



PXP013-30QL

30 V, P-channel Trench MOSFET

5 January 2021

Product data sheet

1. General description

P-channel enhancement mode Field-Effect Transistor (FET) in an MLPAK33 (SOT8002) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Logic level compatible
- Trench MOSFET technology
- MLPAK33 package (3.3 x 3.3 mm footprint)

3. Applications

- High-side load switch
- Battery management
- DC-to-DC conversion
- Switching circuits

4. Quick reference data

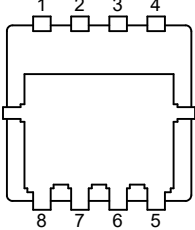
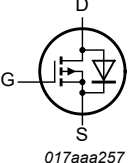
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ }^{\circ}\text{C}$	-	-	-30	V
V_{GS}	gate-source voltage		-20	-	20	V
I_D	drain current	$V_{GS} = -10\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; t \leq 5\text{ s}$	[1]	-	-14.7	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = -10\text{ V}; I_D = -8.6\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	11.3	13.3	m Ω
		$V_{GS} = -4.5\text{ V}; I_D = -7.1\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	15.6	19.5	m Ω

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for drain 6 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 MLPAK33 (SOT8002-1)	 017aaa257
2	S	source		
3	S	source		
4	G	gate		
5	D	drain		
6	D	drain		
7	D	drain		
8	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PXP013-30QL	MLPAK33	plastic thermal enhanced surface mounted package; mini leads; 8 terminals; pitch 0.65 mm; 3.3 x 3.3 x 0.8 mm body	SOT8002-1

7. Marking

Table 4. Marking codes

Type number	Marking code
PXP013-30QL	8AG

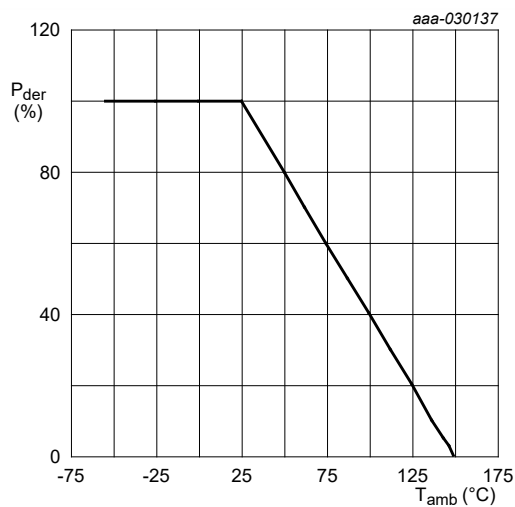
8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

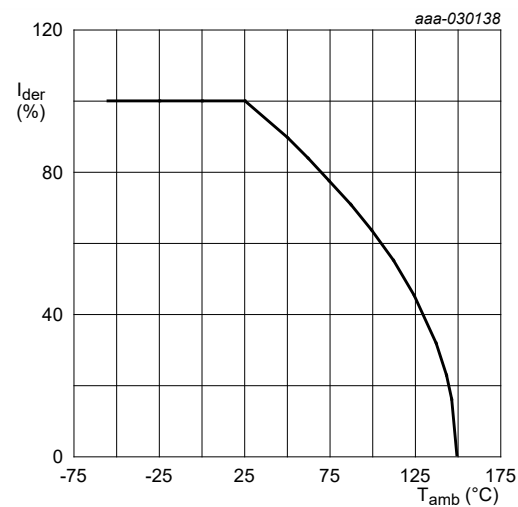
Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	T _j = 25 °C		-	-30	V
V _{GS}	gate-source voltage			-20	20	V
I _D	drain current	V _{GS} = -10 V; T _{amb} = 25 °C; t ≤ 5 s	[1]	-	-14.7	A
		V _{GS} = -10 V; T _{amb} = 25 °C	[1]	-	-8.6	A
		V _{GS} = -10 V; T _{amb} = 100 °C	[1]	-	-5.5	A
		V _{GS} = -10 V; T _{sp} = 25 °C		-	-42.5	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	-59.3	A
P _{tot}	total power dissipation	T _{amb} = 25 °C; t ≤ 5 s	[1]	-	4.8	W
		T _{amb} = 25 °C	[1]	-	1.7	W
		T _{sp} = 25 °C		-	40	W
T _j	junction temperature			-55	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C
Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	-1.7	A

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for drain 6 cm².



$$P_{der} = \frac{P_{tot}}{P_{tot}(25^{\circ}\text{C})} \times 100\%$$

Fig. 1. Normalized total power dissipation as a function of ambient temperature



$$I_{der} = \frac{I_D}{I_D(25^{\circ}\text{C})} \times 100\%$$

Fig. 2. Normalized continuous drain current as a function of ambient temperature

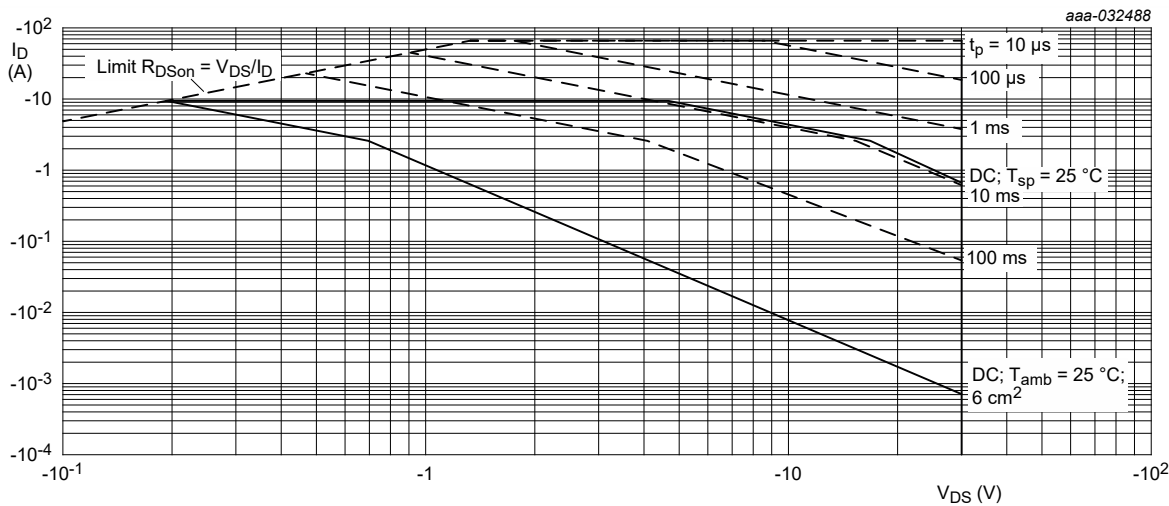


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	150	190	K/W
			[2]	-	60	75	K/W
		in free air; $t \leq 5$ s	[2]	-	21	26	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	2.1	3.1	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm².

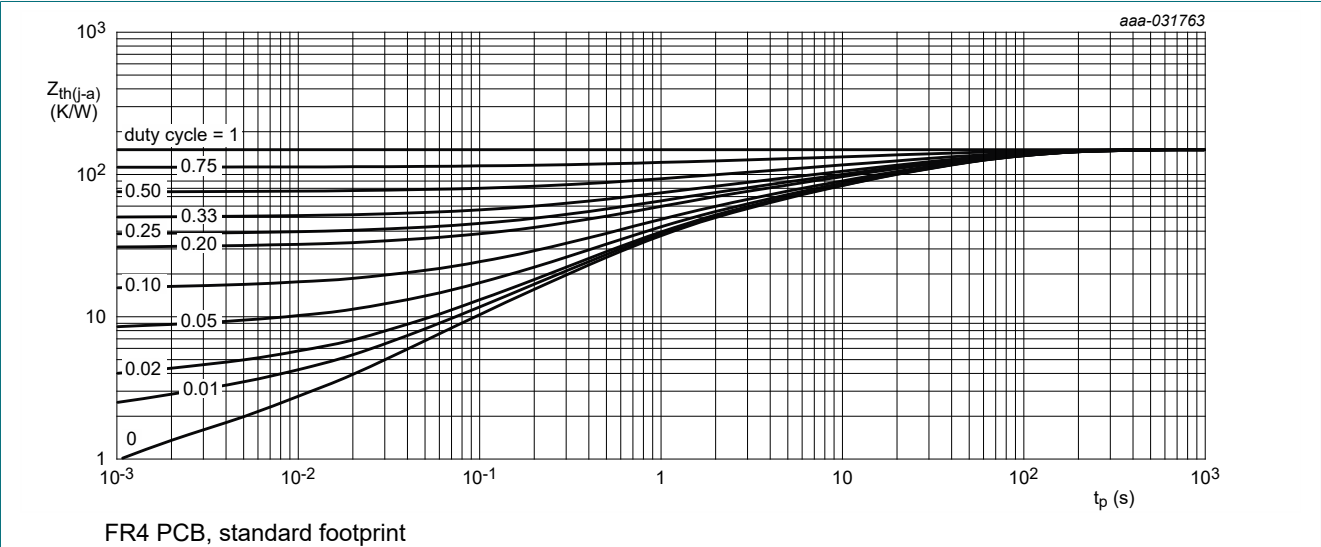


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

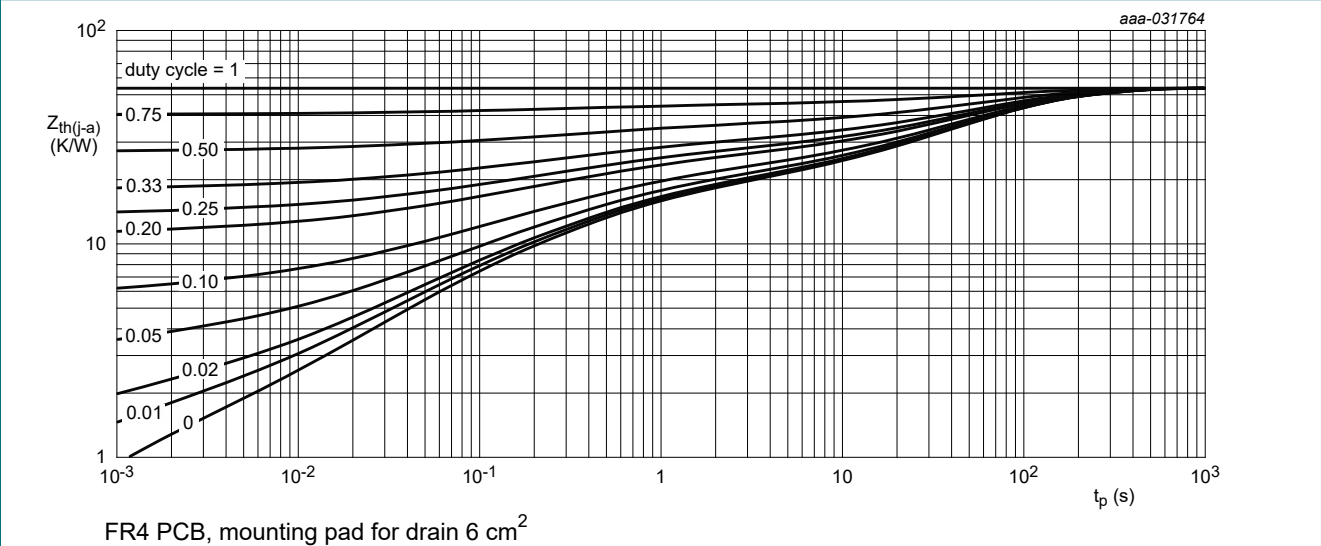


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = -250 \mu A$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$		-30	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = -250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 ^\circ C$		-1	-1.4	-2.5	V
I_{DSS}	drain leakage current	$V_{DS} = -30 V$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$		-	-	-1	μA
I_{GSS}	gate leakage current	$V_{GS} = -20 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$		-	-	-0.1	μA
		$V_{GS} = 20 V$; $V_{DS} = 0 V$; $T_j = 25 ^\circ C$		-	-	0.1	μA
R_{DSon}	drain-source on-state resistance	$V_{GS} = -10 V$; $I_D = -8.6 A$; $T_j = 25 ^\circ C$		-	11.3	13.3	m Ω
		$V_{GS} = -10 V$; $I_D = -8.6 A$; $T_j = 150 ^\circ C$		-	19	22.3	m Ω
		$V_{GS} = -4.5 V$; $I_D = -7.1 A$; $T_j = 25 ^\circ C$		-	15.6	19.5	m Ω
g_{fs}	forward transconductance	$V_{DS} = -10 V$; $I_D = -8.6 A$; $T_j = 25 ^\circ C$		-	21	-	S
R_G	gate resistance	$f = 1 MHz$		-	8	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	$V_{DS} = -15 V$; $I_D = -8.6 A$; $V_{GS} = -10 V$; $T_j = 25 ^\circ C$		-	33.4	50.1	nC
		$V_{DS} = -15 V$; $I_D = -7.1 A$; $V_{GS} = -4.5 V$; $T_j = 25 ^\circ C$		-	16.8	25.2	nC
Q_{GS}	gate-source charge			-	3.8	-	nC
$Q_{GS(th)}$	pre-threshold gate-source charge			-	2.2	-	nC
$Q_{GS(th-pl)}$	post-threshold gate-source charge			-	1.6	-	nC
Q_{GD}	gate-drain charge			-	6.6	-	nC
V_{GSpl}	gate-source plateau voltage	$V_{DS} = -15 V$; $I_D = -7.1 A$; $T_j = 25 ^\circ C$		-	-2.4	-	V
C_{iss}	input capacitance	$V_{DS} = -15 V$; $f = 1 MHz$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$		-	1650	-	pF
C_{oss}	output capacitance			-	190	-	pF
C_{rss}	reverse transfer capacitance			-	160	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = -15 V$; $I_D = -7.1 A$; $V_{GS} = -4.5 V$; $R_{G(ext)} = 5 \Omega$; $T_j = 25 ^\circ C$		-	7	-	ns
t_r	rise time			-	32	-	ns
$t_{d(off)}$	turn-off delay time			-	39	-	ns
t_f	fall time			-	29	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	$I_S = -1.7 A$; $V_{GS} = 0 V$; $T_j = 25 ^\circ C$		-	-0.74	-1.2	V
t_{rr}	reverse recovery time	$I_S = -1.7 A$; $dI_S/dt = 100 A/\mu s$; $V_{GS} = -4.5 V$; $V_{DS} = -15 V$; $T_j = 25 ^\circ C$		-	16	-	ns
Q_r	recovered charge			-	6	-	nC
t_a	reverse recovery rise time			-	8	-	ns
t_b	reverse recovery fall time			-	8	-	ns

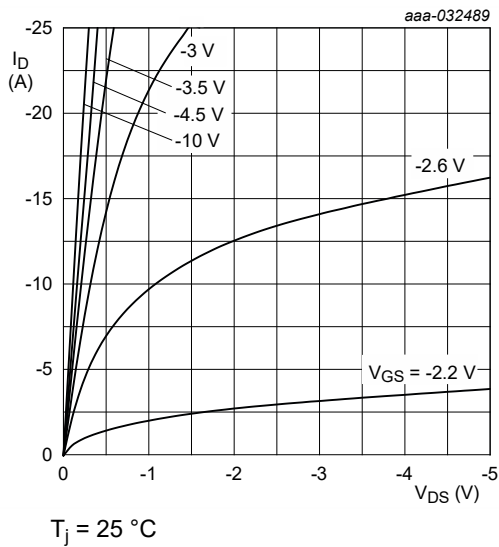


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

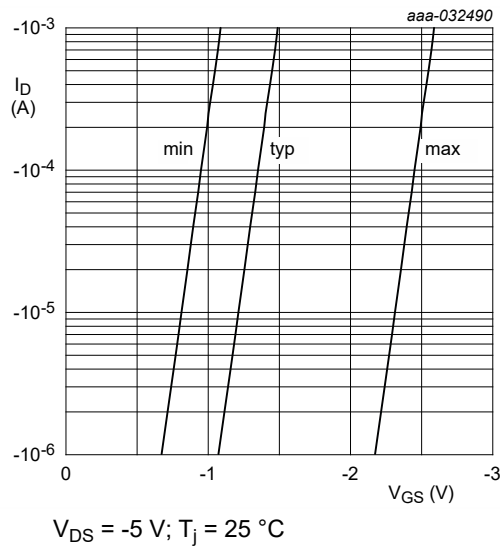


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

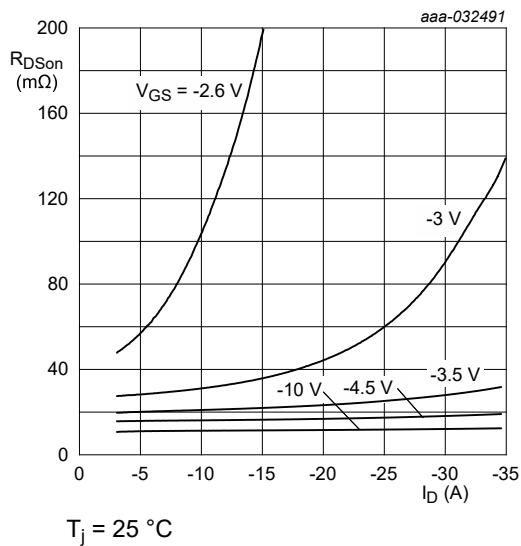


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

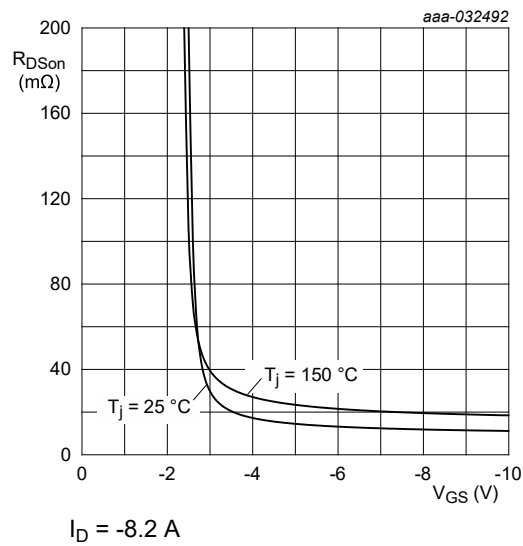


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

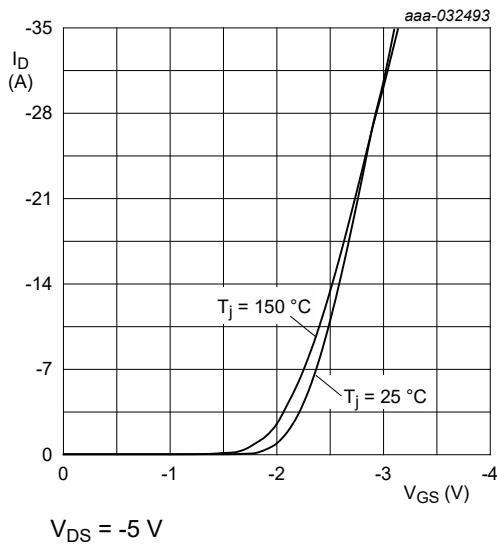


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

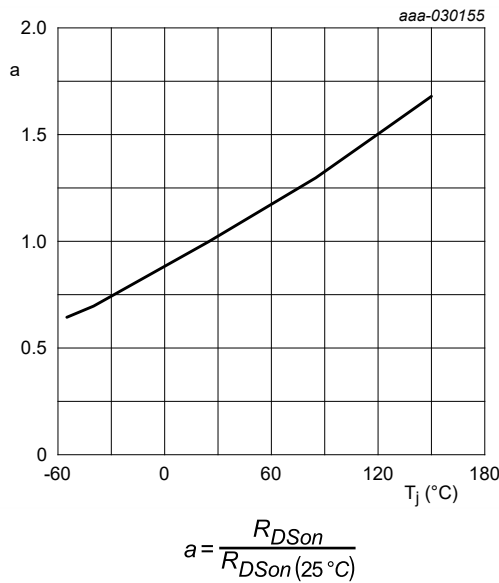


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

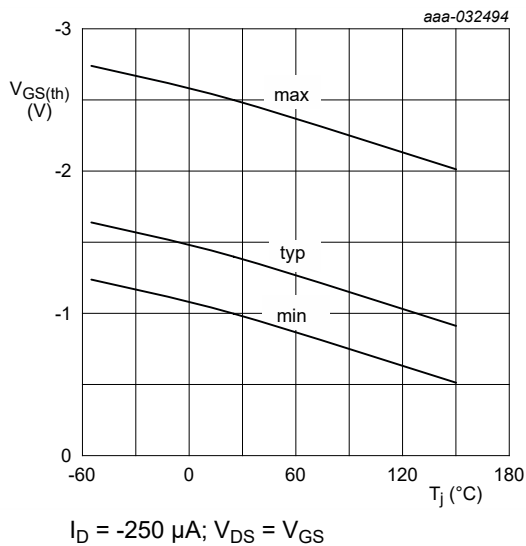


Fig. 12. Gate-source threshold voltage as a function of junction temperature

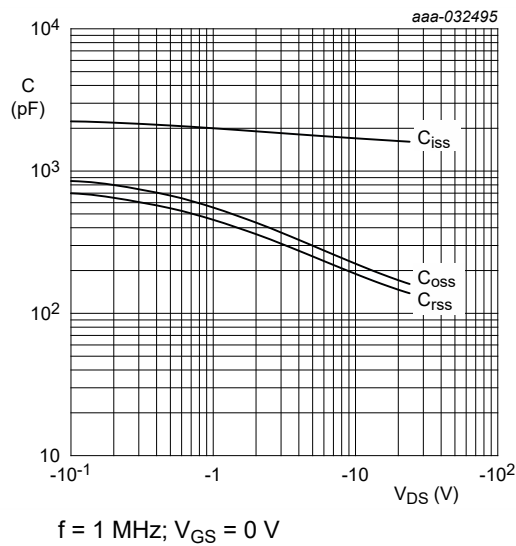


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

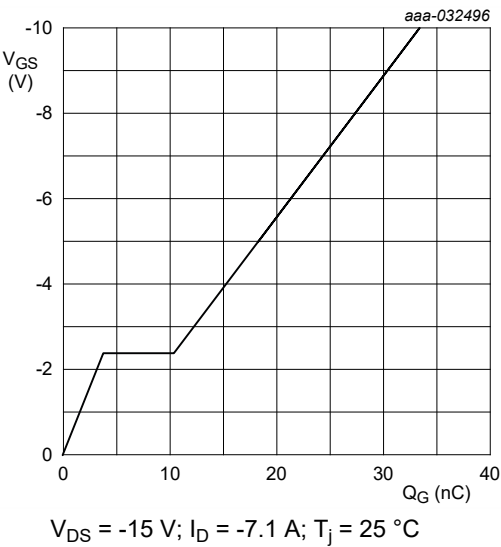


Fig. 14. Gate-source voltage as a function of gate charge; typical values

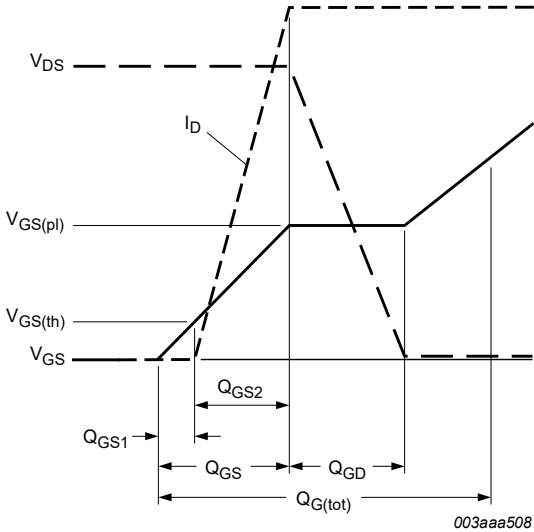


Fig. 15. Gate charge waveform definitions

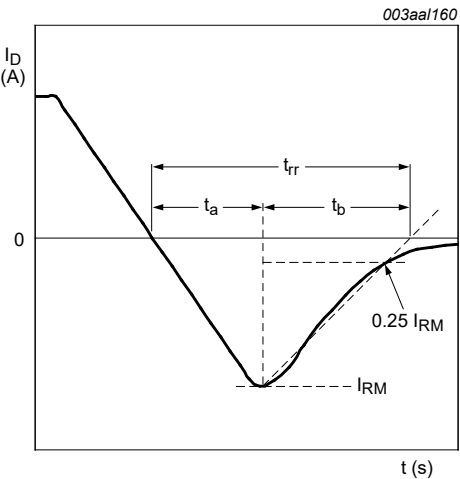


Fig. 16. Reverse recovery timing definition

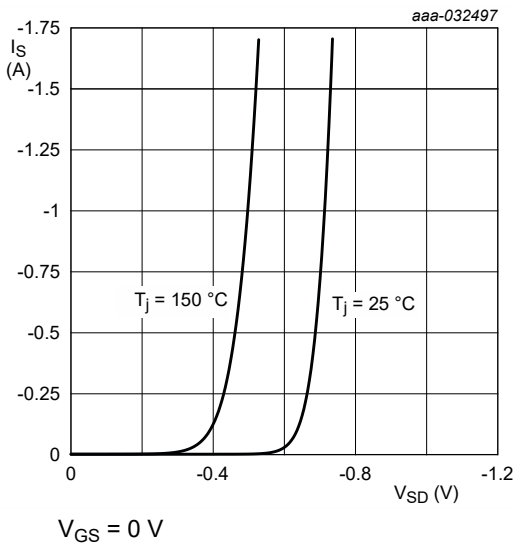


Fig. 17. Source current as a function of source-drain voltage; typical values

11. Test information

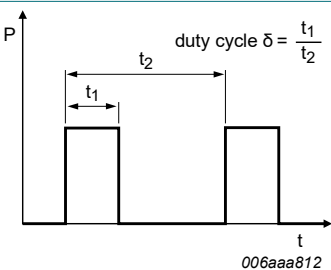


Fig. 18. Duty cycle definition

12. Package outline

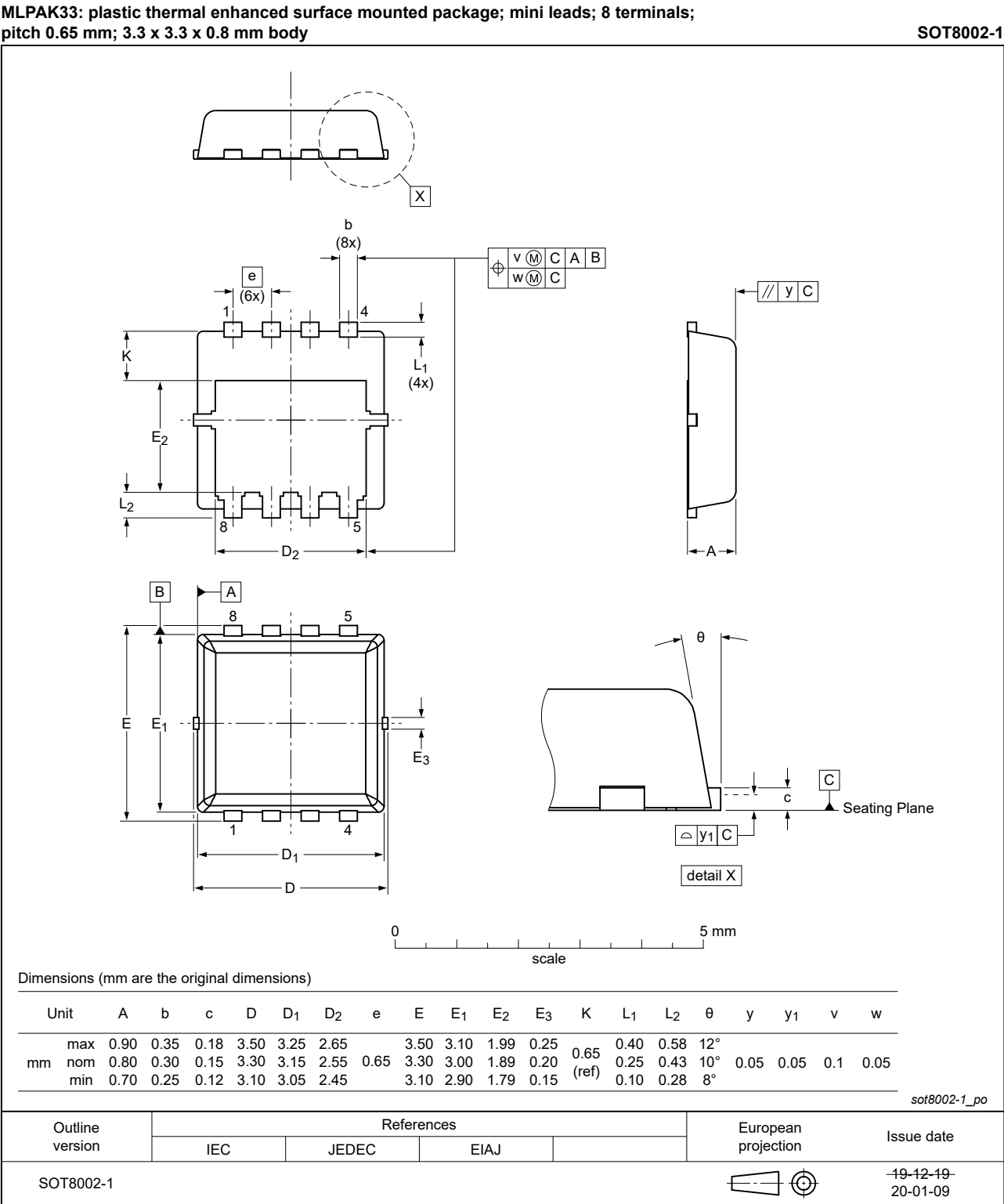


Fig. 19. Package outline MLPAK33 (SOT8002-1)

13. Soldering

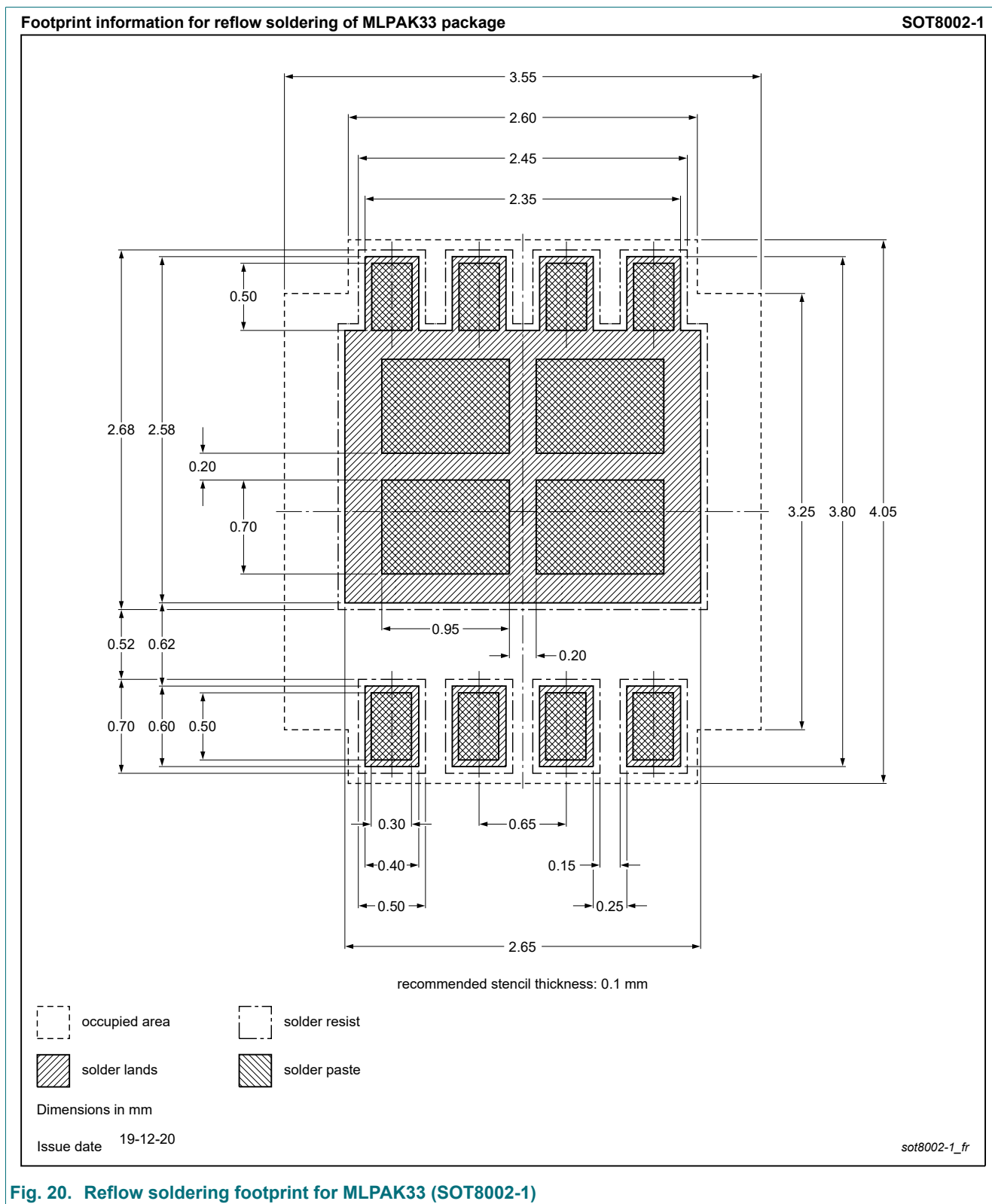


Fig. 20. Reflow soldering footprint for MLPAK33 (SOT8002-1)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PXP013-30QL v.1	20210105	Product data sheet	-	-

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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