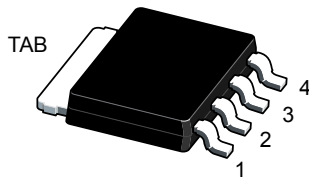
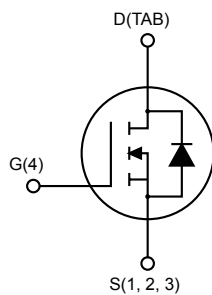


Automotive N-channel 40 V, 2.4 mΩ typ., 100 A, STripFET F7 Power MOSFET in an LFAK 5x6 package



LFAK 5x6


G4S123DTAB_LFAK



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STK130N4LF7AG	40 V	3.0 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.

Product status link

[STK130N4LF7AG](#)

Product summary

Order code	STK130N4LF7AG
Marking	130N4LF7
Package	LFAK 5x6
Packing	Tape and reel

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	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ ⁽¹⁾	100	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	93	A
$I_{DM}^{(2)}$	Drain current (pulsed)	400	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	105	W
I_{AV}	Avalanche current, repetitive or not repetitive (pulse width limited by maximum junction temperature)	32	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 25\text{ V}$)	250	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 130 A at 25 °C.
2. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thJB}^{(1)}$	Thermal resistance, junction-to-board	31.3	$^\circ\text{C/W}$
R_{thJC}	Thermal resistance, junction-to-case	1.43	$^\circ\text{C/W}$

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	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.5		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		2.4	3.0	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$		4	6.0	m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0\text{ V}$	-	1850	-	pF
C_{oss}	Output capacitance		-	520	-	pF
C_{riss}	Reverse transfer capacitance		-	33	-	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)	-	26	-	nC
Q_{gs}	Gate-source charge		-	7.5	-	nC
Q_{gd}	Gate-drain charge		-	4.5	-	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)	-	9.5	-	ns
t_r	Rise time		-	3.2	-	ns
$t_{d(off)}$	Turn-off delay time		-	30	-	ns
t_f	Fall time		-	12	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 100\text{ A}, V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 100\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 32\text{ V}$	-	14		ns
Q_{rr}	Reverse recovery charge		-	15		nC
I_{RRM}	Reverse recovery current	(see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	1		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

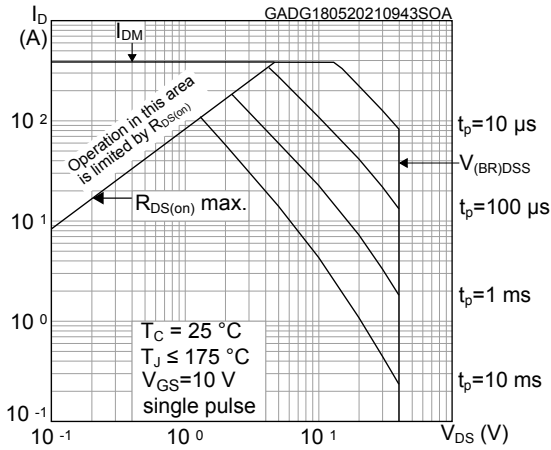


Figure 2. Normalized transient thermal impedance

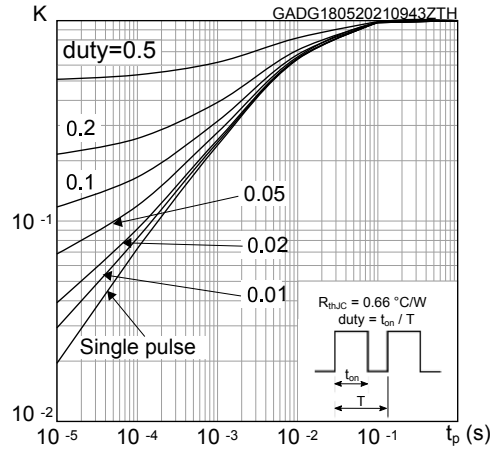


Figure 3. Typical output characteristics

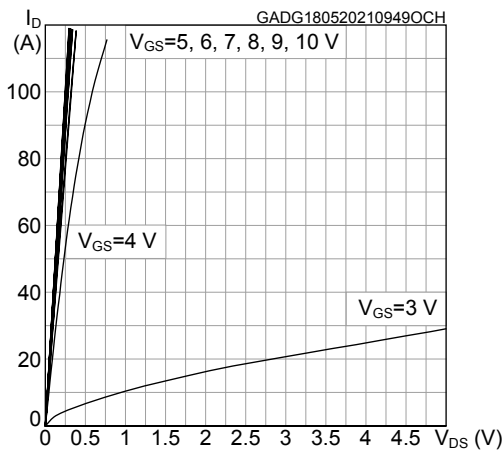


Figure 4. Typical transfer characteristics

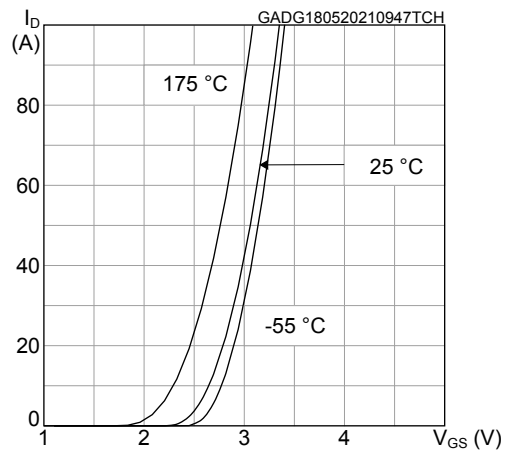


Figure 5. Typical gate charge characteristics

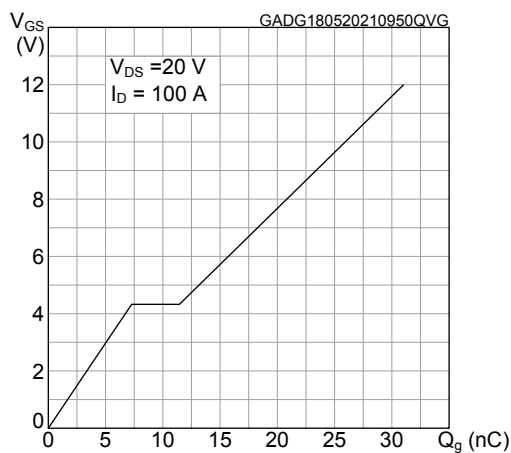


Figure 6. Typical drain-source on-resistance

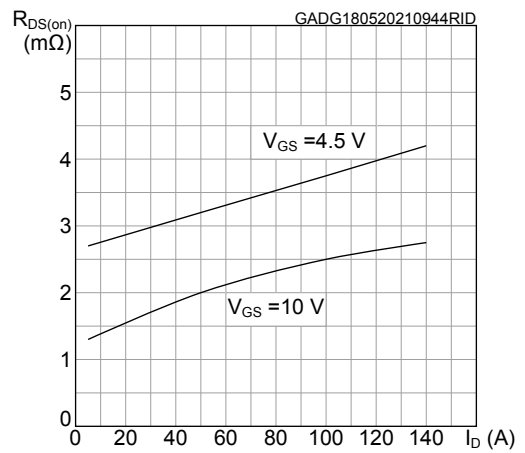


Figure 7. Typical capacitance characteristics

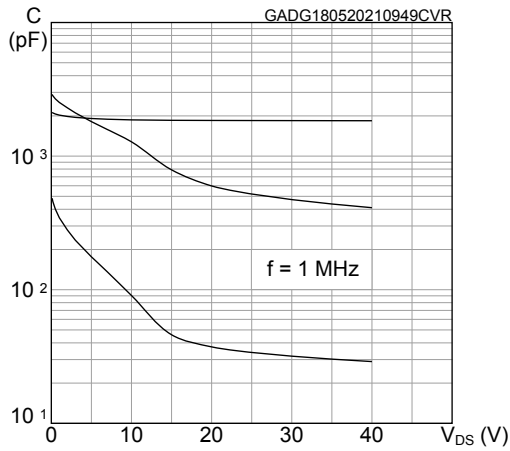


Figure 8. Normalized gate threshold vs temperature

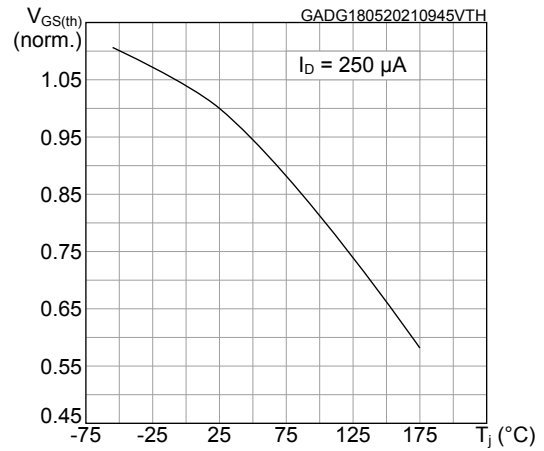


Figure 9. Normalized on-resistance vs temperature

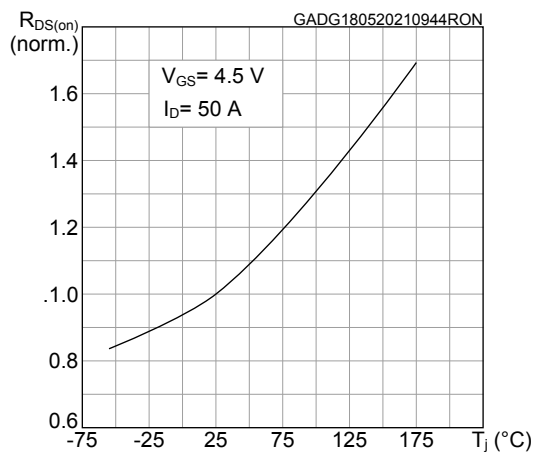


Figure 10. Normalized breakdown voltage vs temperature

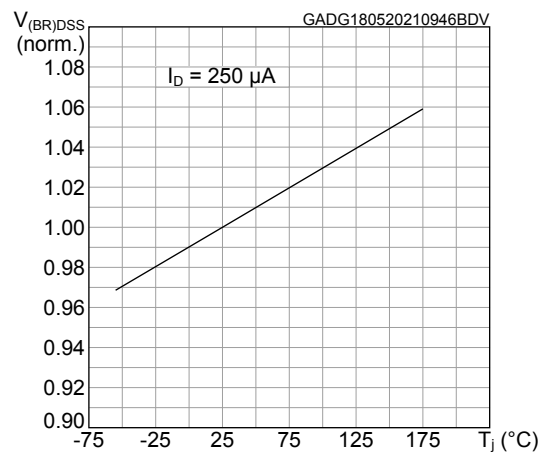
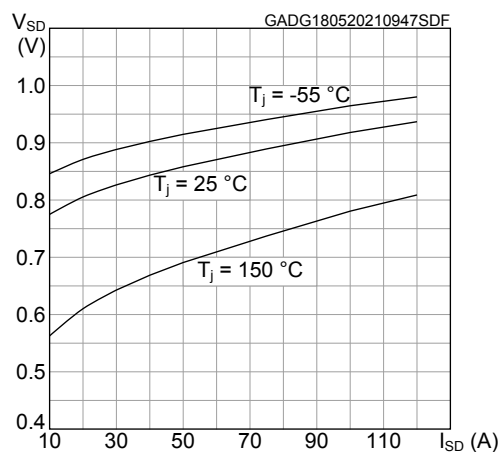
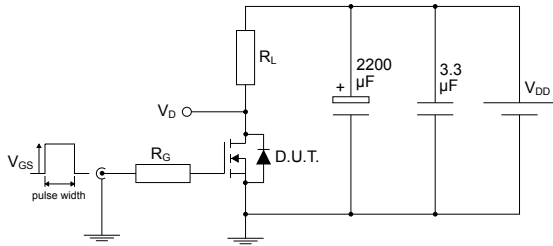


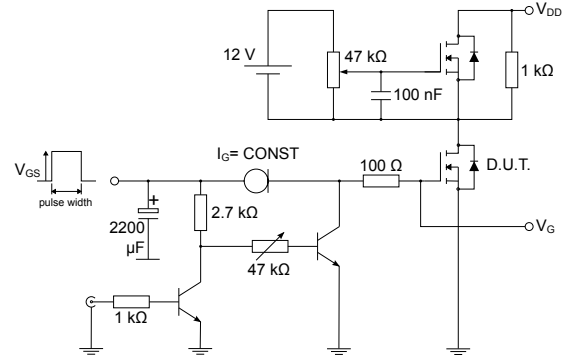
Figure 11. Typical reverse diode forward characteristics



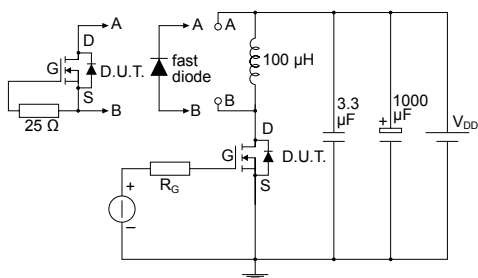
3 Test circuits

Figure 12. Test circuit for resistive load switching times


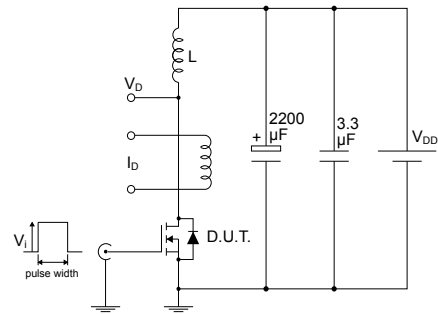
AM01468v1

Figure 13. Test circuit for gate charge behavior


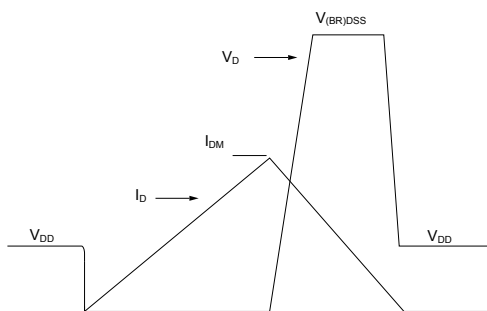
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Figure 14. Test circuit for inductive load switching and diode recovery times


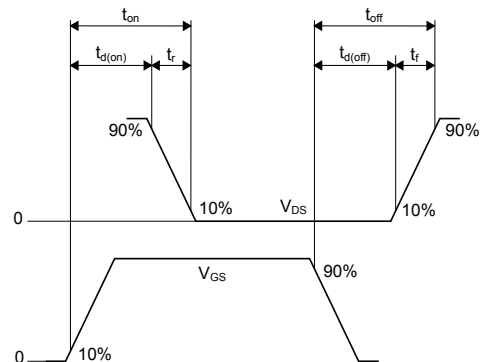
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Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform


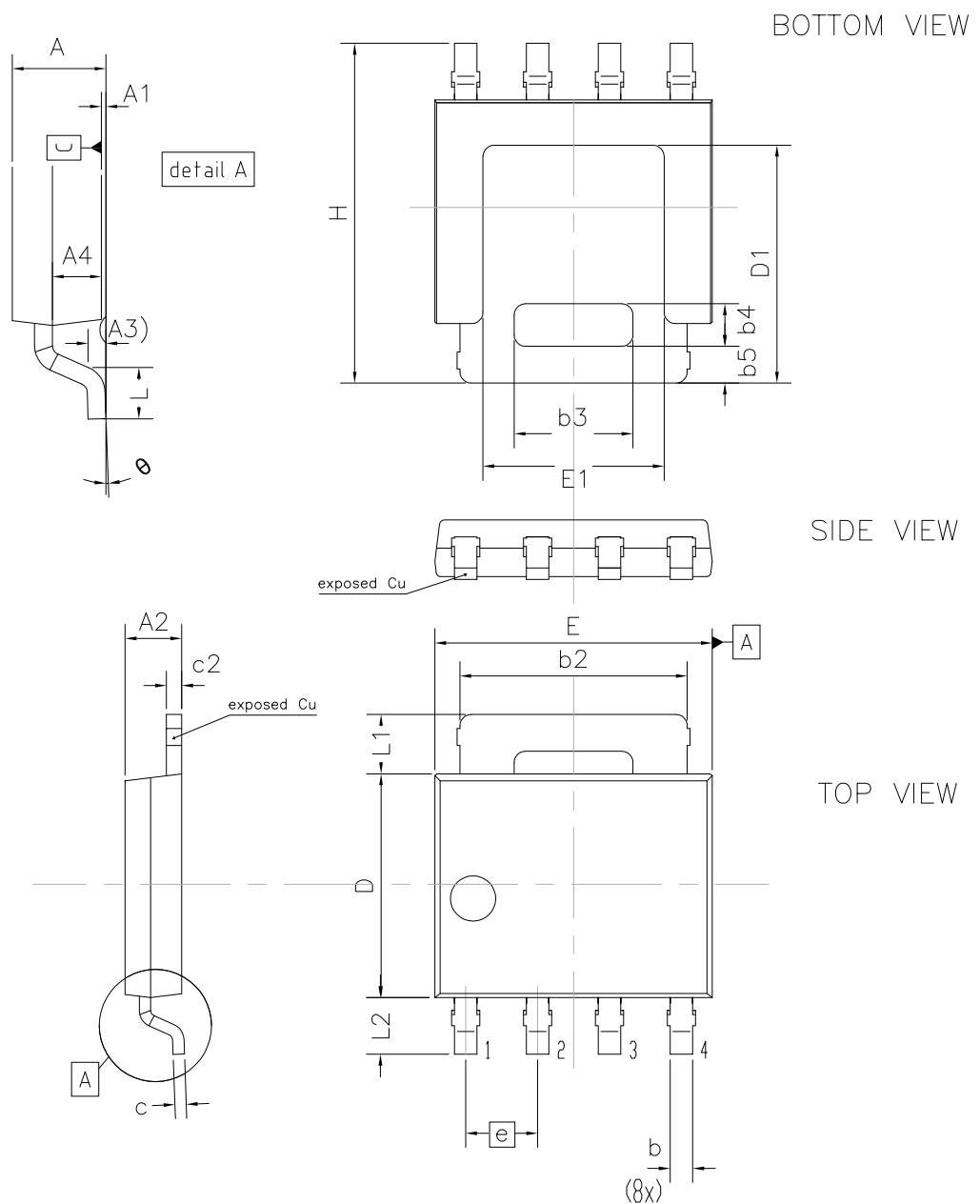
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4 Package information

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 LFAK 5x6 package information

Figure 18. LFAK 5x6 package outline



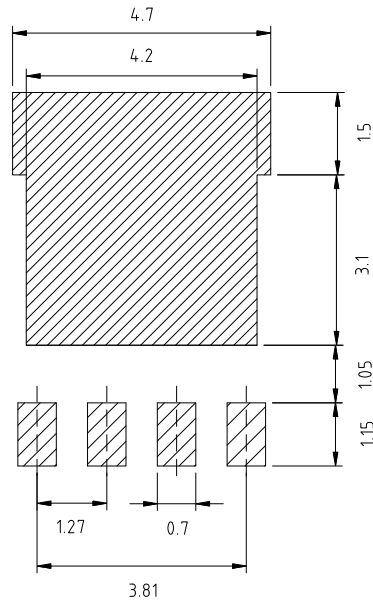
DM00299525_1

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	2.00		2.20
b4	0.70		0.90
b5			0.70
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	4.80		5.00
E1	3.10		3.30
e		1.27	
H	5.80		6.20
L	0.40		0.85
L1	0.80		1.30
L2	0.80		1.30
w		0.25	
y		0.10	
θ	0°		8°

1. Dimension without plating

Figure 19. LFPACK 5x6 recommended footprint (dimensions in mm)



DM00299525_FP_1

Revision history

Table 8. Document revision history

Date	Revision	Changes
18-Mar-2019	1	First release.
27-Jul-2020	2	Updated title and features in cover page.
24-May-2021	3	Modified <i>Table 1. Absolute maximum ratings</i> , <i>Table 3. On/off states</i> , <i>Table 4. Dynamic</i> , <i>Table 5. Switching times</i> , and <i>Table 6. Source-drain diode</i> . Added <i>Electrical characteristics (curves)</i> . Minor text changes.
28-Sep-2021	4	Updated Figure 1. Safe operating area .

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