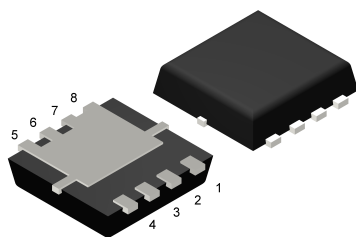
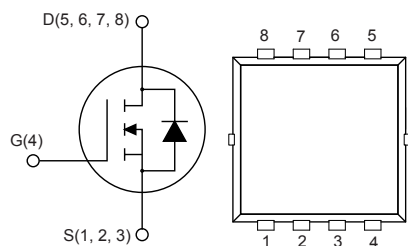


N-channel 100 V, 11.3 mΩ typ., 12 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 3.3x3.3 package



PowerFLAT™ 3.3x3.3



AM15810v1

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STL12N10F7	100 V	13.3 mΩ	12 A

- 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

[STL12N10F7](#)

Product summary

Order code	STL12N10F7
Marking	12N10
Package	PowerFLAT™ 3.3x3.3
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	44	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	28	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	176	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	12	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	7	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	48	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	52	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	3	W
T_{stg}	Storage temperature range	-55 to 150	$^\circ\text{C}$
T_J	Operating junction temperature range		

1. This value is rated according to R_{thj-c} .
2. Pulse width is limited by safe operating area.
3. This value is rated according to $R_{thj-pcb}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max.	42.8	$^\circ\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case max.	2.4	$^\circ\text{C/W}$

1. When mounted on an 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	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$			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	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 6\text{ A}$		11.3	13.3	m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1820	-	pF
C_{oss}	Output capacitance		-	400	-	pF
C_{rss}	Reverse transfer capacitance		-	30	-	pF
Q_g	Total gate charge	$V_{DD} = 50\text{ V}$, $I_D = 12\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	30	-	nC
Q_{gs}	Gate-source charge		-	11.3	-	nC
Q_{gd}	Gate-drain charge		-	6.4	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 6\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	22.4	-	ns
t_r	Rise time		-	8.7	-	ns
$t_{d(off)}$	Turn-off delay time		-	28.6	-	ns
t_f	Fall time		-	8.9	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 12\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 80\text{ V}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	47.5		ns
Q_{rr}	Reverse recovery charge		-	59.4		nC
I_{RRM}	Reverse recovery current		-	2.5		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

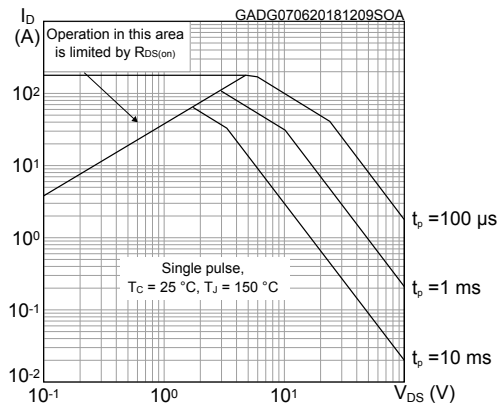


Figure 2. Thermal impedance

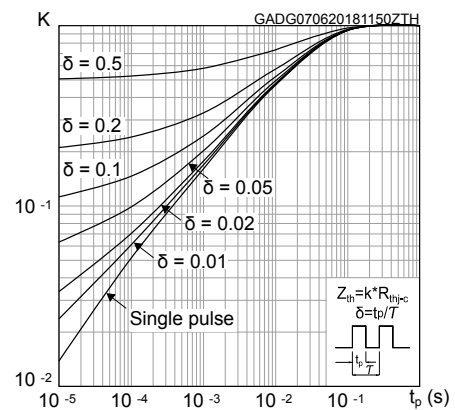


Figure 3. Output characteristics

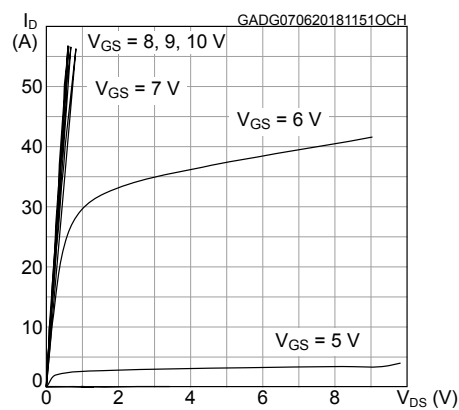


Figure 4. Transfer characteristics

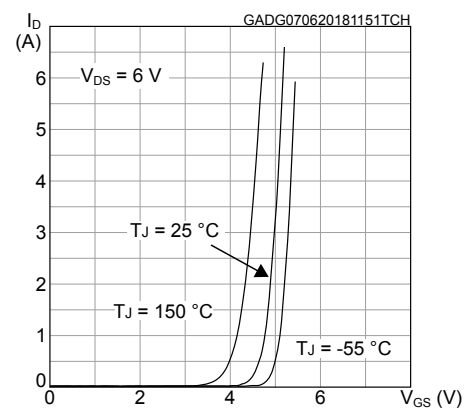


Figure 5. Gate charge vs gate-source voltage

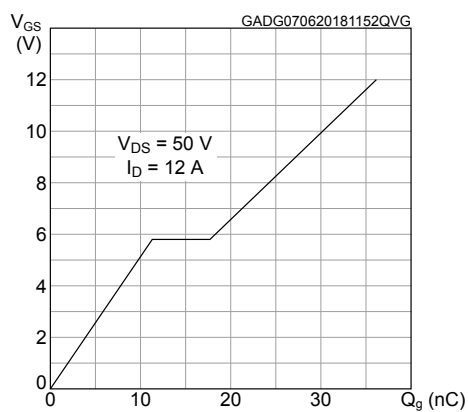


Figure 6. Static drain-source on-resistance

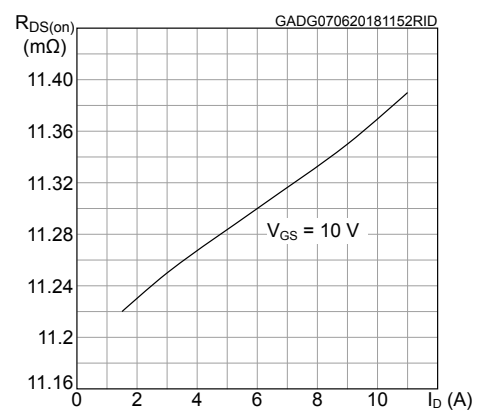


Figure 7. Capacitance variations

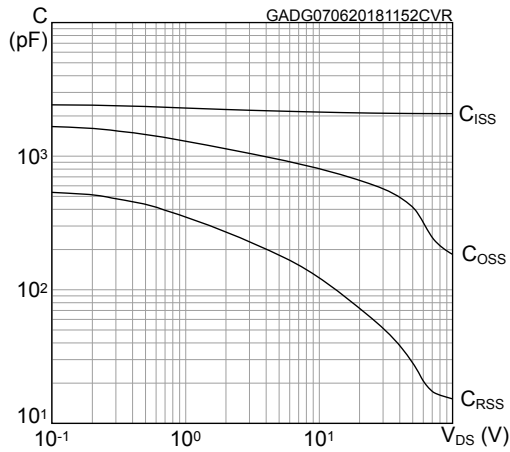


Figure 8. Normalized gate threshold voltage vs temperature

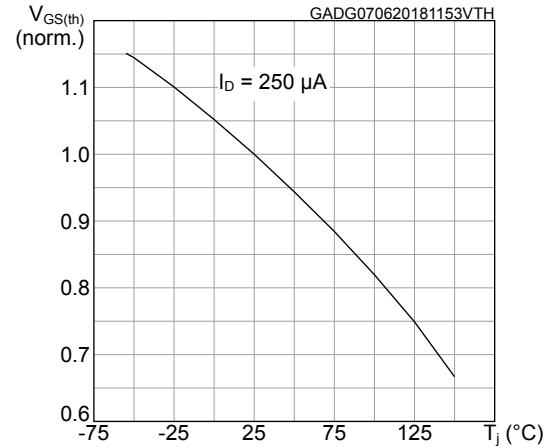


Figure 9. Normalized on-resistance vs temperature

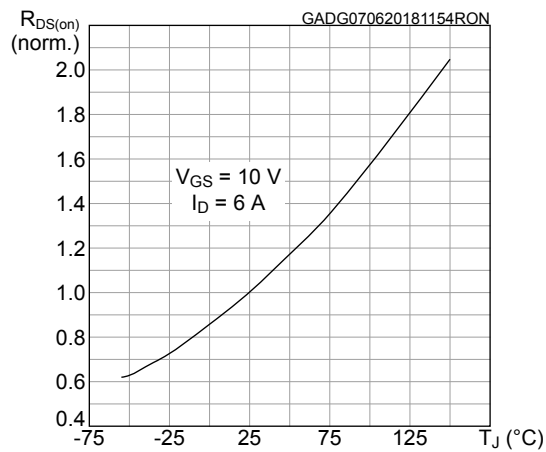


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

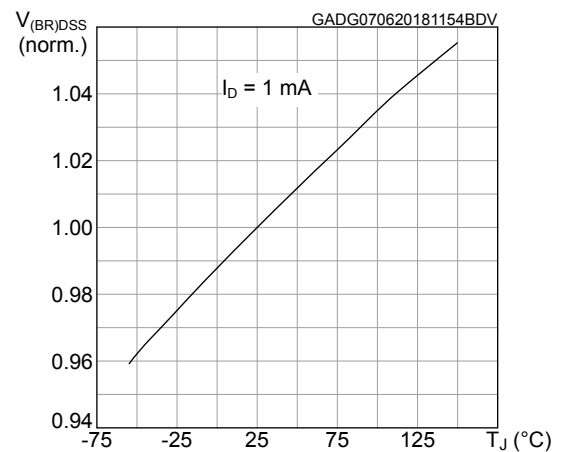
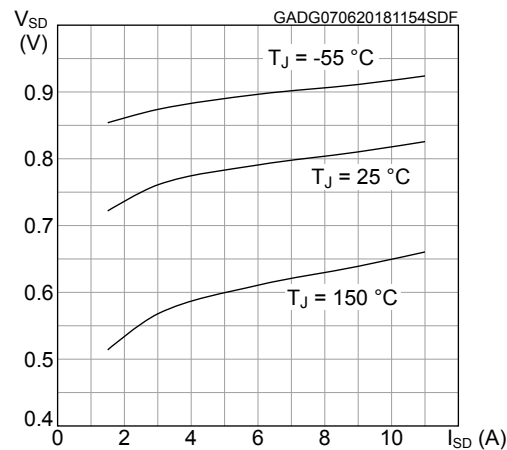
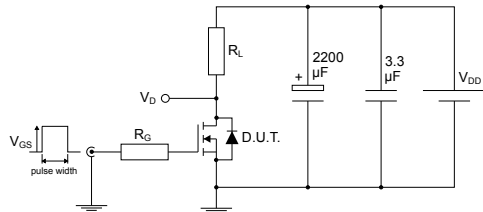


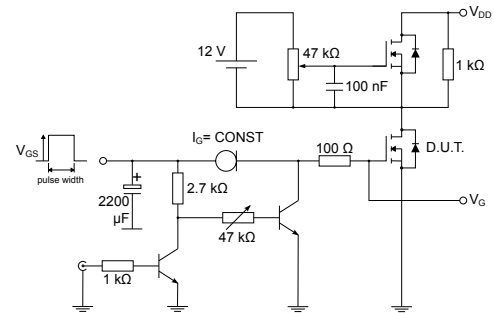
Figure 11. Source-drain diode forward characteristics



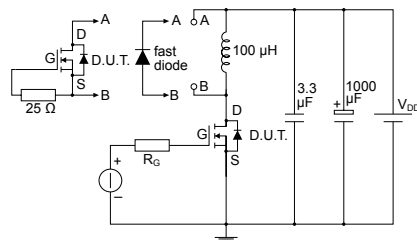
3 Test circuits

Figure 12. Test circuit for resistive load switching times


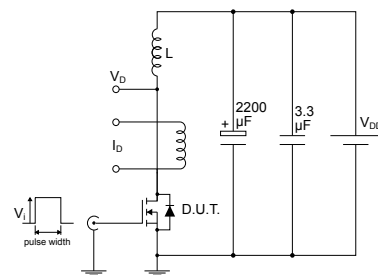
AM01468v1

Figure 13. Test circuit for gate charge behavior


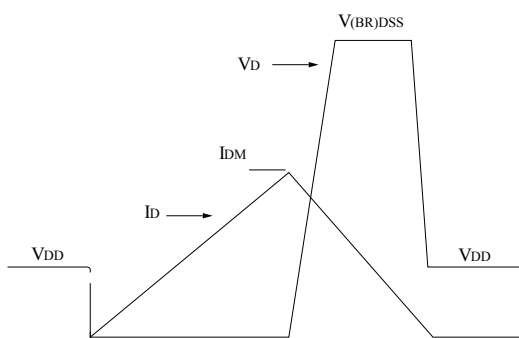
AM01469v1

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


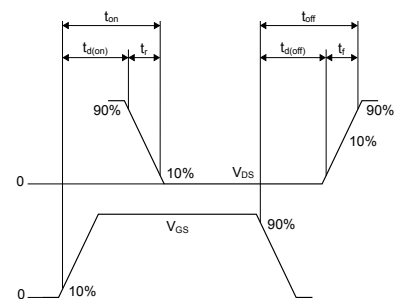
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Figure 15. Unclamped inductive load test circuit


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Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform


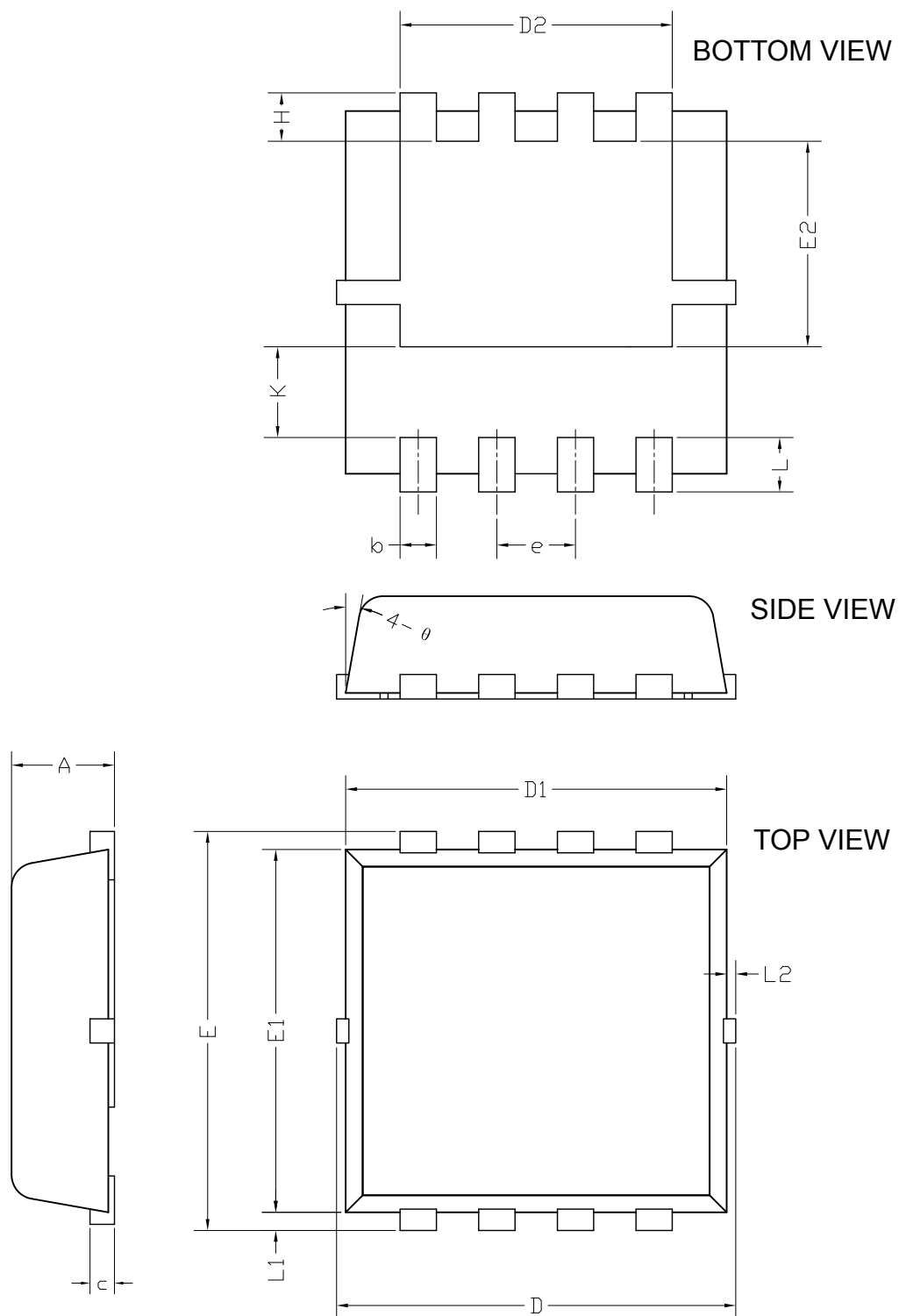
AM01473v1

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 PowerFLAT™ 3.3x3.3 package information

Figure 18. PowerFLAT™ 3.3x3.3 package outline

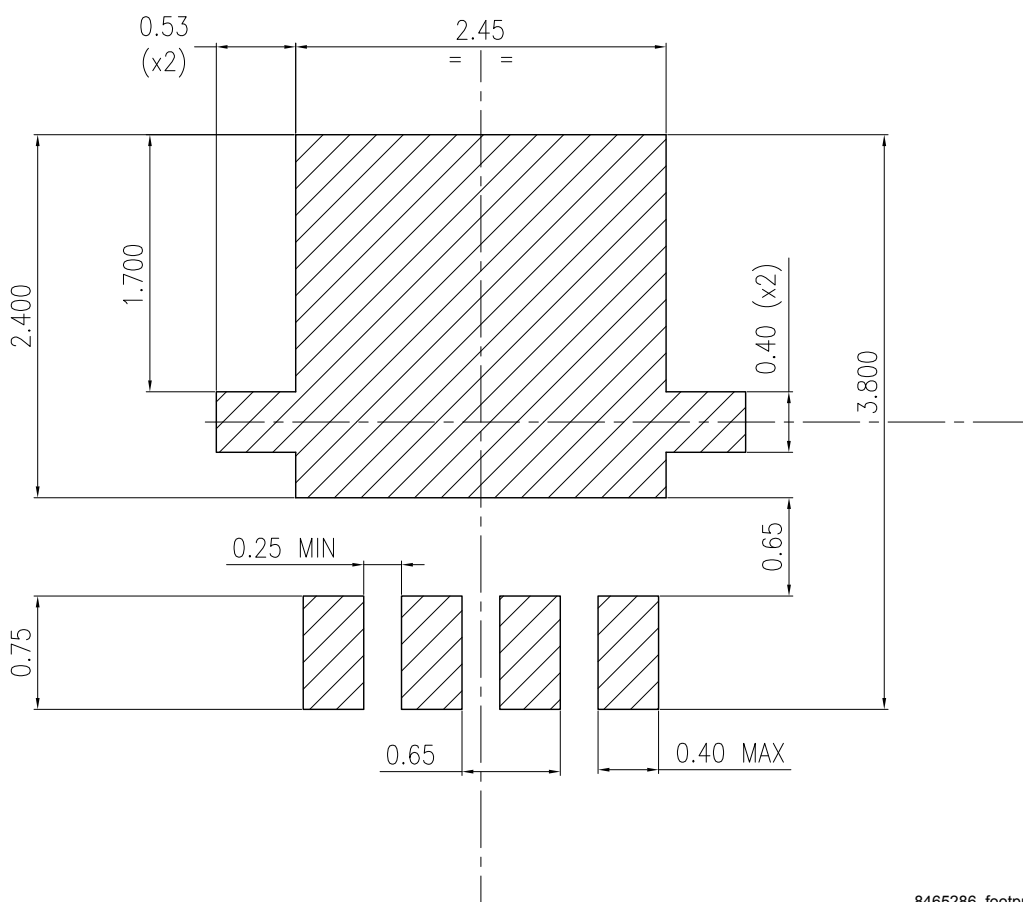


8465286_2

Table 7. PowerFLAT™ 3.3x3.3 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.70	0.80	0.90
b	0.25	0.30	0.39
c	0.14	0.15	0.20
D	3.10	3.30	3.50
D1	3.05	3.15	3.25
D2	2.15	2.25	2.35
e	0.55	0.65	0.75
E	3.10	3.30	3.50
E1	2.90	3.00	3.10
E2	1.60	1.70	1.80
H	0.25	0.40	0.55
K	0.65	0.75	0.85
L	0.30	0.45	0.60
L1	0.05	0.15	0.25
L2			0.15
θ	8°	10°	12°

Figure 19. PowerFLAT™ 3.3x3.3 recommended footprint (dimensions are in mm)



8465286_footprint

Revision history

Table 8. Document revision history

Date	Revision	Changes
22-Feb-2017	1	First release
14-Jun-2018	2	Removed maturity status indication from cover page. Updated 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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