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STL6P3LLH6

P-channel 30 V, 0.024 Ω typ., 6 A STripFET™ H6 Power MOSFET in a PowerFLAT™ 3.3 x 3.3 package

Datasheet - production data

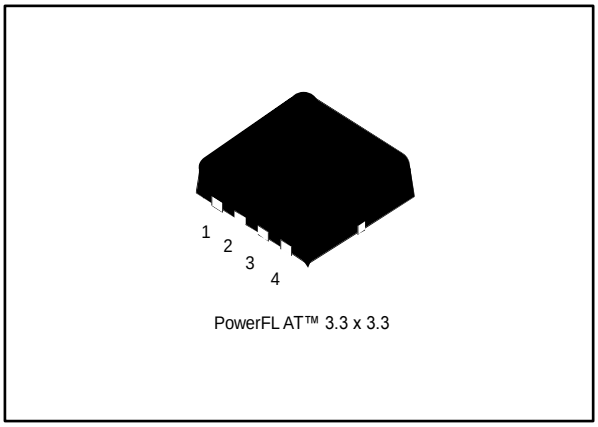
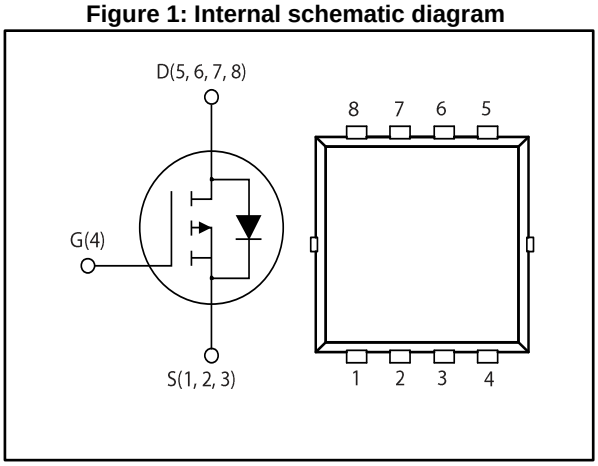


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D	P_{TOT}
STL6P3LLH6	30 V	0.03 Ω	6 A	2.9 W

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching applications

Description

This device is a P-channel Power MOSFET developed using the STripFET™ H6 technology, with a new trench gate structure. The resulting Power MOSFET exhibits very low RDS(on) in all packages.

Table 1: Device summary

Order code	Marking	Package	Packaging
STL6P3LLH6	6P3L	PowerFLAT™ 3.3 x 3.3	Tape and reel

For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	6	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	3.8	A
I_{DM} (1)(2)	Drain current (pulsed)	24	A
P_{TOT}	Total dissipation at T_C = 25 °C	2.9	W
T_{stg}	Storage temperature	- 55 to 150	°C
T_j	Max. operating junction temperature	150	°C

Notes:

(1)The value is rated according $R_{thj\text{-}pcb}$.

(2)Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	2.50	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb, single operation	42.8	°C/W

Notes:

(1)When mounted on FR-4 board of 1inch², 2oz Cu, t<10 sec.

For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0, I_D = 250 µA	30			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0, V_{DS} = 30 V			1	µA
		V_{GS} = 0, V_{DS} = 30 V T_C = 125 °C			10	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0, V_{GS} = ± 20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	1			V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 3 A		0.024	0.03	Ω
		V_{GS} = 4.5 V, I_D = 3 A		0.038	0.05	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0	-	1450	-	pF
C_{oss}	Output capacitance		-	178	-	pF
C_{rss}	Reverse transfer capacitance		-	120	-	pF
Q_g	Total gate charge	V_{DD} = 24 V, I_D = 6 A, V_{GS} = 4.5 V (see *Figure 13: "Switching times test circuit for resistive load"*)	-	12	-	nC
Q_{gs}	Gate-source charge		-	4.4	-	nC
Q_{gd}	Gate-drain charge		-	5	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 24 V, I_D = 3 A R_G = 4.7 Ω V_{GS} = 10 V	-	15	-	ns
t_r	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
t_f	Fall time		-	21	-	ns

For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD}	Forward on voltage	I_{SD} = 6 A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 6 A, di/dt = 100 A/µs V_{DD} = 16 V, T_j = 150 °C	-	15		ns
Q_{rr}	Reverse recovery charge		-	6.5		nC
I_{RRM}	Reverse recovery current		-	0.9		A

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

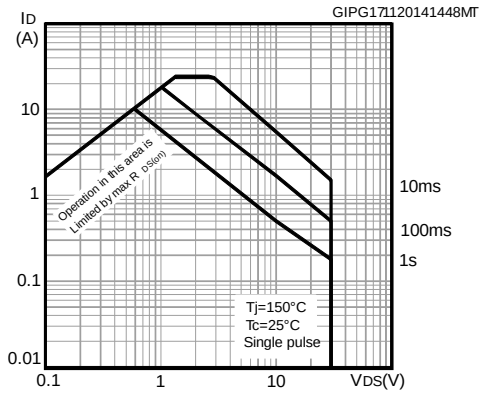


Figure 3: Thermal impedance

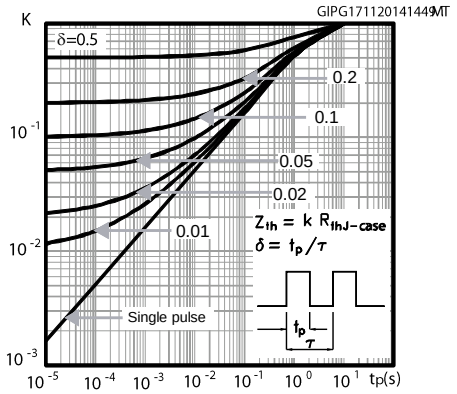


Figure 4: Output characteristics

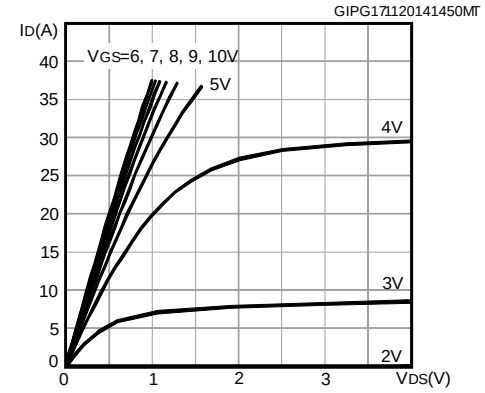


Figure 5: Transfer characteristics

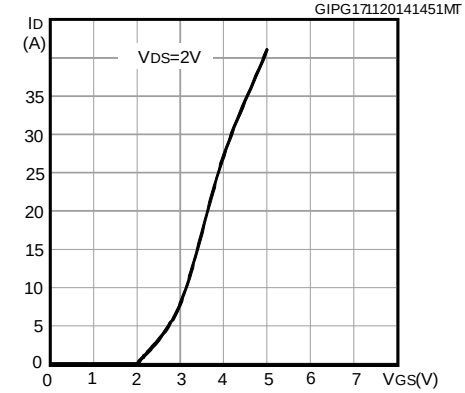


Figure 6: Gate charge vs gate-source voltage

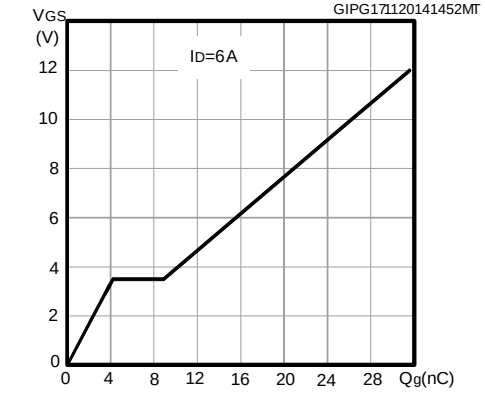


Figure 7: Static drain-source on-resistance

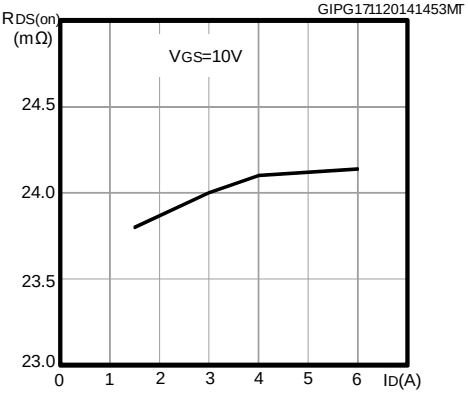


Figure 8: Capacitance variations

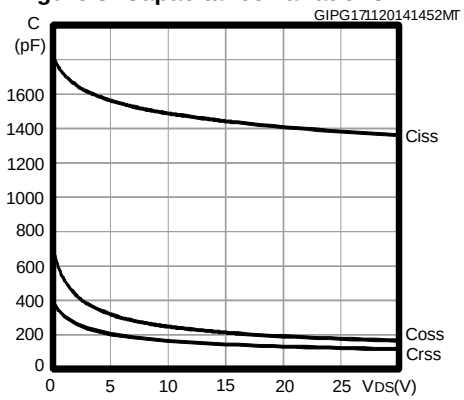


Figure 9: Normalized gate threshold voltage vs temperature

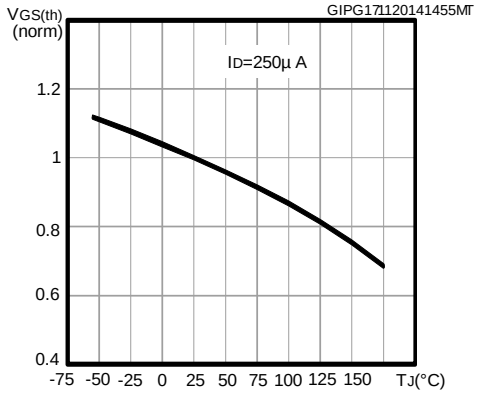


Figure 10: Normalized on-resistance vs temperature

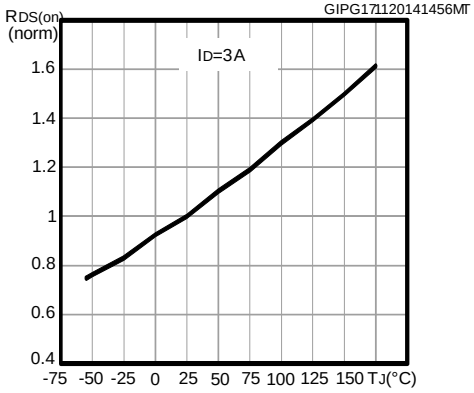


Figure 11: Normalized VDS vs temperature

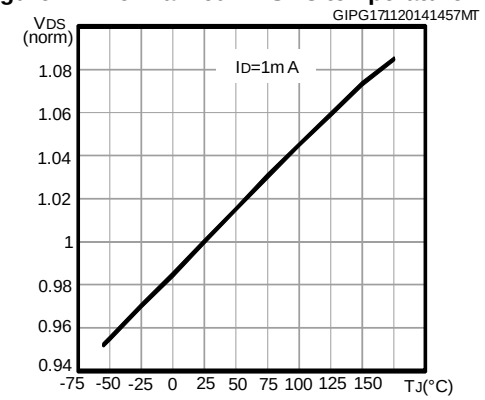
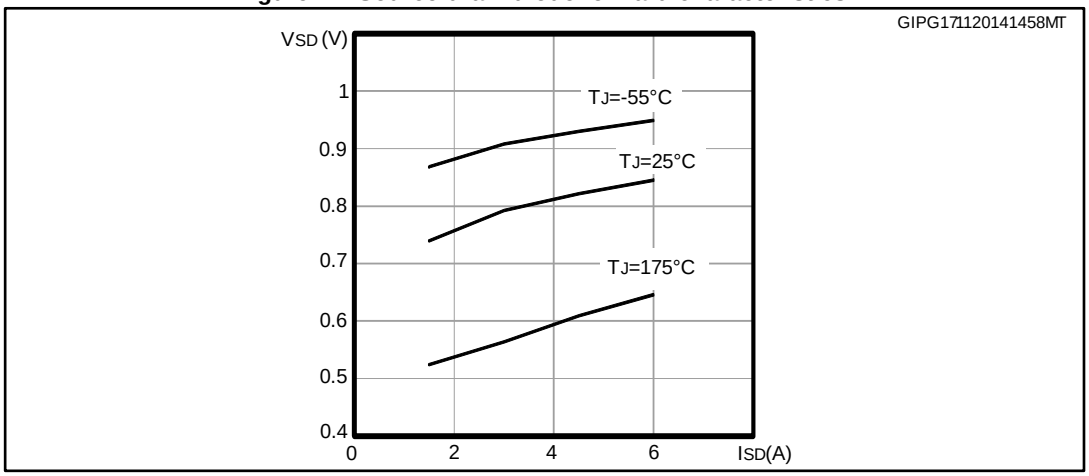


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

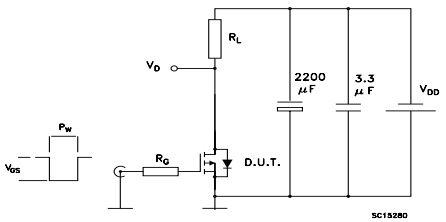


Figure 14: Gate charge test circuit

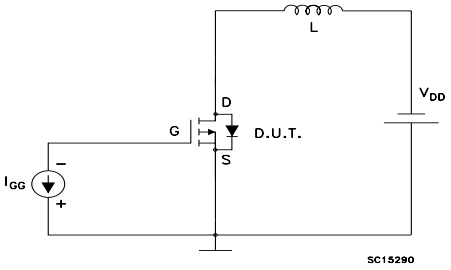
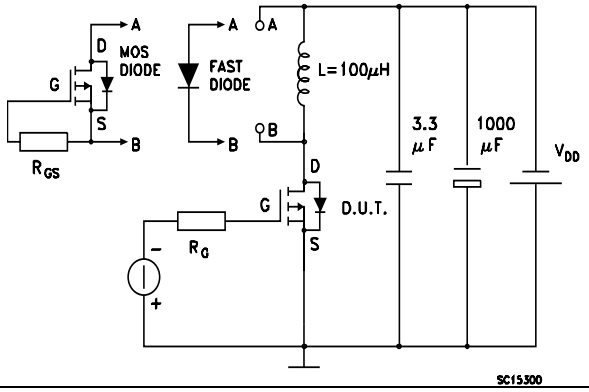


Figure 15: Test circuit for inductive load switching and diode recovery times



4 Package mechanical data

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™ 3.3 x 3.3 type C mechanical data

Figure 16: PowerFLAT™ 3.3 x 3.3 type C drawing

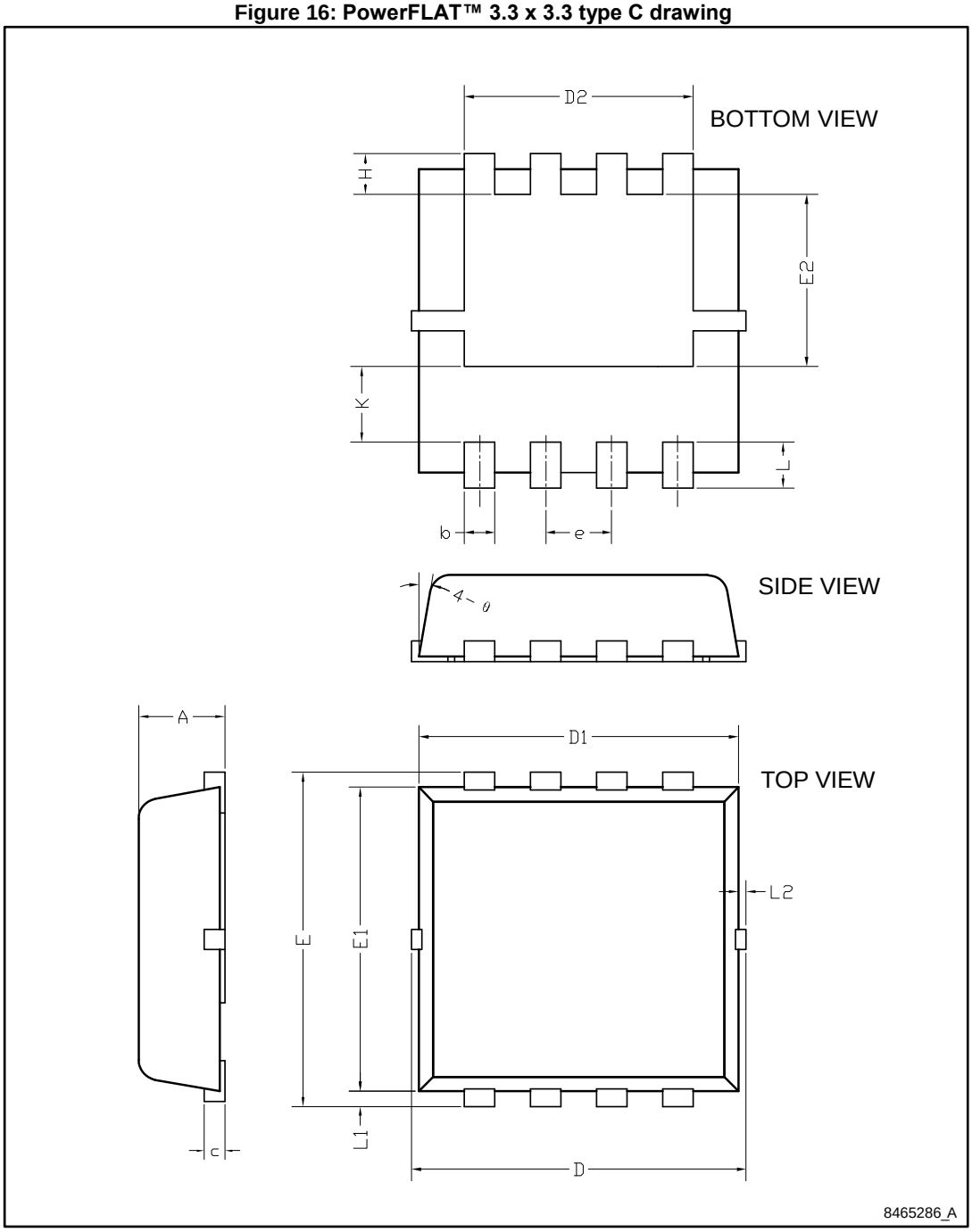
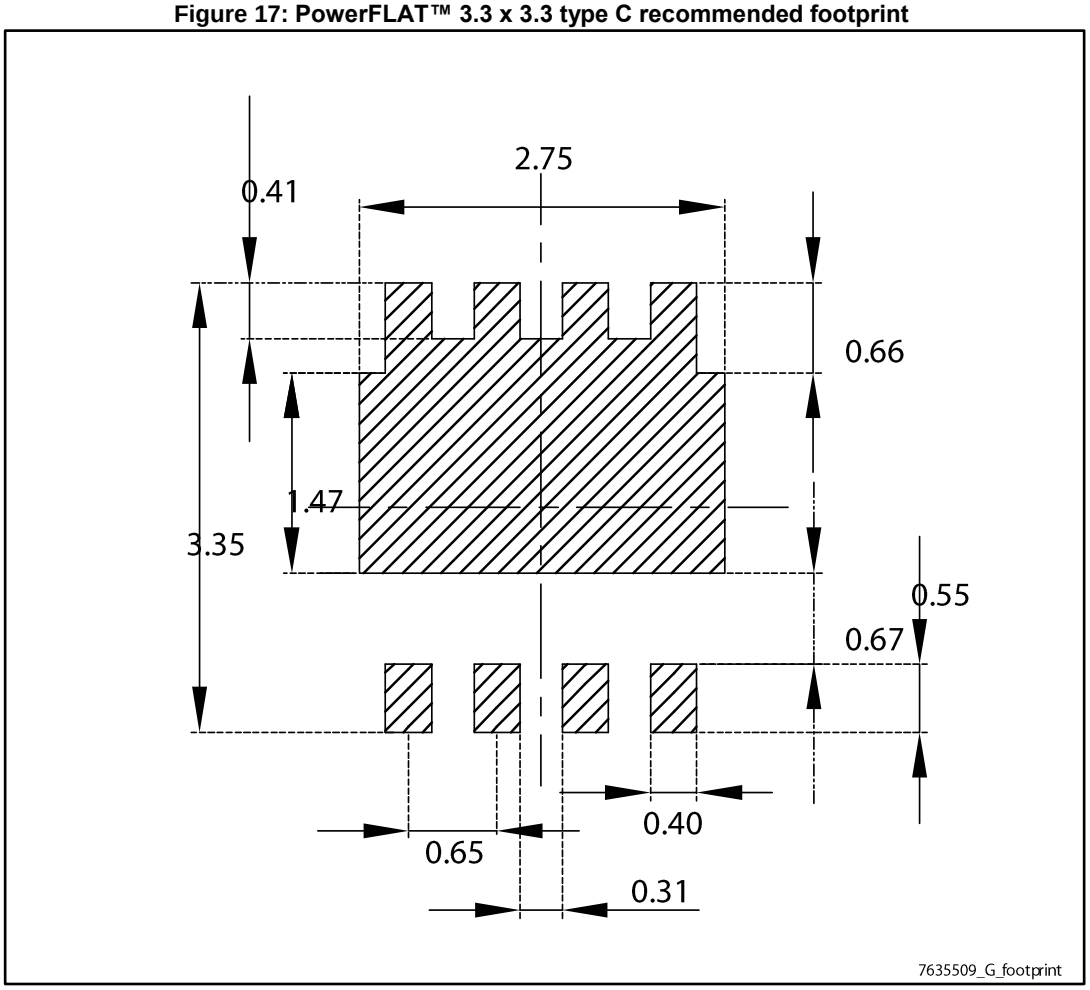


Table 8: PowerFLAT™ 3.3 x 3.3 type C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.90	1.00
A1	0		0.05
A3		0.20	
b	0.23		0.38
D	3.20	3.30	3.40
D2	2.50		2.75
E	3.20	3.30	3.40
E2	1.25		1.50
e		0.65	
L	0.30		0.50

Figure 17: PowerFLAT™ 3.3 x 3.3 type C recommended footprint



4.2 PowerFLAT™ 3.3 x 3.3 type F mechanical data

Figure 18: PowerFLAT™ 3.3 x 3.3 type F drawing

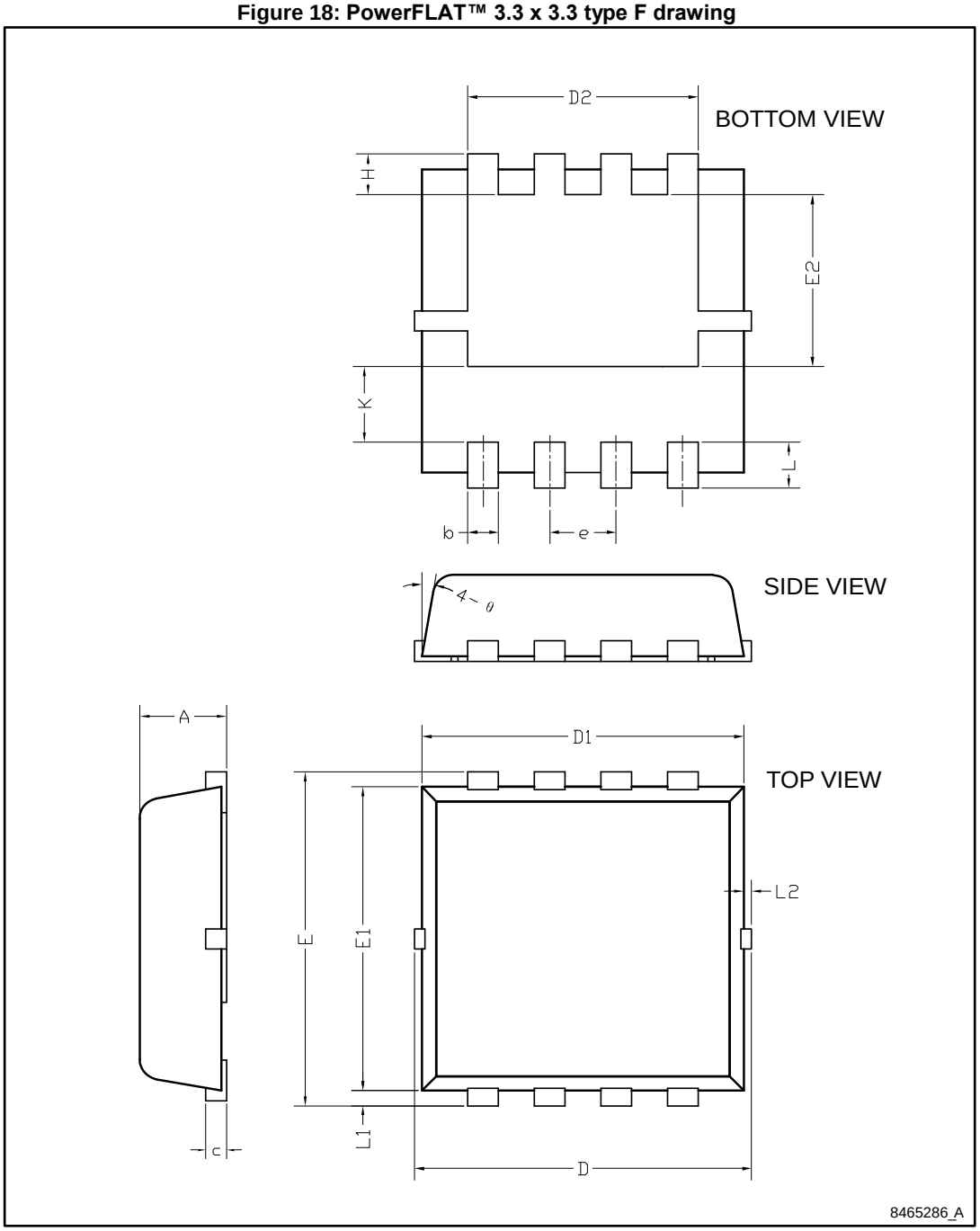
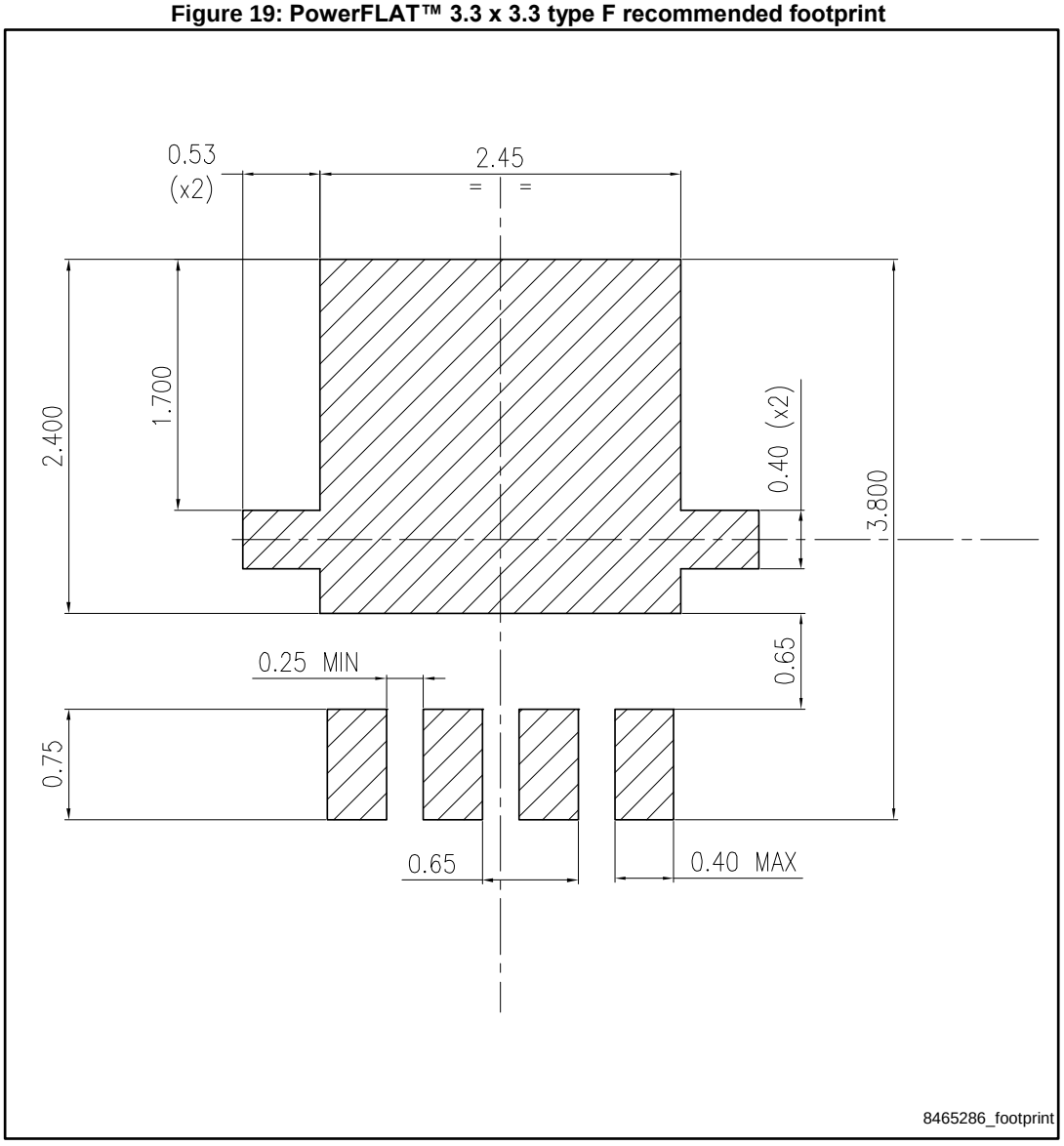


Table 9: PowerFLAT™ 3.3 x 3.3 type F mechanical data

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
J	8°	10°	12°

Figure 19: PowerFLAT™ 3.3 x 3.3 type F recommended footprint



5 Revision history

Table 10: Document revision history

Date	Revision	Changes
04-Mar-2013	1	First release.
28-Nov-2013	2	• Modified: P_{TOT} value, silhouette and not found in cover page • Modified: V_{GS} and P_{TOT} values in not found • Modified: $R_{thj\text{-}pcb}$ value and note (1) in *Table 3: "Thermal data"* • Modified: I_{GSS} test conditions value • Modified: Q_g in *Table 5: "Dynamic"* • Added: *Table 9: "PowerFLAT™ 3.3 x 3.3 type F mechanical data"*, *Figure 18: "PowerFLAT™ 3.3 x 3.3 type F drawing"* and *Figure 19: "PowerFLAT™ 3.3 x 3.3 type F recommended footprint"* • Minor text changes
26-Nov-2014	3	Updated *Figure 1: "Internal schematic diagram"*. Added *Section 4.1: "PowerFLAT™ 3.3 x 3.3 type C package information"* and *Section 4.2: "PowerFLAT™ 3.3 x 3.3 type F package information"*. Minor text changes.

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