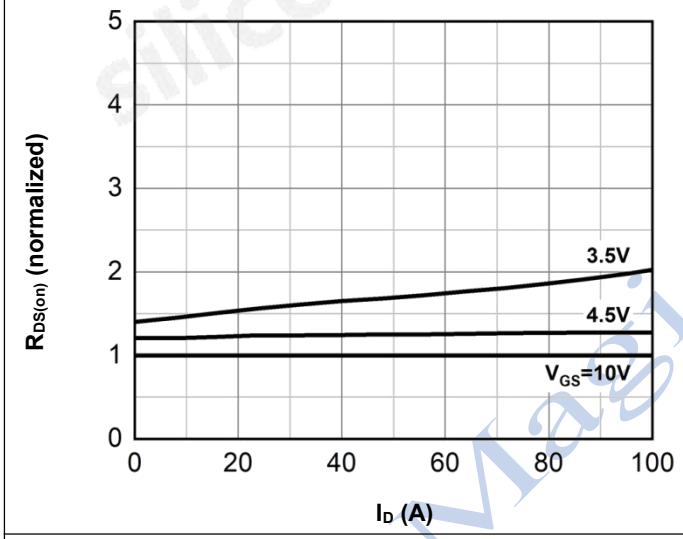


Fig.4 Typ. on-resistance vs gate-source voltage

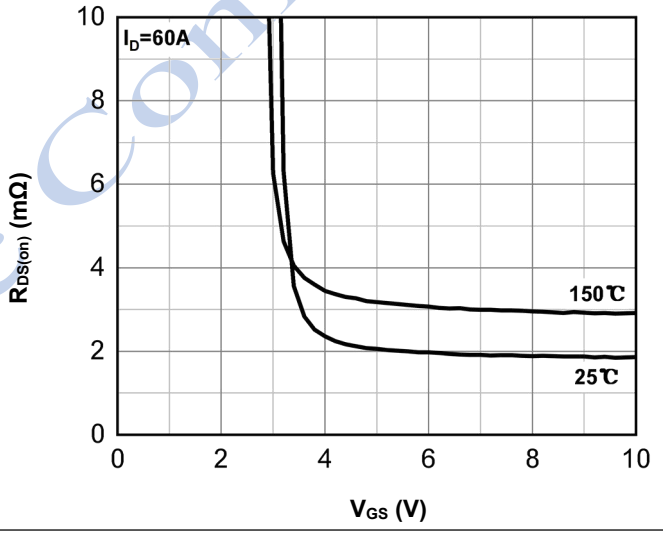


Fig.5 Normalized on-resistance vs junction temperature

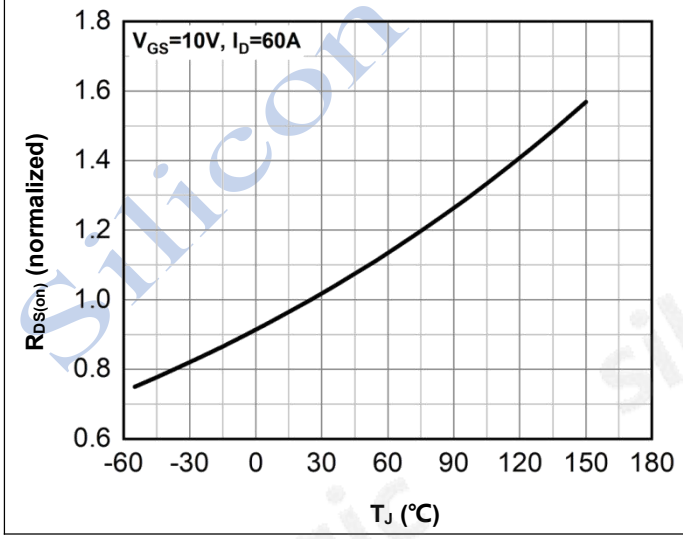


Fig.6 Typ. gate charge

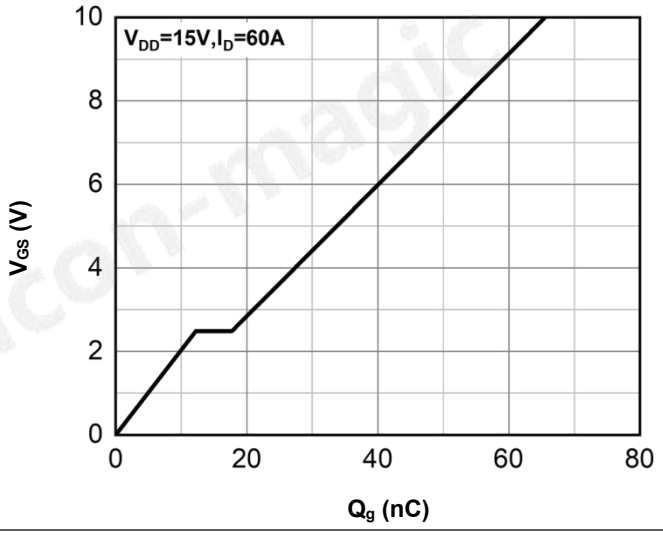


Fig.7 Typ. forward characteristics of body diode

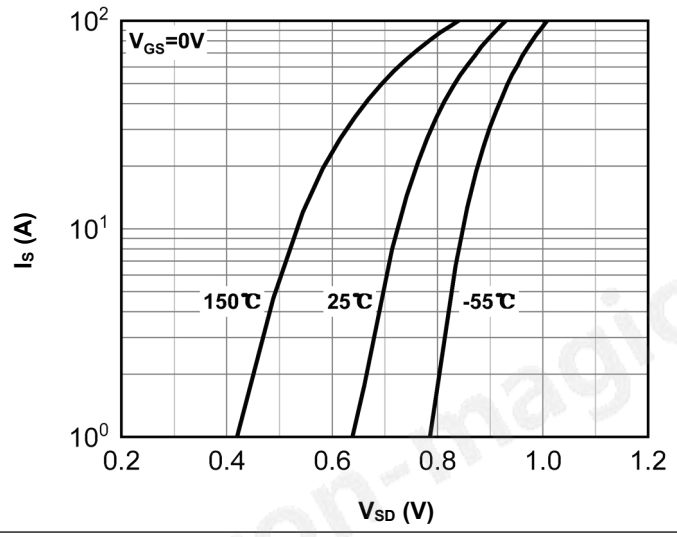


Fig.8 Safe operating area

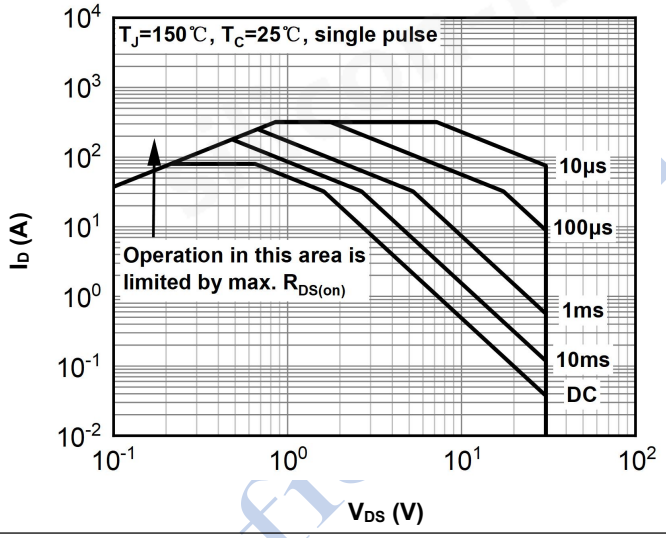


Fig.9 Typ. Capacitance

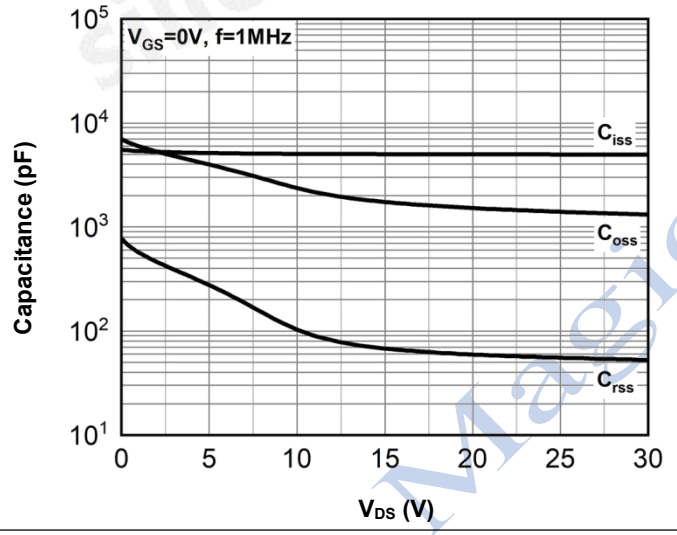


Fig.10 Single pulse maximum power dissipation

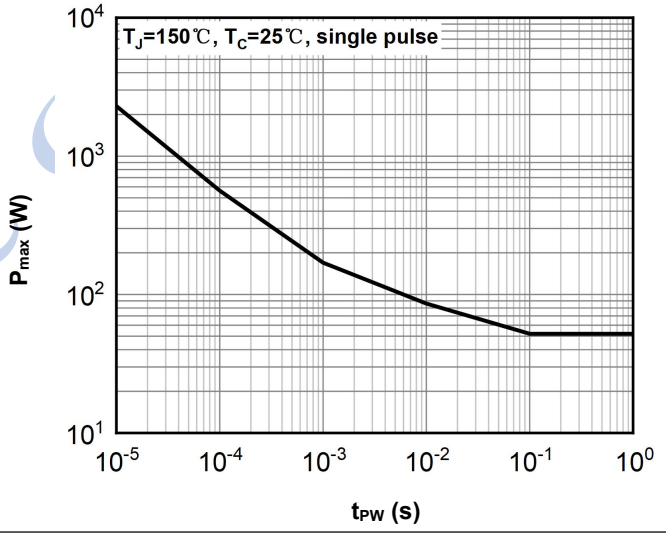


Fig.11 Max. power dissipation vs case temperature

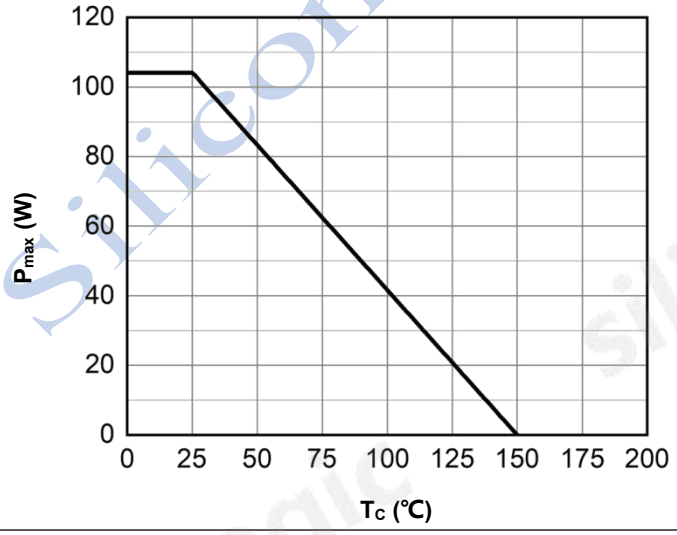


Fig.12 Max. continuous drain current vs case temperature

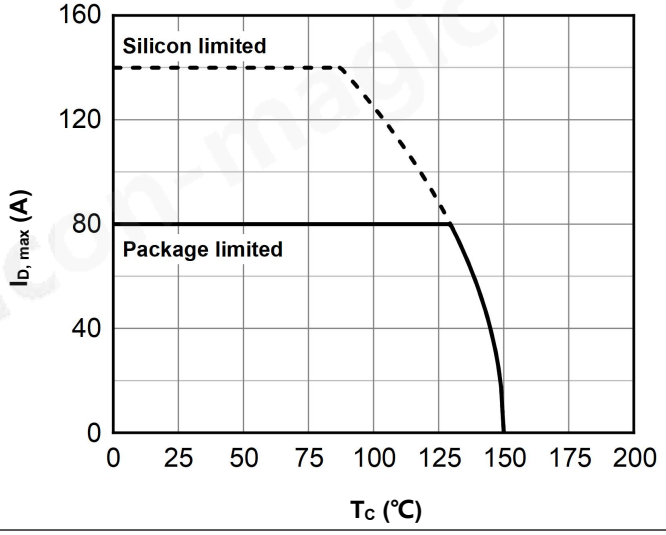


Fig.13 Normalized $V_{(BR)DSS}$ vs junction temperature

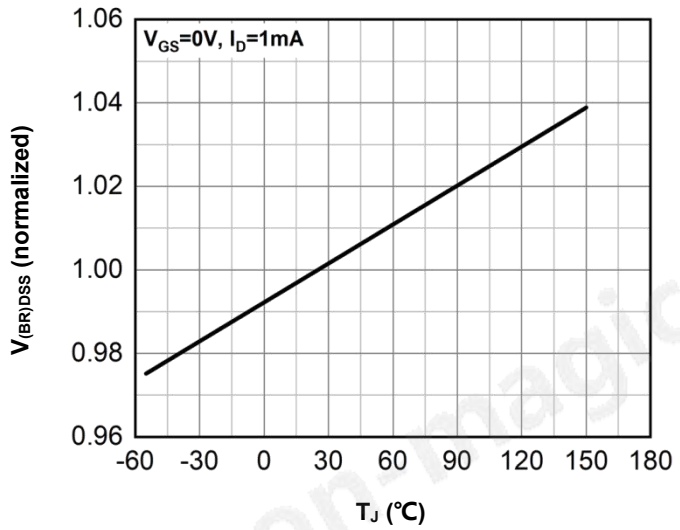


Fig.14 Normalized $V_{GS(th)}$ vs junction temperature

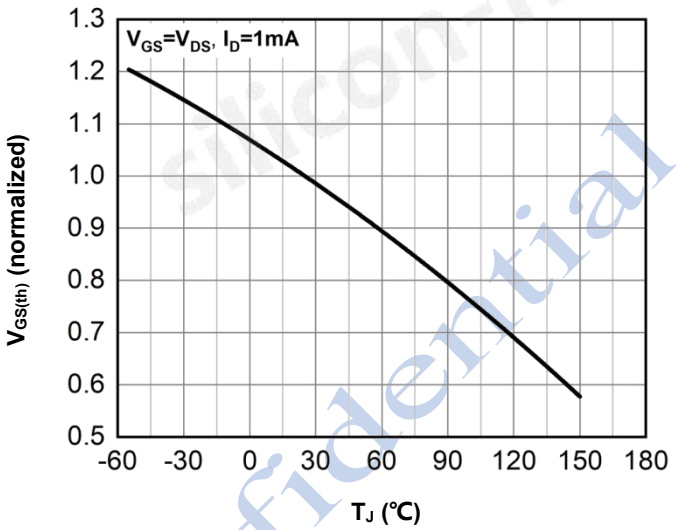
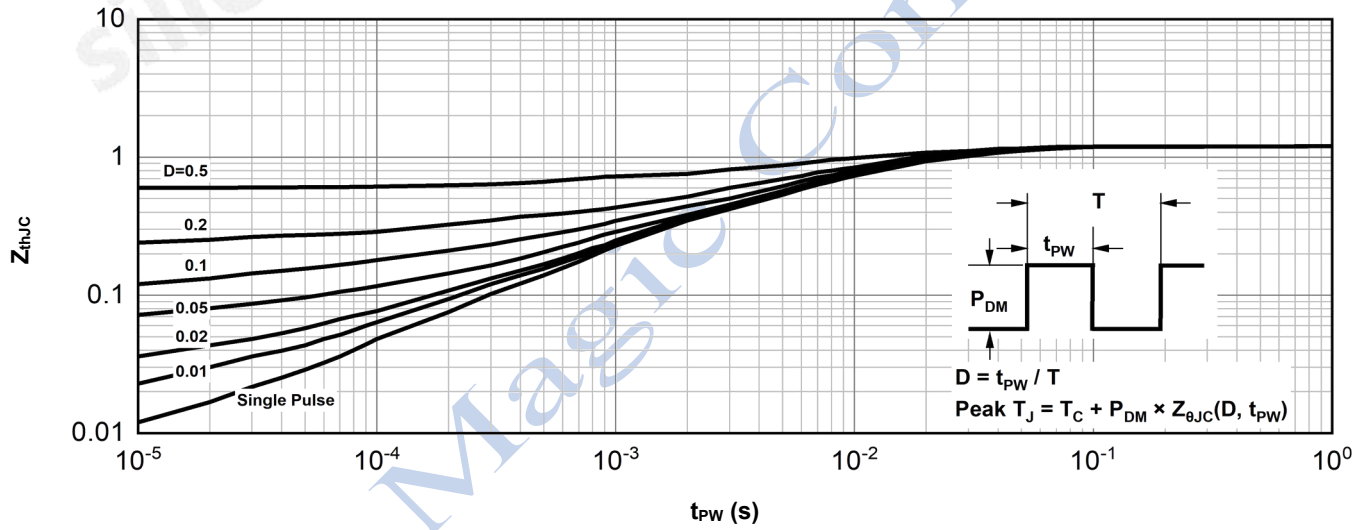
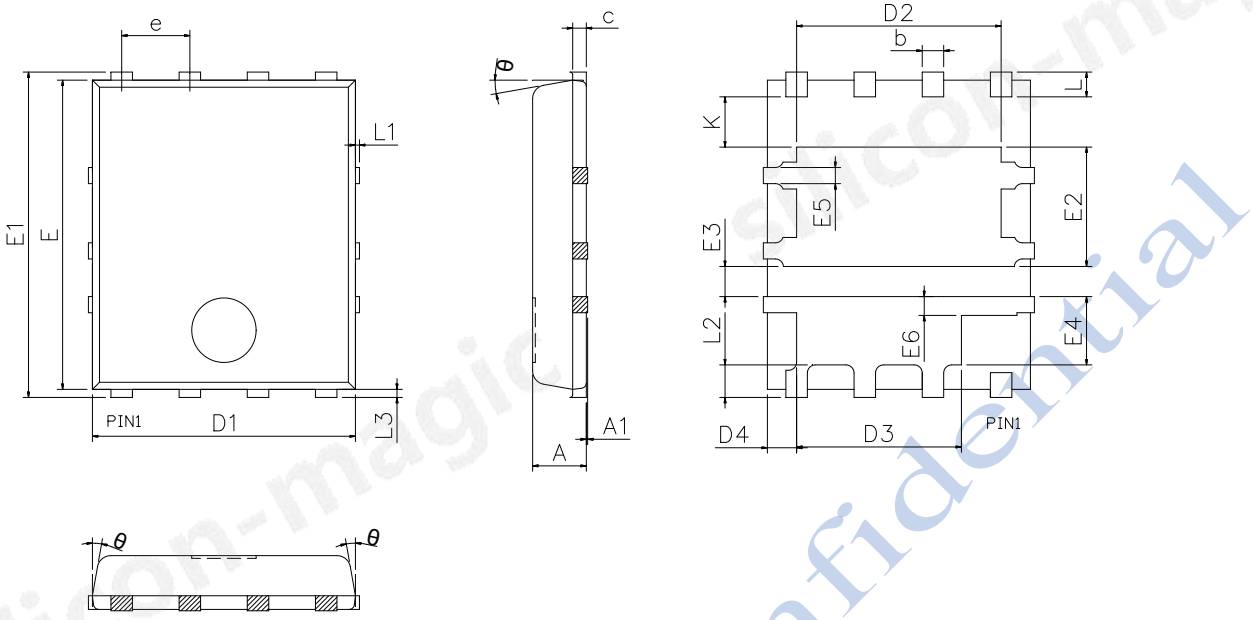


Fig.15 Transient thermal impedance from junction to case



7. Package outline dimensions



Dim	Millimeters		
	Min	Nom	Max
A	0.90	1.00	1.10
A1	0.00	—	0.05
b	0.33	0.40	0.51
c	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
D3	2.87	3.07	3.22
D4	0.45	0.55	0.65
E	5.70	5.75	5.80
E1	5.90	6.05	6.15
E2	2.02	2.22	2.32
E3	0.45	0.55	0.65
E4	1.22	1.32	1.42
E5	0.20	—	0.40
E6	0.31	—	0.51
e		1.27	
L	0.39	0.46	0.61
L1	0.00	—	0.20
L2	0.48	0.58	0.68
L3	0.06	0.15	0.25
K	0.70	0.95	1.20
θ	0°	10°	12°

Legal Disclaimer

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