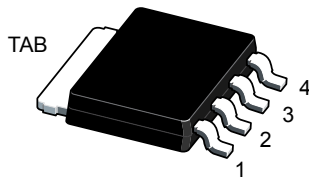
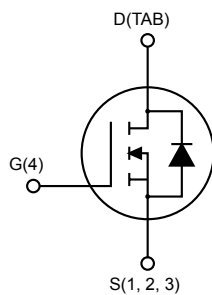


Automotive-grade N-channel 40 V, 1.6 mΩ typ., 100 A, STripFET™ F7 Power MOSFET in an LFPAK 5x6 package


LFPAK 5x6



G4S123DTAB_LFPAK


Product status link
[STK184N4F7AG](#)
Product summary

Order code	STK184N4F7AG
Marking	184N4F7AG
Package	LFPAK 5x6
Packing	Tape and reel

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STK184N4F7AG	40 V	2.0 mΩ	100 A

- AEC-Q101 qualified 
- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	40	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	100	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	100	A
$I_{DM}^{(2)}$	Drain current (pulsed)	400	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	136	W
I_{AV}	Avalanche current, repetitive or not repetitive (pulse width limited by maximum junction temperature)	42	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 25\text{ V}$)	280	mJ
T_j	Operating junction temperature range	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature range		

1. Drain current is limited by package, the current capability of the silicon is 184 A at 25 °C.
2. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	$^\circ\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case	1.1	$^\circ\text{C/W}$

1. When mounted on FR-4 board of 1 inch², 2oz Cu, $t < 10\text{ s}$.

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	40			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		1.6	2.0	m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0\text{ V}$	-	2750	-	pF
C_{oss}	Output capacitance		-	625	-	pF
C_{riss}	Reverse transfer capacitance		-	200	-	pF
Q_g	Total gate charge	$V_{DD} = 20\text{ V}, I_D = 100\text{ A},$ $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	35	-	nC
Q_{gs}	Gate-source charge		-	16	-	nC
Q_{gd}	Gate-drain charge		-	8.9	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20\text{ V}, I_D = 50\text{ A},$ $R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	12	-	ns
t_r	Rise time		-	20	-	ns
$t_{d(off)}$	Turn-off delay time		-	33.4	-	ns
t_f	Fall time		-	20.7	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 100\text{ A}, V_{GS} = 0\text{ V}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_D = 100\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	25		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 20\text{ V}$	-	9.5		nC
I_{RRM}	Reverse recovery current	(see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	0.8		A

1. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

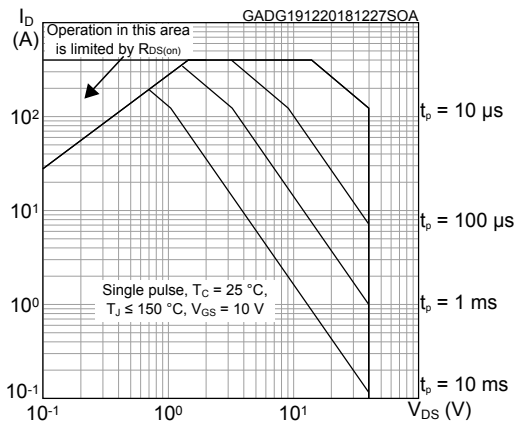


Figure 2. Thermal impedance

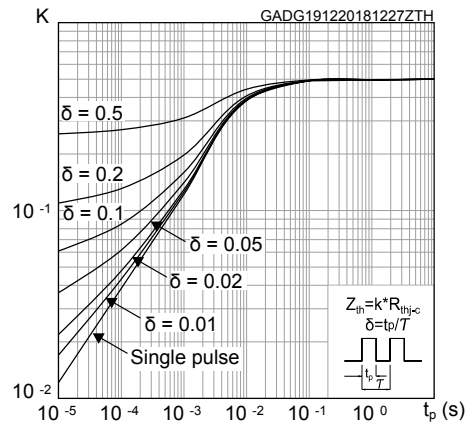


Figure 3. Output characteristics

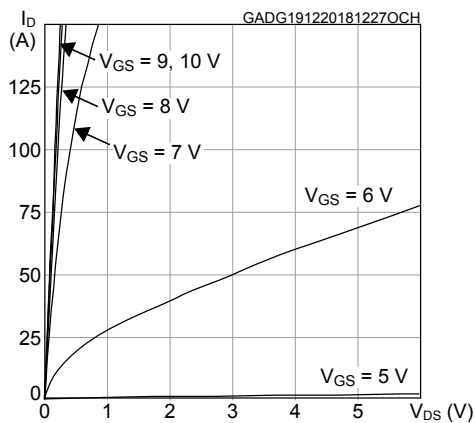


Figure 4. Transfer characteristics

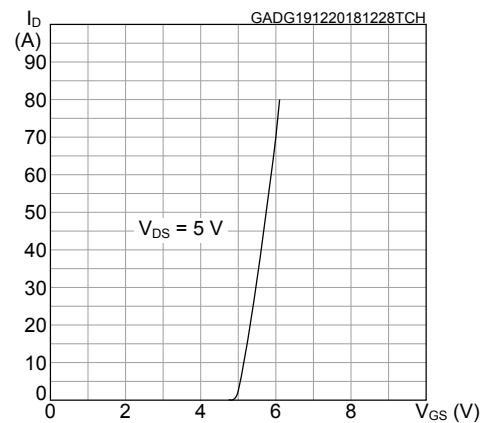


Figure 5. Gate charge vs gate-source voltage

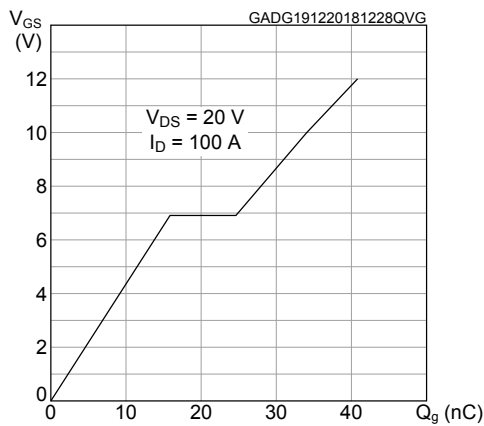


Figure 6. Static drain-source on-resistance

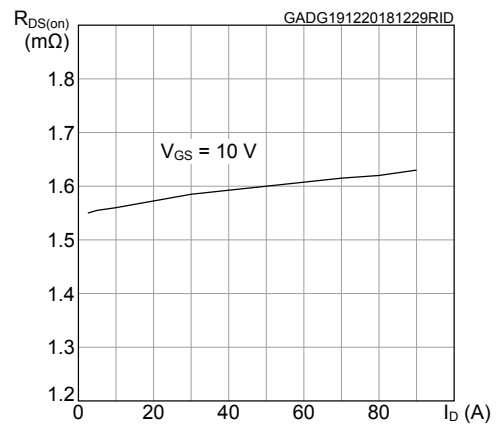


Figure 7. Capacitance variations

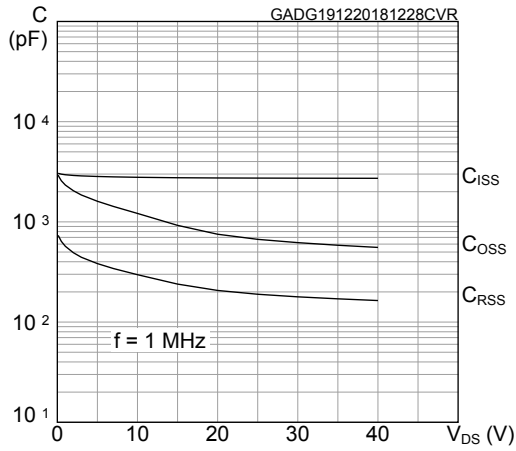


Figure 8. Normalized $V_{(BR)DSS}$ vs temperature

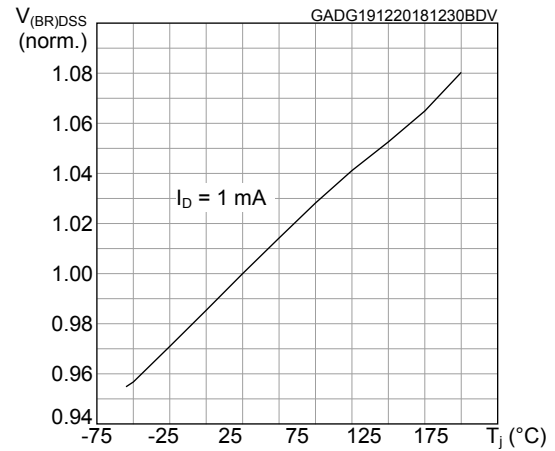


Figure 9. Normalized gate threshold voltage vs temperature

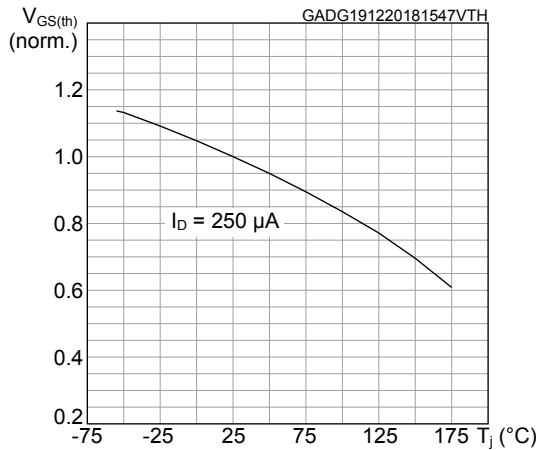


Figure 10. Normalized on-resistance vs temperature

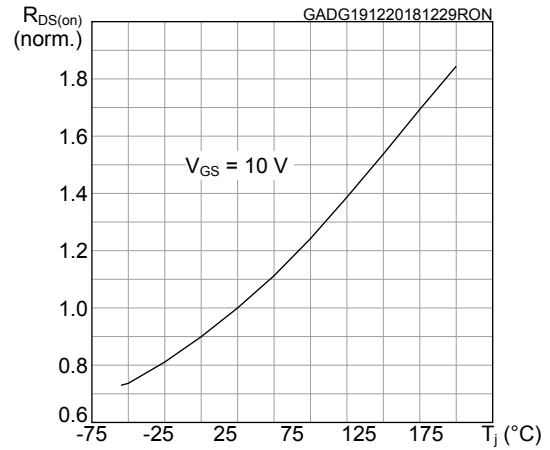
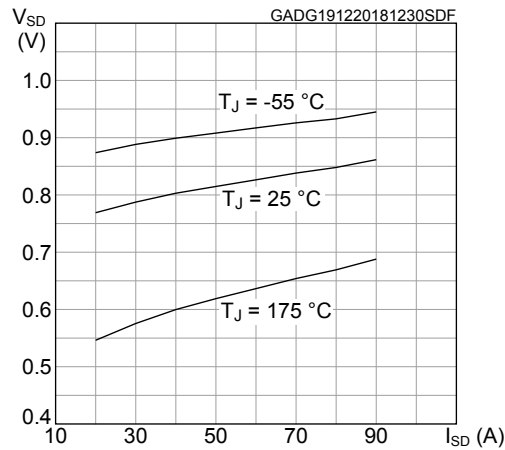
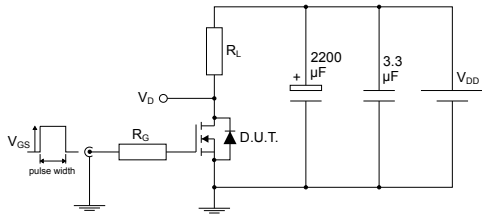


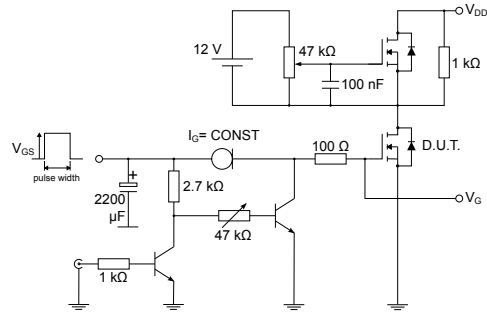
Figure 11. Source-drain diode forward characteristics



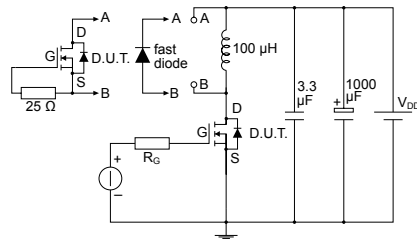
3 Test circuits

Figure 12. Test circuit for resistive load switching times


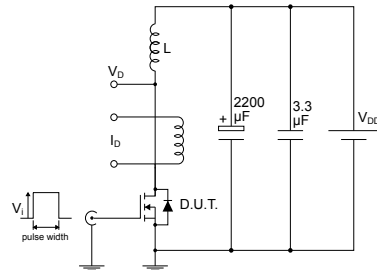
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Figure 13. Test circuit for gate charge behavior


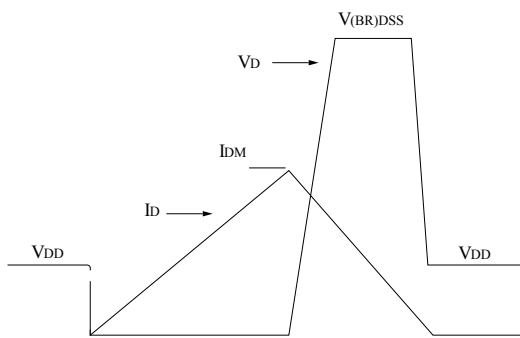
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Figure 14. Test circuit for inductive load switching and diode recovery times


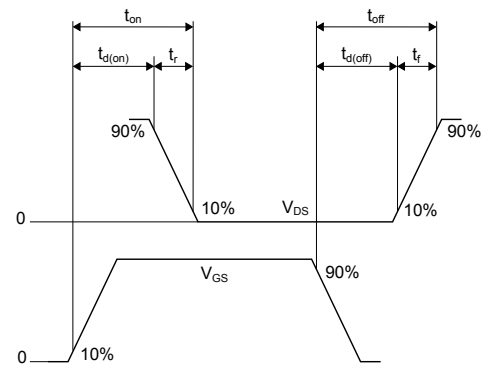
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Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform


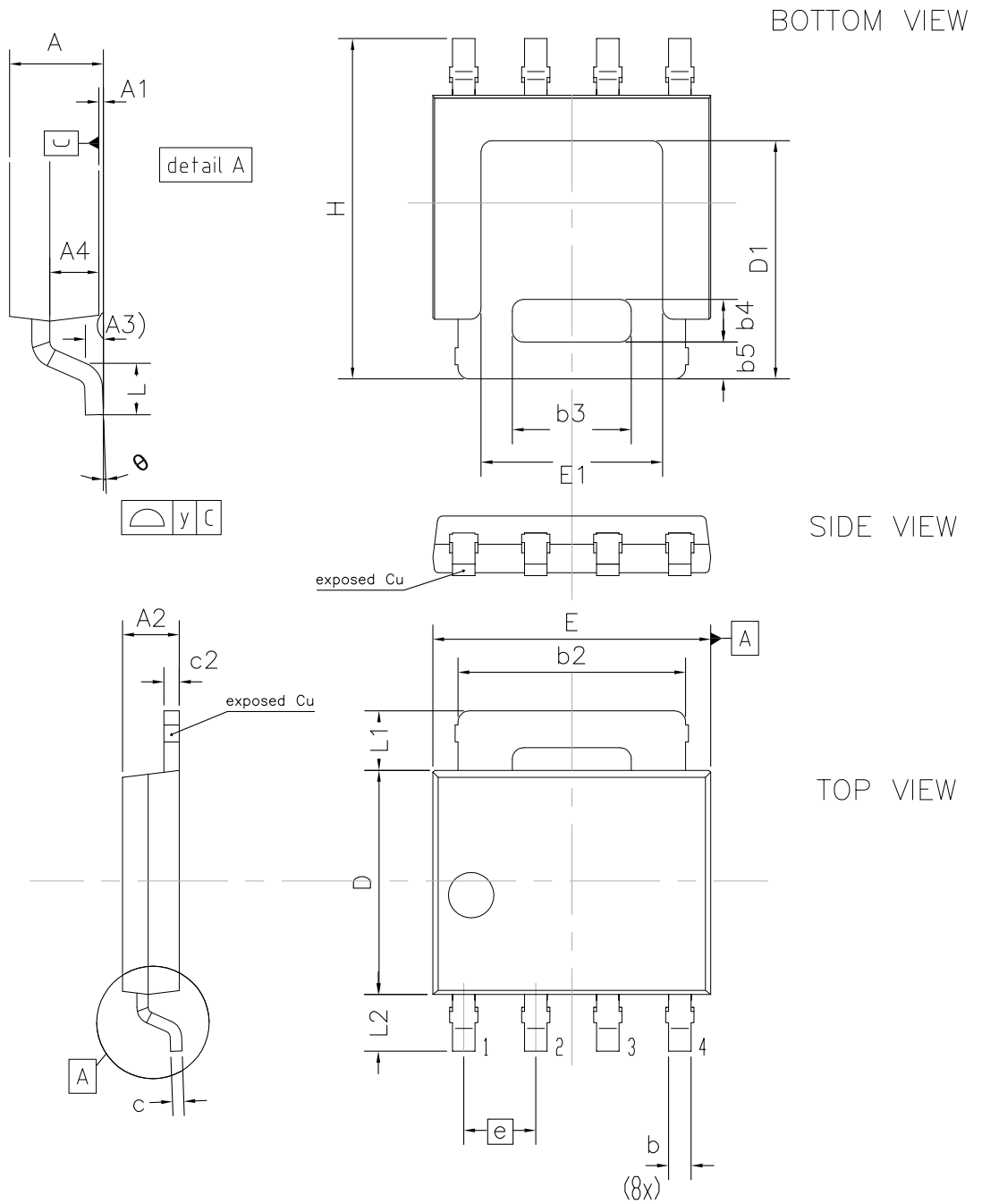
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4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK®** packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

4.1 LFPK 5x6 package information

Figure 18. LFPK 5x6 package outline



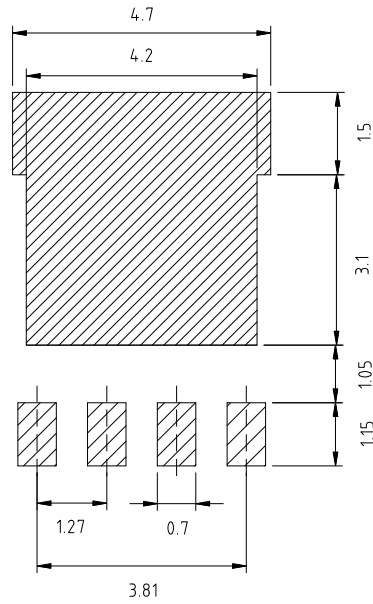
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Table 7. LFPACK 5x6 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	1.01		1.20
A1	0.00		0.15
A2	0.95		1.10
A3		0.25	
A4	0.50	0.55	0.65
b	0.35		0.50
b2	3.62		4.41
b3	2.0		2.20
b4	0.70		0.90
b5			0.7
c	0.19	0.20 ⁽¹⁾	0.25
c2	0.24		0.30
D	3.80		4.10
D1	3.80	4.00	4.20
E	4.8		5.0
E1	3.1		3.3
e		1.27	
H	5.8		6.2
L	0.40		0.85
L1	0.80		1.30
L2	0.80		1.3
w		0.25	
y		0.10	
θ	0°		8°

1. Dimension without plating

Figure 19. LFPAK 5x6 recommended footprint



00299525_FP_A

Revision history

Table 8. Document revision history

Date	Revision	Changes
05-Jul-2018	1	First release.
10-Jan-2019	2	Updated title and features on cover page. Updated Section 1 Electrical ratings and Section 2 Electrical characteristics . Added Section 2.1 Electrical characteristics (curves) . Minor text changes

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