



PXM028-100QL

N-channel 100 V, 28 mOhm, logic level Trench MOSFET in MLPAK33

21 September 2023

Product data sheet

1. General description

General purpose MOSFET for standard applications, 24 A, logic level N-channel enhancement mode Power MOSFET in MLPAK33 package.

2. Features and benefits

- Logic level compatibility
- Trench MOSFET technology
- Thermally efficient package in a small form factor (3.3 mm x 3.3 mm footprint)

3. Applications

- Secondary side synchronous rectification
- DC-to-DC converters
- Home appliance
- Motor drive
- Load switching
- LED lighting

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	-	100	V	
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}; \text{Fig. 2}$	-	-	24	A	
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}; \text{Fig. 1}$	-	-	30	W	
T_j	junction temperature		-55	-	150	°C	
Static characteristics							
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}; \text{Fig. 9}$	-	19.7	28	mΩ	
		$V_{GS} = 4.5\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}; \text{Fig. 9}$	-	25.6	33	mΩ	
Dynamic characteristics							
Q_{GD}	gate-drain charge	$I_D = 5\text{ A}; V_{DS} = 50\text{ V}; V_{GS} = 4.5\text{ V}; T_j = 25\text{ °C}; \text{Fig. 11}; \text{Fig. 12}$	-	3	-	nC	
$Q_{G(tot)}$	total gate charge		-	7	-	nC	
Avalanche ruggedness							
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 4.9\text{ A}; V_{sup} \leq 100\text{ V}; V_{GS} = 10\text{ V}; T_{j(init)} = 25\text{ °C}; \text{unclamped}$	[1]	-	-	42	mJ

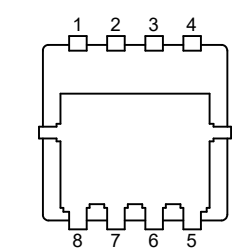
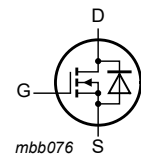
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Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Source-drain diode							
Q_r	recovered charge	$I_S = 5\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 15	[2]	-	15	-	nC

- [1] Protected by 100% test
- [2] includes capacitive recovery

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>MLPAK33 (SOT8002-1)</p>	 <p>mbb076</p>
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
PXN028-100QL	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
PXN028-100QL	7AR

8. Limiting values

Table 5. Limiting values

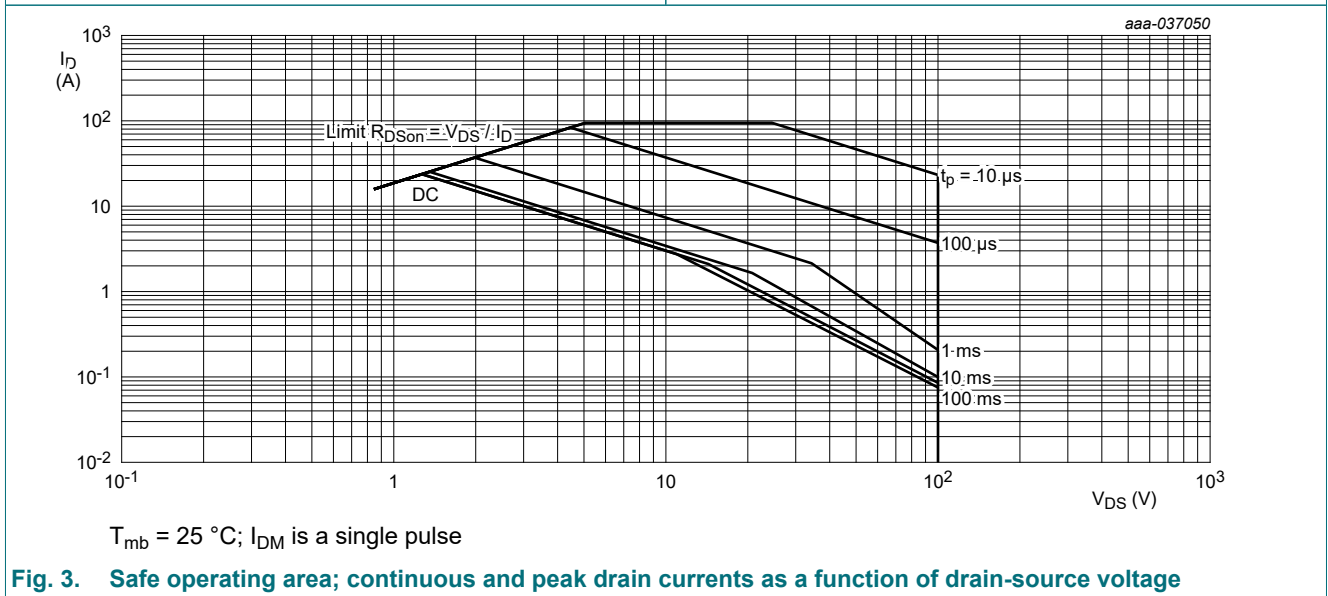
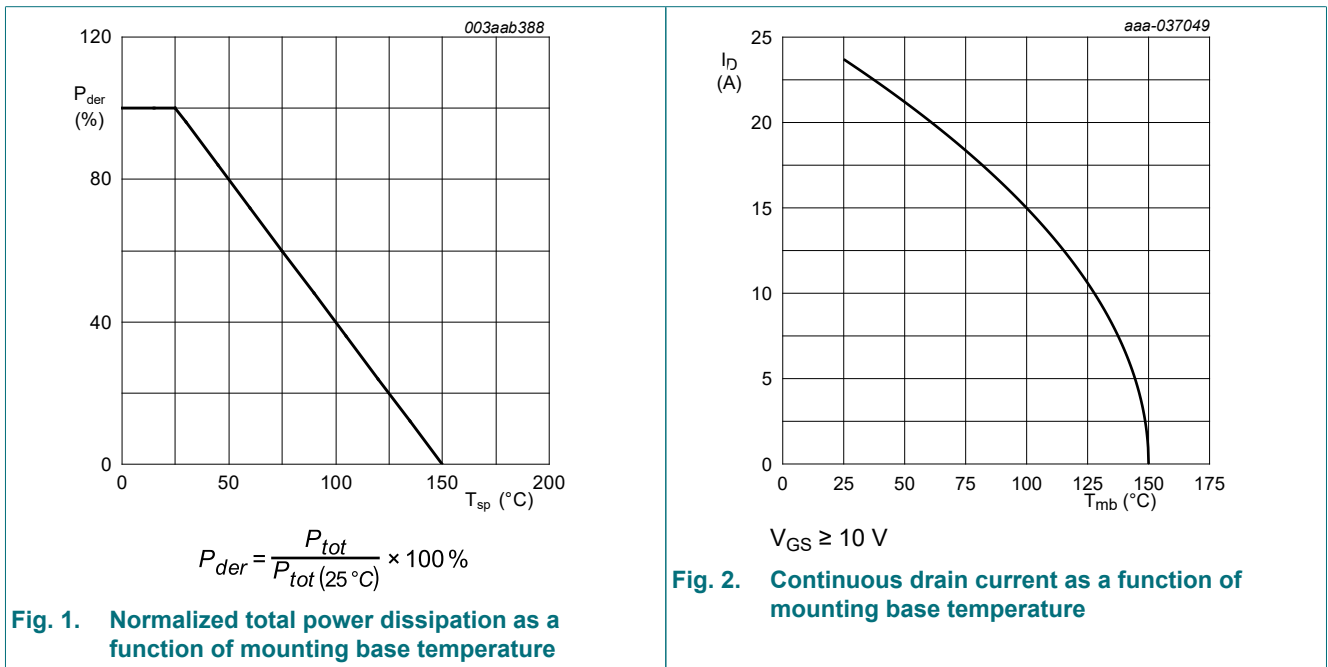
In accordance with the Absolute Maximum Rating System (IEC 60134). $T_J = 25\text{ }^\circ\text{C}$ unless otherwise stated.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ }^\circ\text{C} \leq T_J \leq 150\text{ }^\circ\text{C}$	-	100	V
V_{GS}	gate-source voltage		-20	20	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 1	-	30	W
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 2	-	24	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ }^\circ\text{C}$; Fig. 2	-	15	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 3	-	95	A
T_{stg}	storage temperature		-55	150	$^\circ\text{C}$

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Symbol	Parameter	Conditions	Min	Max	Unit
T _j	junction temperature		-55	150	°C
T _{slid(M)}	peak soldering temperature		-	260	°C
Source-drain diode					
I _S	source current	T _{mb} = 25 °C	-	24	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C	-	95	A
Avalanche ruggedness					
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 4.9 A; V _{sup} ≤ 100 V; V _{GS} = 10 V; T _{J(init)} = 25 °C; unclamped	[1]	-	42 mJ
I _{AS}	non-repetitive avalanche current	T _{J(init)} = 25 °C	[1]	-	4.9 A

[1] Protected by 100% test



9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4	-	3.47	4.16	K/W

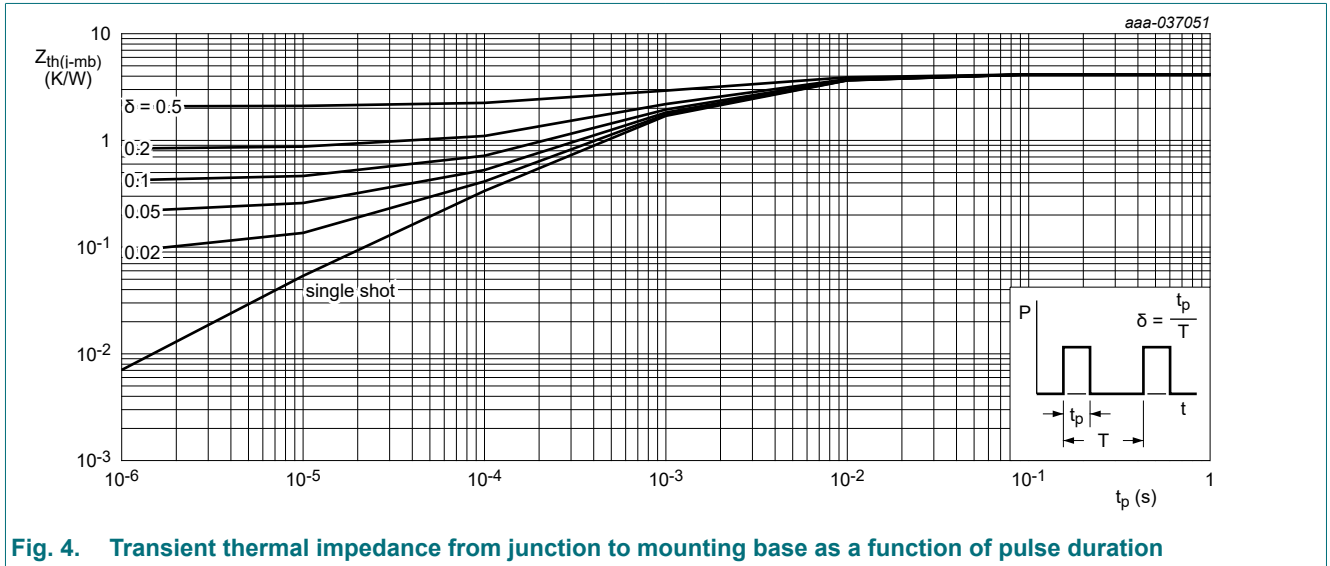


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	100	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	-	100	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 0.25 \text{ mA}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ C;$ Fig. 8	1.2	1.7	2.2	V
		$I_D = 0.25 \text{ mA}; V_{DS}=V_{GS}; T_j = 150 \text{ }^\circ C$	-	1	-	V
		$I_D = 0.25 \text{ mA}; V_{DS}=V_{GS}; T_j = -55 \text{ }^\circ C$	-	2.1	-	V
$\Delta V_{GS(th)}/\Delta T$	gate-source threshold voltage variation with temperature	$25 \text{ }^\circ C \leq T_j \leq 150 \text{ }^\circ C$	-	-5.8	-	mV/K
I_{DSS}	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.01	1	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 150 \text{ }^\circ C$	-	7	-	μA
I_{GSS}	gate leakage current	$V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
		$V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	2	100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ C;$ Fig. 9	-	19.7	28	m Ω
		$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 150 \text{ }^\circ C;$ Fig. 10	-	-	53	m Ω
		$V_{GS} = 4.5 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ C;$ Fig. 9	-	25.6	33	m Ω
		$V_{GS} = 4.5 \text{ V}; I_D = 5 \text{ A}; T_j = 150 \text{ }^\circ C;$ Fig. 10	-	-	63	m Ω

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R_G	gate resistance	$f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	0.7	-	Ω
Dynamic characteristics						
$Q_{G(\text{tot})}$	total gate charge	$I_D = 5 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 4.5 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 11 ; Fig. 12	-	7	-	nC
		$I_D = 5 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 11 ; Fig. 12	-	14	-	nC
		$I_D = 0 \text{ A}; V_{DS} = 0 \text{ V}; V_{GS} = 10 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	7	-	nC
Q_{GS}	gate-source charge	$I_D = 5 \text{ A}; V_{DS} = 50 \text{ V}; V_{GS} = 4.5 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 11 ; Fig. 12	-	2.1	-	nC
$Q_{GS(\text{th})}$	pre-threshold gate-source charge		-	1.2	-	nC
$Q_{GS(\text{th-pl})}$	post-threshold gate-source charge		-	0.9	-	nC
Q_{GD}	gate-drain charge		-	3	-	nC
$V_{GS(\text{pl})}$	gate-source plateau voltage	$I_D = 5 \text{ A}; V_{DS} = 50 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 11 ; Fig. 12	-	2.8	-	V
C_{iss}	input capacitance	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 13	-	706	-	pF
C_{oss}	output capacitance		-	205	-	pF
C_{riss}	reverse transfer capacitance		-	10	-	pF
$t_{d(\text{on})}$	turn-on delay time	$V_{DS} = 50 \text{ V}; R_L = 10 \text{ } \Omega; V_{GS} = 4.5 \text{ V}; R_{G(\text{ext})} = 5 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	7.1	-	ns
t_r	rise time		-	9.3	-	ns
$t_{d(\text{off})}$	turn-off delay time		-	10	-	ns
t_f	fall time		-	8.8	-	ns
Q_{oss}	output charge	$V_{GS} = 0 \text{ V}; V_{DS} = 50 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	15	-	nC
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 5 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 14	-	0.82	1.2	V
t_{rr}	reverse recovery time	$I_S = 5 \text{ A}; di_S/dt = -100 \text{ A}/\mu\text{s}; V_{GS} = 0 \text{ V}; V_{DS} = 50 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 15	-	25	-	ns
Q_r	recovered charge		[1]	15	-	nC

[1] includes capacitive recovery

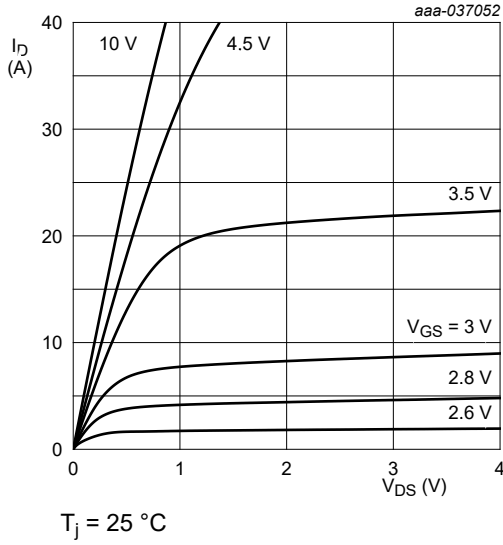


Fig. 5. Output characteristics; drain current as a function of drain-source voltage; typical values

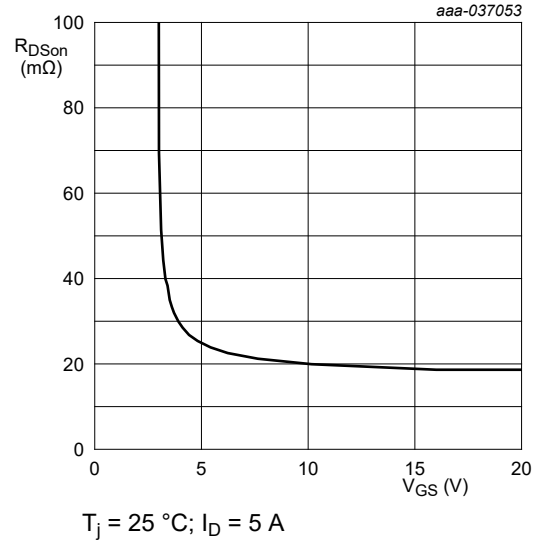


Fig. 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

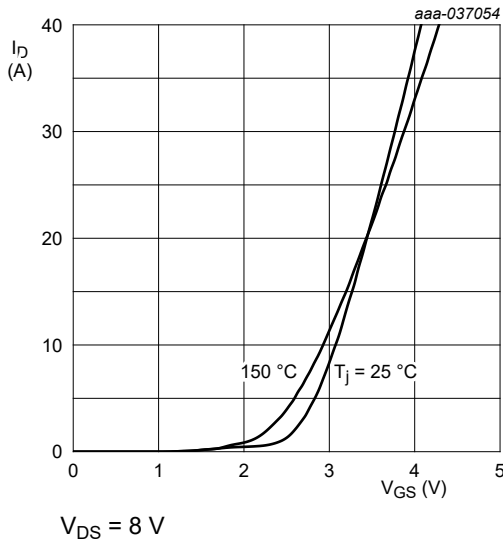


Fig. 7. Transfer characteristics; drain current as a function of gate-source voltage; typical values

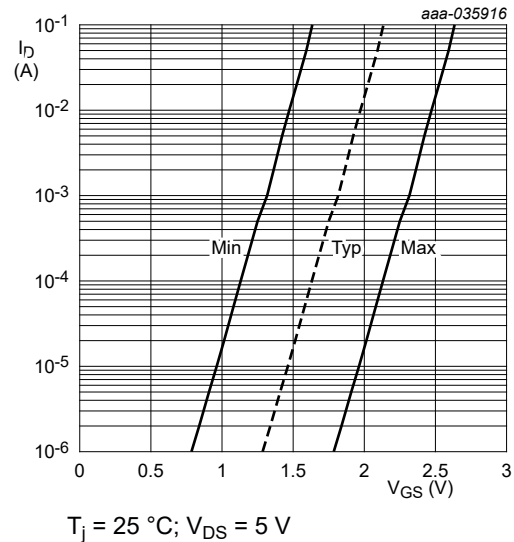


Fig. 8. Sub-threshold drain current as a function of gate-source voltage

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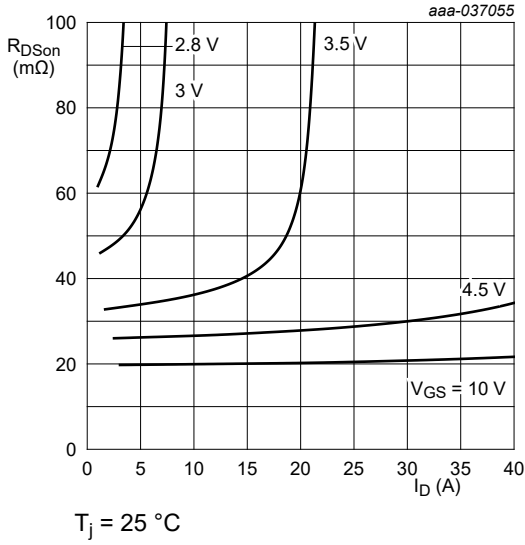
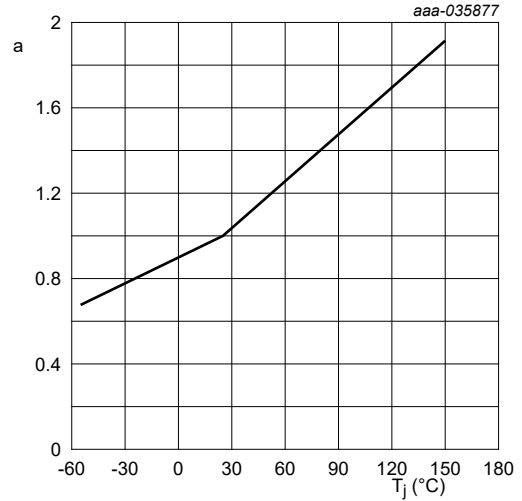


Fig. 9. Drain-source on-state resistance as a function of drain current; typical values



$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

Fig. 10. Normalized drain-source on-state resistance factor as a function of junction temperature

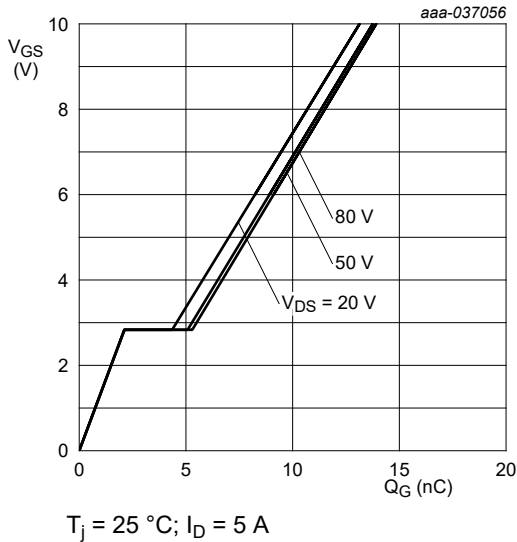


Fig. 11. Gate-source voltage as a function of gate charge; typical values

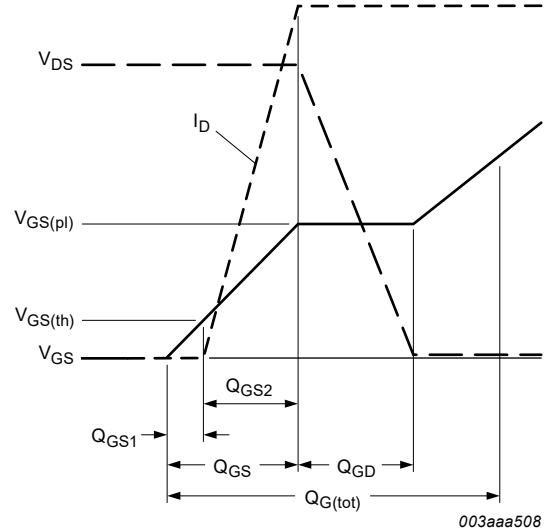


Fig. 12. Gate charge waveform definitions

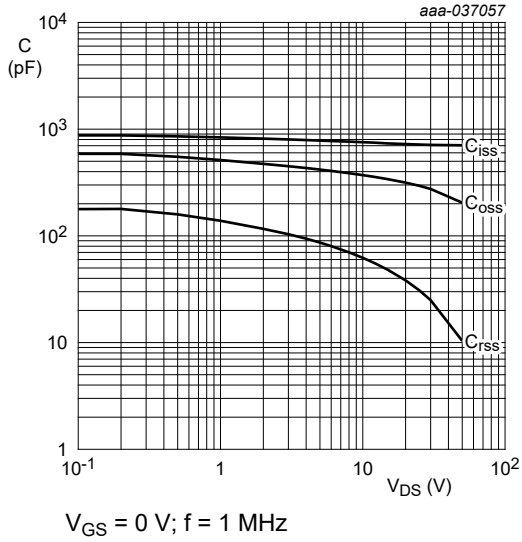


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

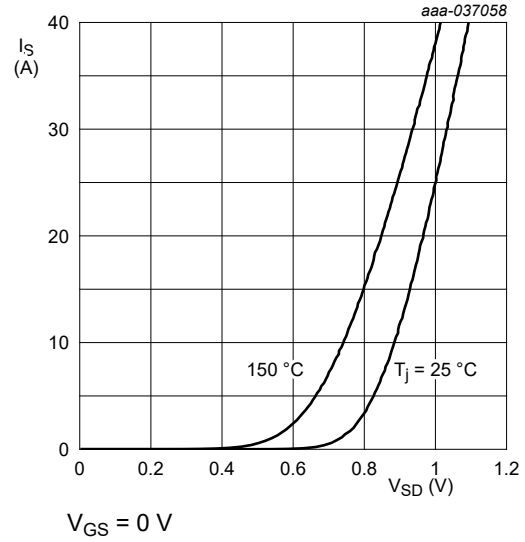


Fig. 14. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

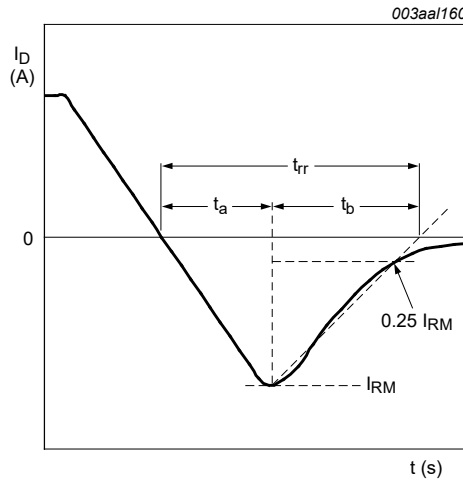
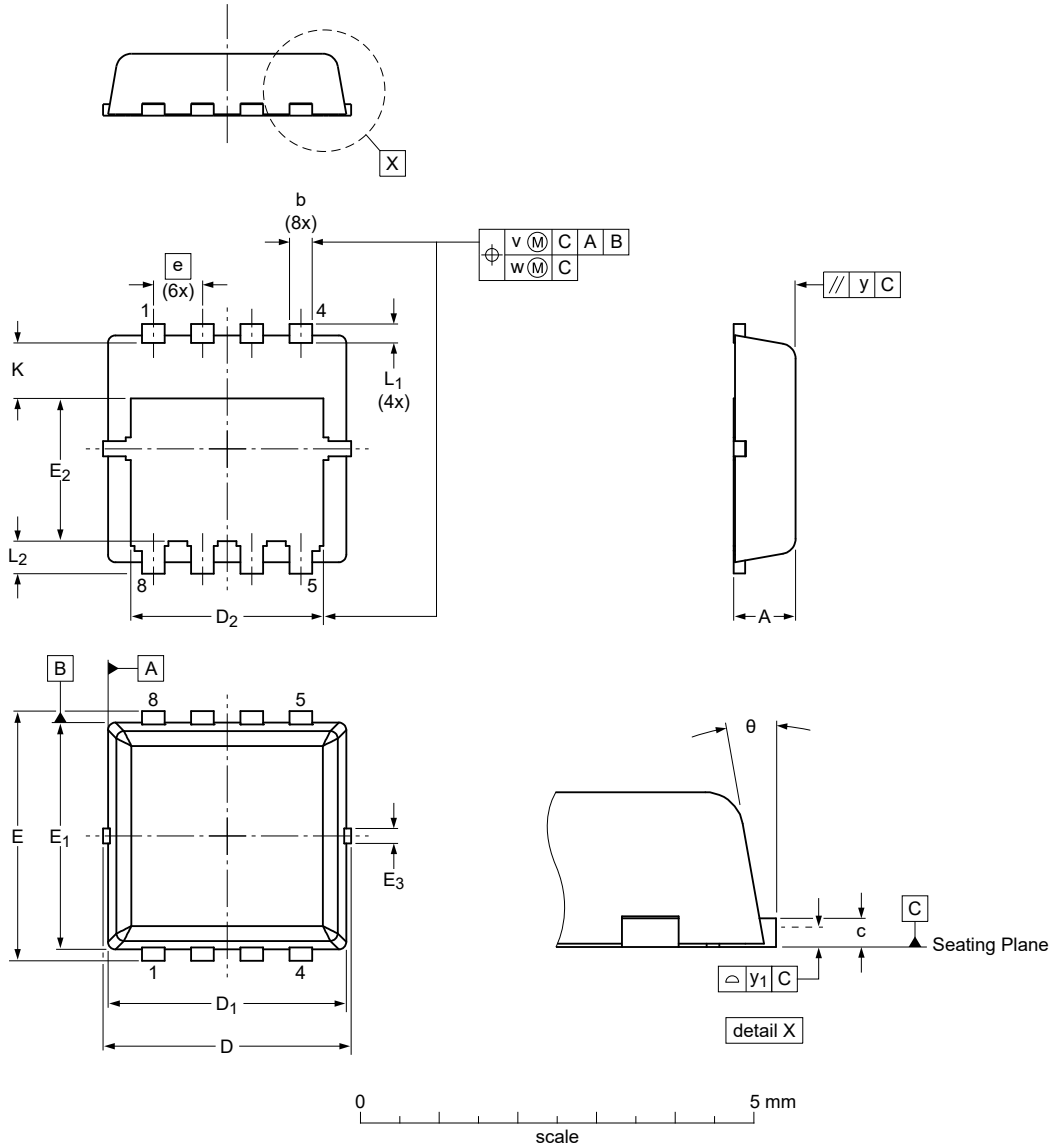


Fig. 15. Reverse recovery timing definition

11. Package outline

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



Dimensions (mm are the original dimensions)

Unit	A	b	c	D	D ₁	D ₂	e	E	E ₁	E ₂	E ₃	K	L ₁	L ₂	θ	y	y ₁	v	w
max	0.90	0.35	0.18	3.50	3.25	2.65		3.50	3.10	1.99	0.25		0.40	0.58	12°				
mm	nom	0.80	0.30	3.30	3.15	2.55	0.65	3.30	3.00	1.89	0.20	0.65 (ref)	0.25	0.43	10°	0.05	0.05	0.1	0.05
	min	0.70	0.25	3.10	3.05	2.45		3.10	2.90	1.79	0.15		0.10	0.28	8°				

sot8002-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	EIAJ			
SOT8002-1						20-01-19 23-05-17

Fig. 16. Package outline MLPAK33 (SOT8002-1)

12. Soldering

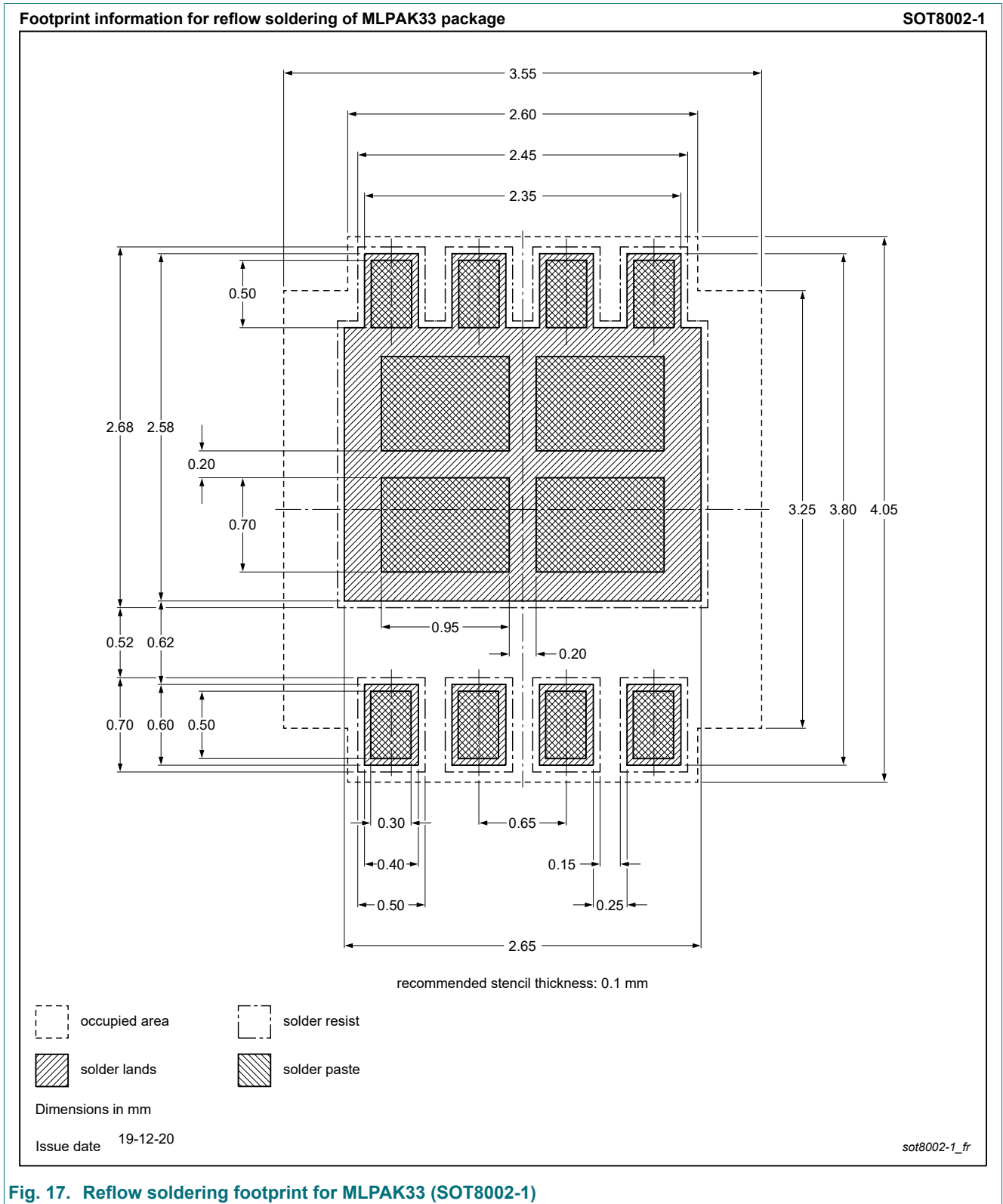


Fig. 17. Reflow soldering footprint for MLPAK33 (SOT8002-1)

13. 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.
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Date of release: 21 September 2023
