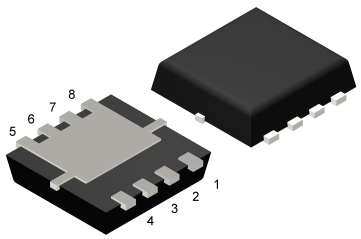
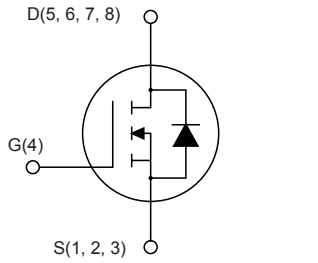
STL130N4LF8

Datasheet

N-channel logic level 40 V, 2.3 mΩ max., 124 A, STripFET F8 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
STL130N4LF8	40 V	2.3 mΩ	124 A

- MSL1 grade
- 150 °C operating temperature
- 100% avalanche tested
- Low gate charge Q_g

Applications

- Industrial tools, motor drives and equipment
- Industrial motor control
- Power supplies and converters

Description

The STL130N4LF8 is a 40 V N-channel enhancement mode Power MOSFET designed in STripFET F8 technology featuring an enhanced trench gate structure.

It ensures a state-of-the-art of figure of merit for very low on-state resistance while reducing internal capacitances and gate charge for faster and more efficient switching.

Product status link
STL130N4LF8

Product summary	
Order code	STL130N4LF8
Marking	1304L
Package	PowerFLAT 3.3x3.3
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings (at T_C = 25 °C, unless otherwise specified)

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 °C(1)	124	A
	Drain current (continuous) at T_C = 25 °C(2)	45	
	Drain current (continuous) at T_C = 100 °C(1)	78	
I_{DM}(1)(3)(4)	Drain current (pulsed), t_P = 10 µs	496	A
P_{TOT}	Total power dissipation at T_C = 25 °C	64	W
I_{AS}	Single pulse avalanche current (pulse width limited by maximum junction temperature)	22	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = 22 A, R_{Gmin} = 25 Ω)	290	mJ
T_J	Operating junction temperature range	-55 to 150	°C
T_{stg}	Storage temperature range		

1. *This is the theoretical current value only related to the silicon.*
2. *This current value is limited by package.*
3. *Pulse width is limited by safe operating area.*
4. *Specified by design, not tested in production.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJA}(1)	Thermal resistance, junction-to-ambient (on 2s2p FR-4 board vertical in still area)	18.8	°C/W
R_{thJC}	Thermal resistance, junction-to-case	1.95	°C/W

1. *Defined according to JEDEC standards (JESD51-5, -7).*

2 Electrical characteristics

(T_J = 25 °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 V, I_D = 1 mA	40	-	-	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 40 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 125 °C (1)	-	-	100	
I_{GSS}	Gate-body leakage current	V_{GS} = 20 V, V_{DS} = 0 V	-	-	100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	1.2	-	2.2	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 22 A	-	1.8	2.3	mΩ
		V_{GS} = 4.5 V, I_D = 22 A	-	2.5	3.3	
R_G (1)	Gate resistance		-	0.7	-	Ω

1. *Specified by design and evaluated by characterization, not tested in production.*

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} (1)	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS}= 0 V	-	2600	-	pF
C_{oss} (1)	Output capacitance		-	680	-	pF
C_{rss} (1)	Reverse transfer capacitance		-	18	-	pF
Q_g (1)	Total gate charge	V_{DD} = 20 V, I_D = 22 A, V_{GS} = 0 to 4.5 V	-	16	-	nC
		V_{DD} = 20 V, I_D = 22 A, V_{GS} = 0 to 10 V	-	34.5	-	
Q_{gs} (1)	Gate-source charge	V_{DD} = 20 V, I_D = 22 A, V_{GS} = 0 to 4.5 V	-	7	-	nC
Q_{gd} (1)	Gate-drain charge		-	3.5	-	
$Q_{g(sync)}$ (1)	Total gate charge, sync. MOSFET	V_{DS} = 0.1 V, V_{GS} = 0 to 4.5 V	-	10	-	nC
Q_{oss} (1)	Output charge	V_{DD} = 25 V, V_{GS} = 0 V	-	39	-	nC

1. *Specified by design and evaluated by characterization, not tested in production.*

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ (1)	Turn-on delay time	V_{DD} = 20 V, I_D = 20 A, R_G = 4.7 Ω, V_{GS} = 10 V	-	8.4	-	ns
t_r (1)	Rise time		-	2.95	-	ns
$t_{d(off)}$ (1)	Turn-off delay time		-	27.6	-	ns
t_f (1)	Fall time		-	3.96	-	ns

1. *Specified by design and evaluated by characterization, not tested in production.*

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} (1)(2)	Forward on current (continuous)	T_C = 25 °C	-	-	80	A
V_{SD}	Forward on voltage	I_{SD} = 22 A, V_{GS} = 0 V	-	-	1	V
t_{rr} (1)	Reverse recovery time	I_D = 22 A, di/dt = 100 A/µs V_{DD} = 24 V	-	36	-	ns
Q_{rr} (1)	Reverse recovery charge		-	26	-	nC
I_{RRM} (1)	Reverse recovery current		-	1.46	-	A

1. *This is the theoretical current value only related to the silicon.*
2. *Specified by design and evaluated by characterization, not tested in production.*

2.1 Electrical characteristics (curves)

Figure 1. Total power dissipation

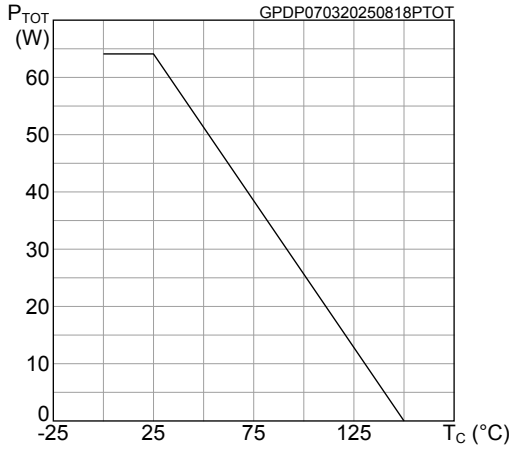


Figure 2. Drain current vs case temperature

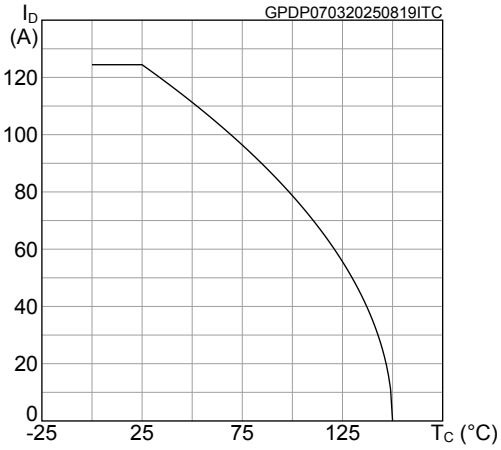


Figure 3. Safe operating area

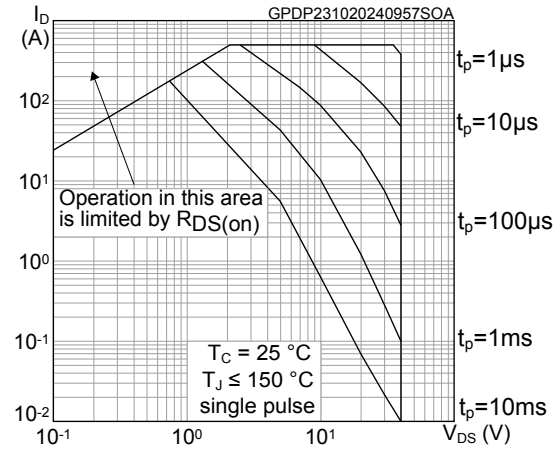


Figure 4. Normalized transient thermal impedance

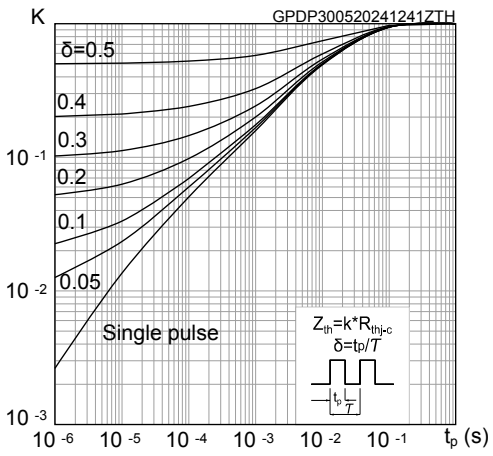


Figure 5. Avalanche characteristics

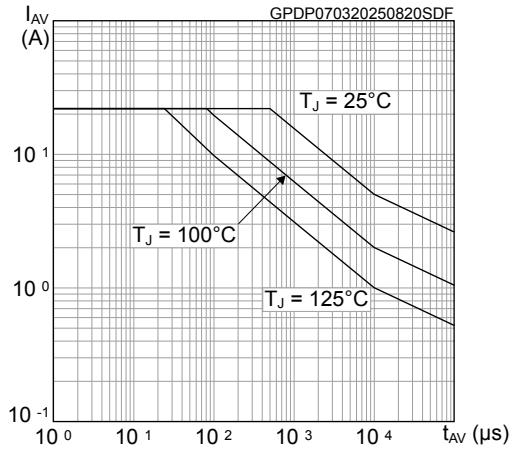


Figure 6. Avalanche energy

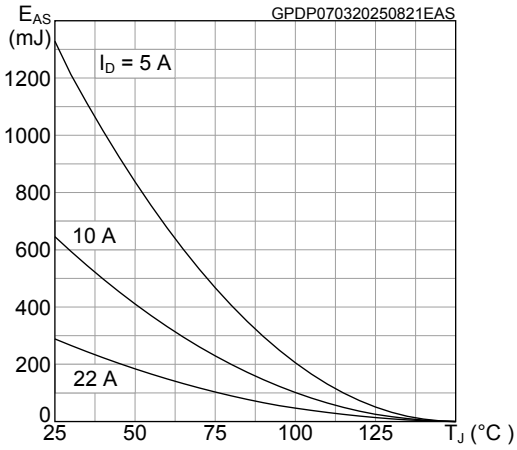


Figure 7. Normalized on-resistance vs temperature

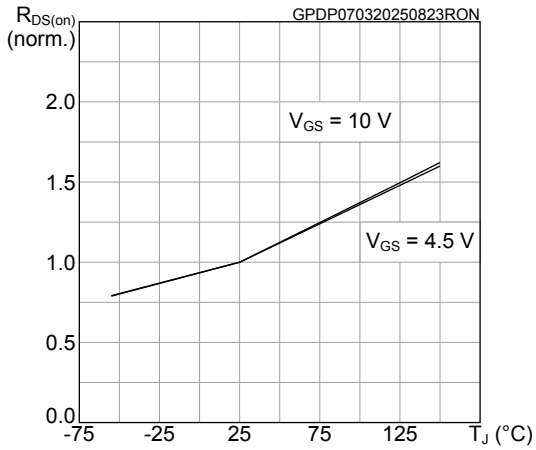


Figure 8. Normalized gate threshold voltage vs temperature

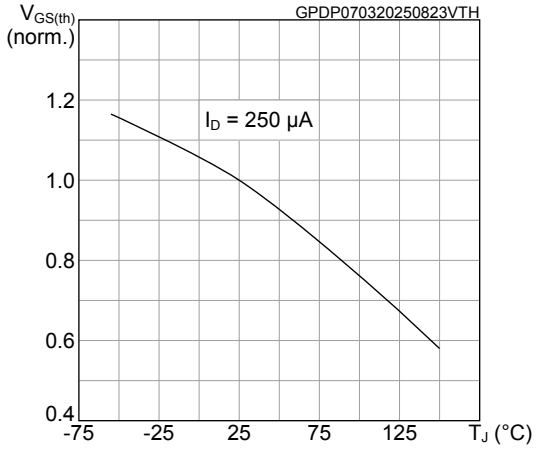


Figure 9. Typical reverse diode forward characteristics

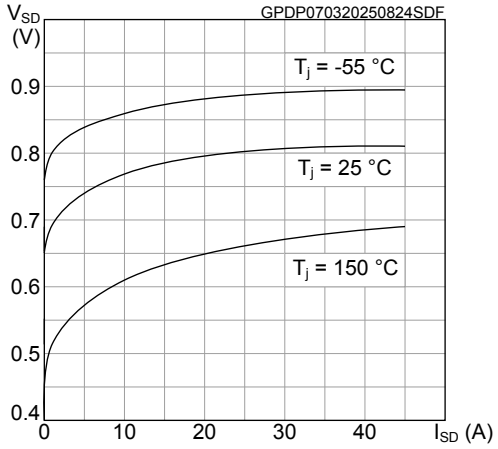


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

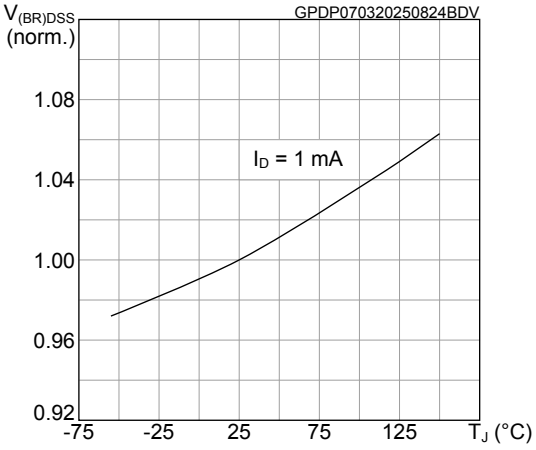


Figure 11. Typical output characteristics

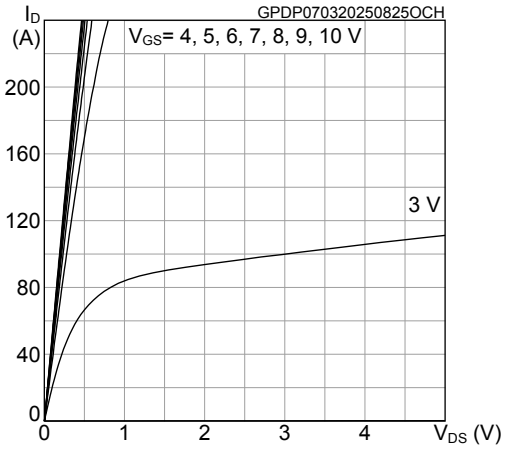


Figure 12. Typical transfer characteristics

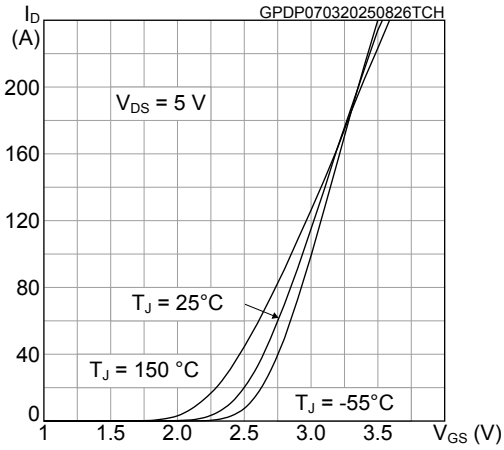


Figure 13. Typical drain-source on-resistance

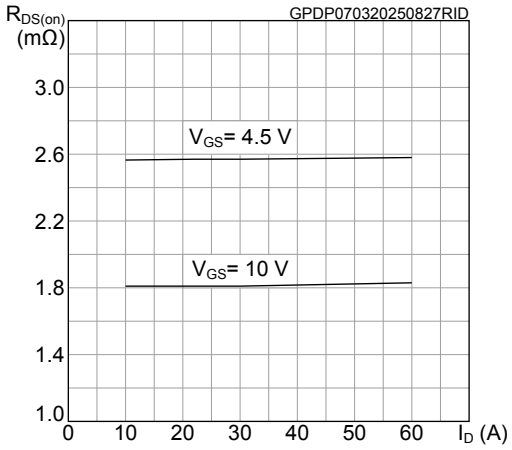


Figure 14. Typical on-resistance vs gate-source voltage

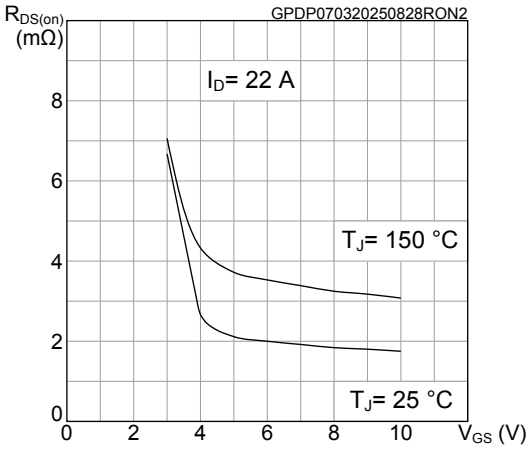


Figure 15. Typical gate charge characteristics

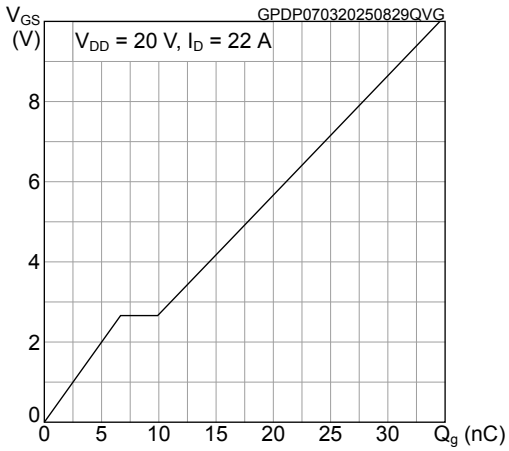
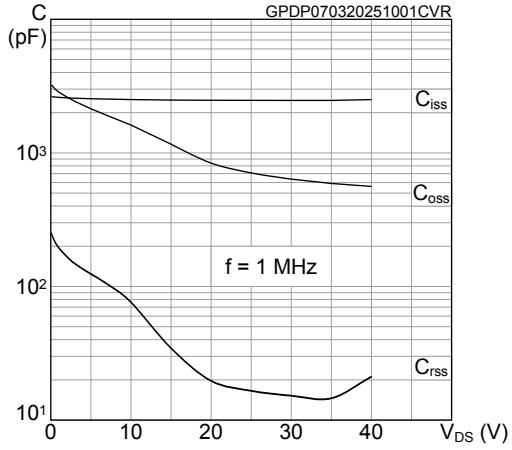


Figure 16. Typical capacitance characteristics



3 Package information

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.

3.1 PowerFLAT 3.3x3.3 package information

Figure 17. PowerFLAT 3.3x3.3 package outline

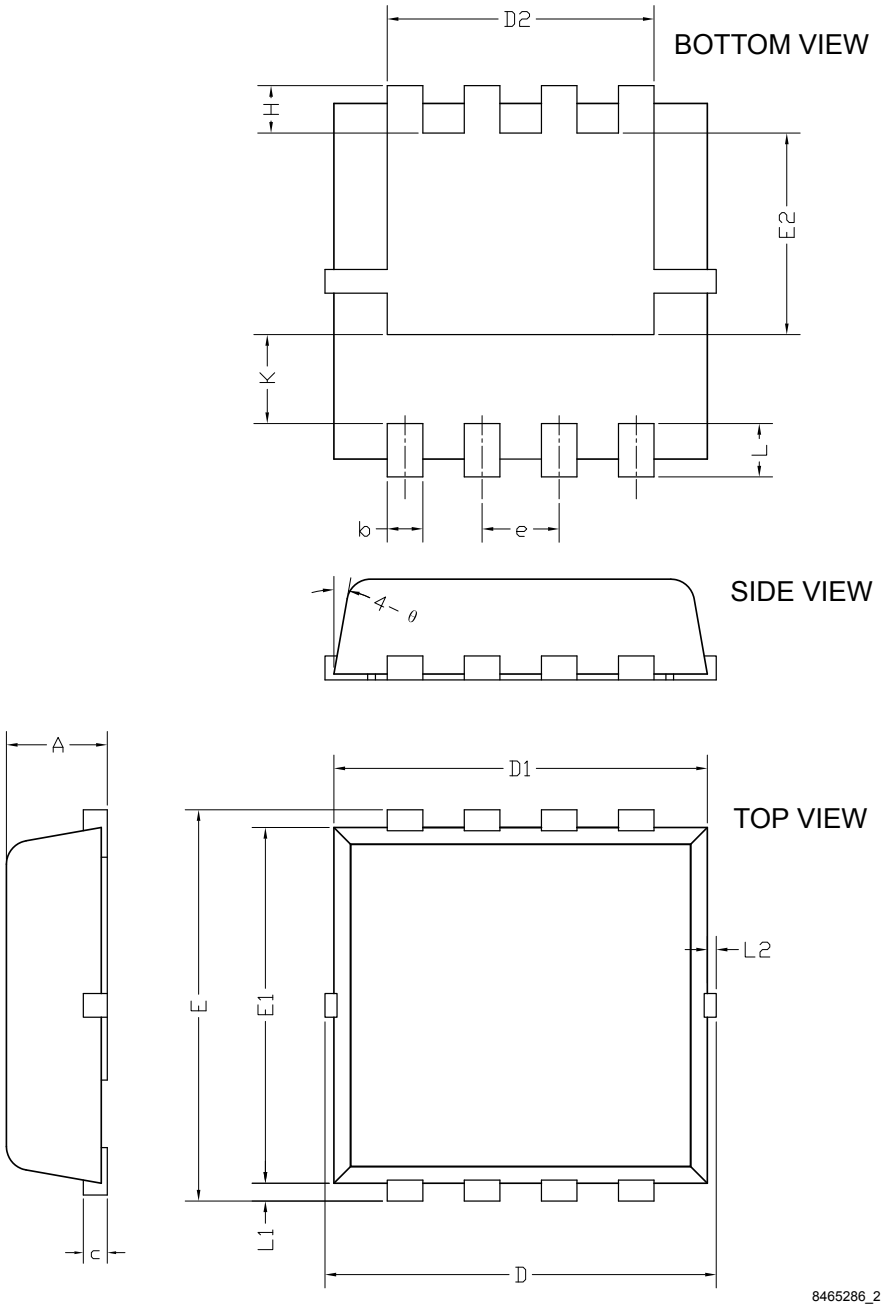
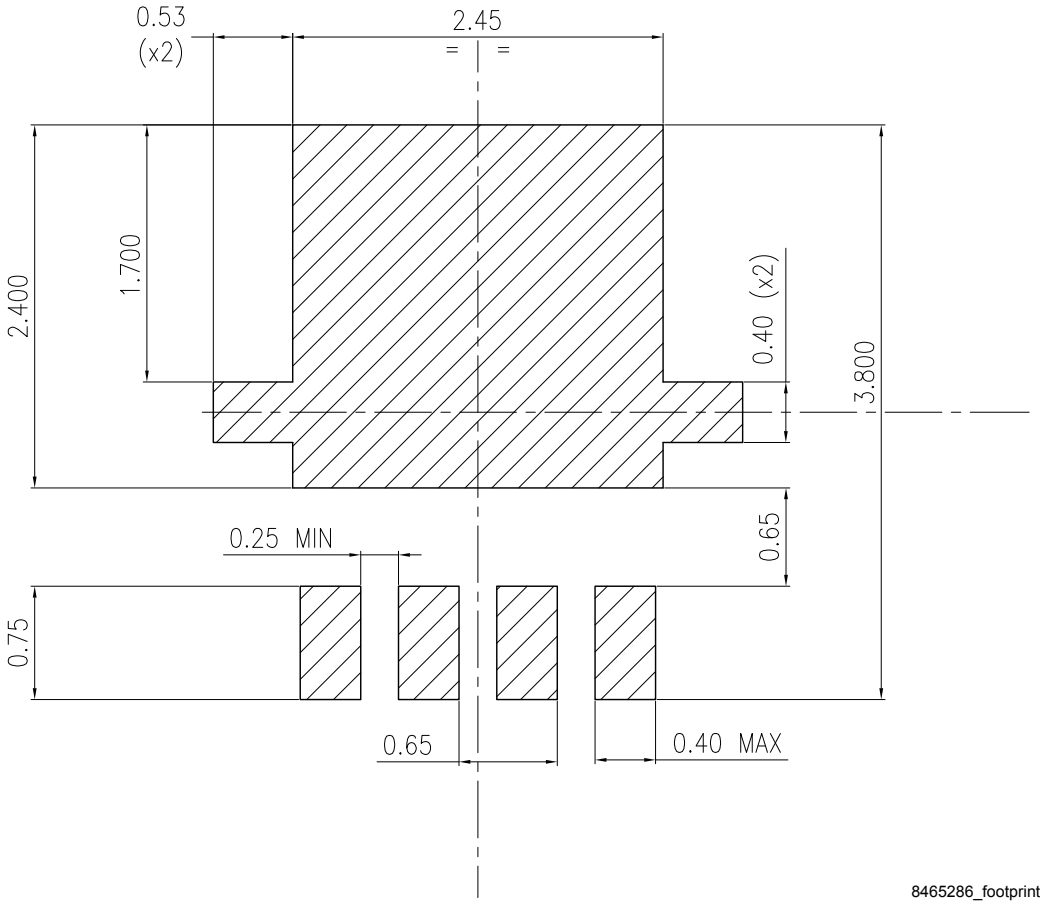


Table 7. **PowerFLAT 3.3x3.3 package mechanical data**

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 18. **PowerFLAT 3.3x3.3 recommended footprint (dimensions are in mm)**



Revision history

Table 8. **Document revision history**

Date	Version	Changes
04-Dec-2023	1	Initial release.
04-Jun-2024	2	Updated "applications" in cover page, *Section 1: Electrical ratings* and *Section 2: Electrical characteristics*. Added *Section 2.1: Electrical characteristics (curves)*. Minor text changes.
25-Sep-2024	3	Updated *Section Features* on cover page. Updated *Table 6. Source-drain diode* and *Section 2.1: Electrical characteristics (curves)*.
19-Nov-2024	4	Updated *Figure 3. Safe operating area*.
14-Apr-2025	5	Updated Figure 1. Total power dissipation, Figure 2. Drain current vs case temperature, Figure 5. Avalanche characteristics, Figure 6. Avalanche energy, Figure 7. Normalized on-resistance vs temperature, Figure 8. Normalized gate threshold voltage vs temperature, Figure 9. Typical reverse diode forward characteristics, Figure 10. Normalized $V_{(BR)DSS}$ vs temperature, Figure 11. Typical output characteristics, Figure 12. Typical transfer characteristics, Figure 13. Typical drain-source on-resistance, Figure 14. Typical on-resistance vs gate-source voltage, Figure 15. Typical gate charge characteristics and Figure 16. Typical capacitance characteristics. Minor text changes in Table 1. Absolute maximum ratings (at T_C = 25 °C, unless otherwise specified).

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