



PSMN045-100HL

N-channel 100 V, 45 mOhm, logic level MOSFET in LPAK56D using TrenchMOS technology

26 September 2022

Product data sheet

1. General description

Dual logic level N-channel MOSFET in an LPAK56D (Dual Power-SO8) package using TrenchMOS technology.

2. Features and benefits

- High peak drain current I_{DM}
- Copper clip and flexible Leads
- High operating junction temperature $T_j = 175\text{ °C}$
- Superior reliability
- Low body diode reverse recovery charge Q_r

3. Applications

- Synchronous rectifier
- Forward and flyback converter
- Industrial drive
- Power management system
- Uninterruptible Power Supply (UPS)

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{DS}	drain-source voltage	25 °C ≤ T _j ≤ 175 °C		-	-	100	V
I _D	drain current	V _{GS} = 5 V; T _{mb} = 25 °C; Fig. 2		-	-	21	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; Fig. 1		-	-	53	W
T _j	junction temperature			-55	-	175	°C
Static characteristics FET1 and FET2							
R _{DSon}	drain-source on-state resistance	V _{GS} = 5 V; I _D = 5 A; T _j = 25 °C; Fig. 12		-	38.3	45	mΩ
		V _{GS} = 5 V; I _D = 5 A; T _j = 175 °C; Fig. 12 ; Fig. 13		-	103	124	mΩ
Dynamic characteristics FET1 and FET2							
Q _{GD}	gate-drain charge	I _D = 5 A; V _{DS} = 80 V; V _{GS} = 5 V; T _j = 25 °C; Fig. 14 ; Fig. 15		-	7.3	-	nC
Q _{G(tot)}	total gate charge			-	18.5	-	nC
Avalanche ruggedness FET1 and FET2							
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 21 A; V _{sup} ≤ 100 V; V _{GS} = 5 V; T _{j(init)} = 25 °C; Fig. 4	[1] [2]	-	-	48	mJ

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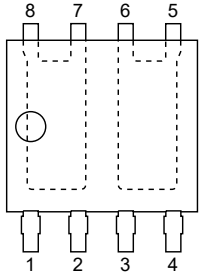
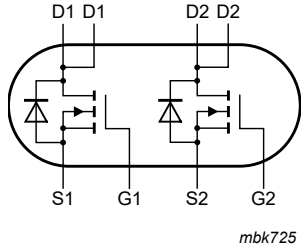
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Source-drain diode FET1 and FET2						
Q_r	recovered charge	$I_S = 5\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	-	42.9	-	nC

[1] Refer to application note AN10273 for further information

[2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S1	source1	 LPAK56D; Dual LPAK (SOT1205)	 mbk725
2	G1	gate1		
3	S2	source2		
4	G2	gate2		
5	D2	drain2		
6	D2	drain2		
7	D1	drain1		
8	D1	drain1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN045-100HL	LPAK56D; Dual LPAK	plastic, single ended surface mounted package (LPAK56D); 8 leads	SOT1205

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN045-100HL	45RL10H

8. Limiting values

Table 5. Limiting values

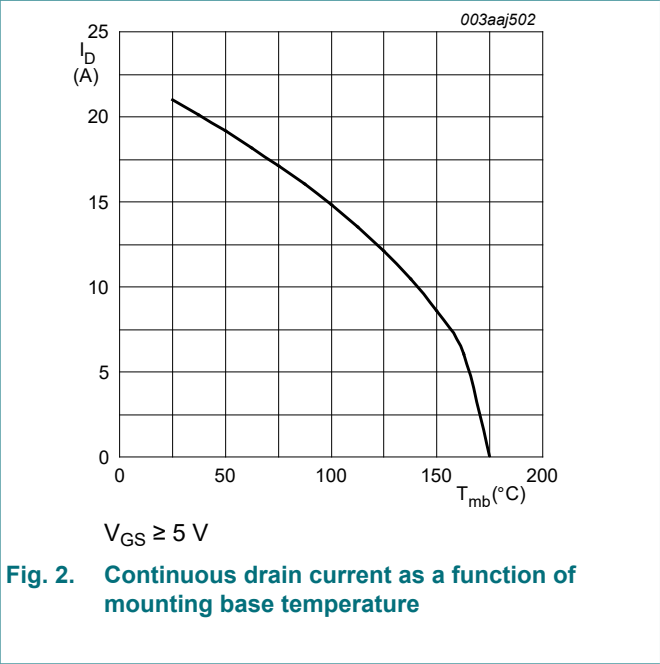
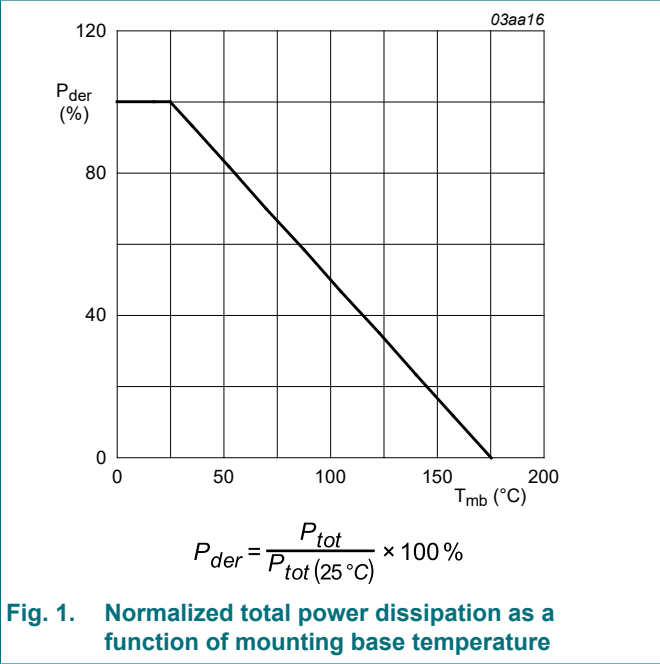
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$25\text{ }^\circ\text{C} \leq T_j \leq 175\text{ }^\circ\text{C}$	-	100	V
V_{DGR}	drain-gate voltage	$25\text{ }^\circ\text{C} \leq T_j \leq 175\text{ }^\circ\text{C}$; $R_{GS} = 20\text{ k}\Omega$	-	100	V
V_{GS}	gate-source voltage	DC; $T_j \leq 175\text{ }^\circ\text{C}$	-10	10	V
		Pulsed; $T_j \leq 175\text{ }^\circ\text{C}$	[1] [2] -15	15	V
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$; Fig. 1	-	53	W

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Symbol	Parameter	Conditions		Min	Max	Unit
I _D	drain current	V _{GS} = 5 V; T _{mb} = 25 °C; Fig. 2		-	21	A
		V _{GS} = 5 V; T _{mb} = 100 °C; Fig. 2		-	15	A
I _{DM}	peak drain current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C; Fig. 3		-	83	A
T _{stg}	storage temperature			-55	175	°C
T _j	junction temperature			-55	175	°C
Source-drain diode FET1 and FET2						
I _S	source current	T _{mb} = 25 °C		-	21	A
I _{SM}	peak source current	pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C		-	83	A
Avalanche ruggedness FET1 and FET2						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	I _D = 21 A; V _{sup} ≤ 100 V; V _{GS} = 5 V; T _{j(init)} = 25 °C; Fig. 4	[3] [4]	-	48	mJ

- [1] Accumulated Pulse duration up to 50 hours delivers zero defect ppm
- [2] Significantly longer life times are achieved by lowering T_j and/or V_{GS}.
- [3] Refer to application note AN10273 for further information
- [4] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C



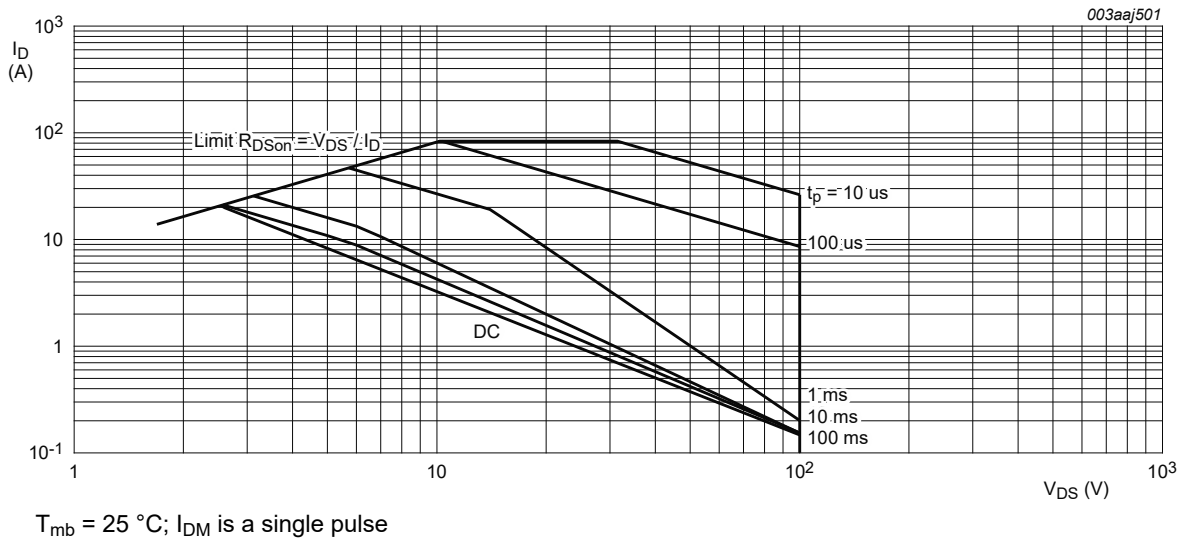
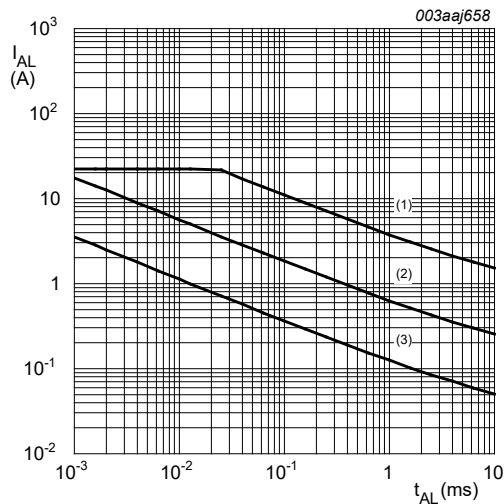


Fig. 3. Safe operating area; continuous and peak drain current as a function of drain-source voltage



(1) $T_{j\ (init)} = 25\ ^\circ C$; (2) $T_{j\ (init)} = 150\ ^\circ C$; (3) Repetitive Avalanche

Fig. 4. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time, FET1 and FET2

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. 5	-	-	2.84	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	Minimum footprint; mounted on a printed circuit board	-	95	-	K/W

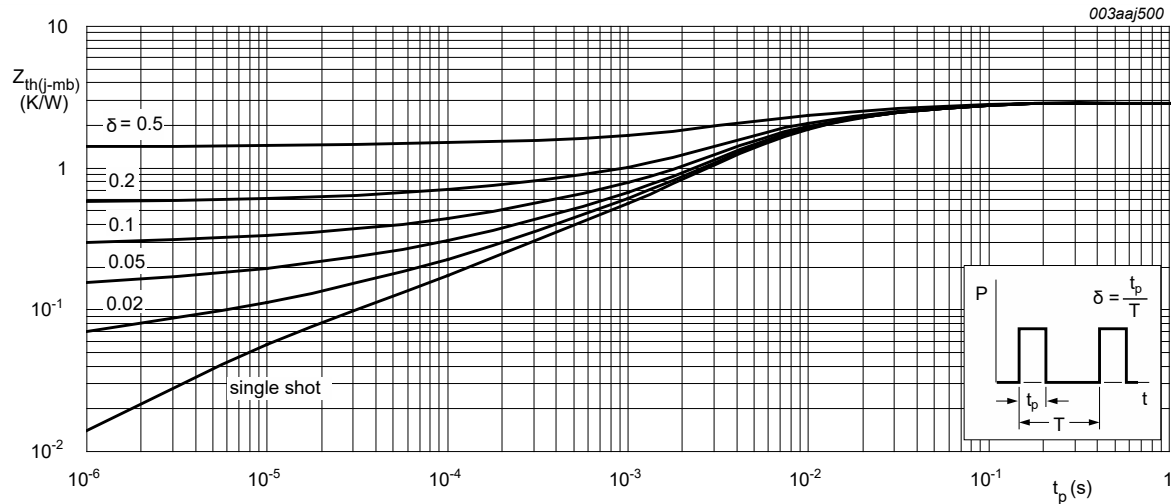


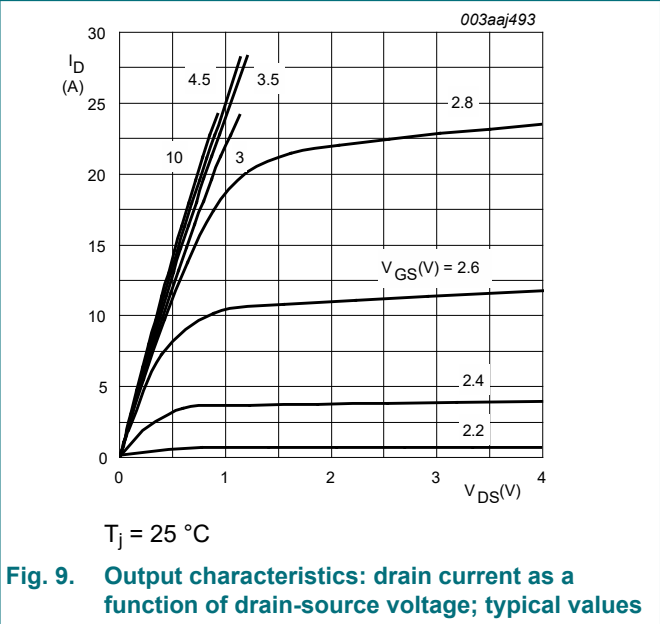
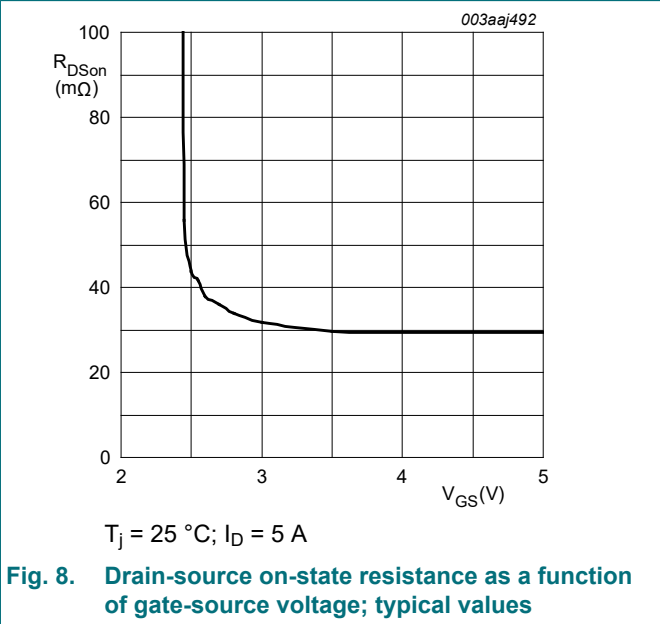
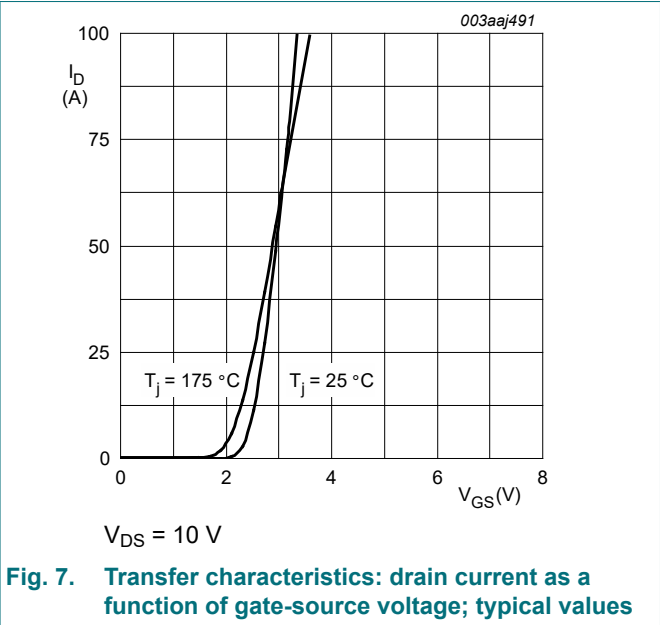
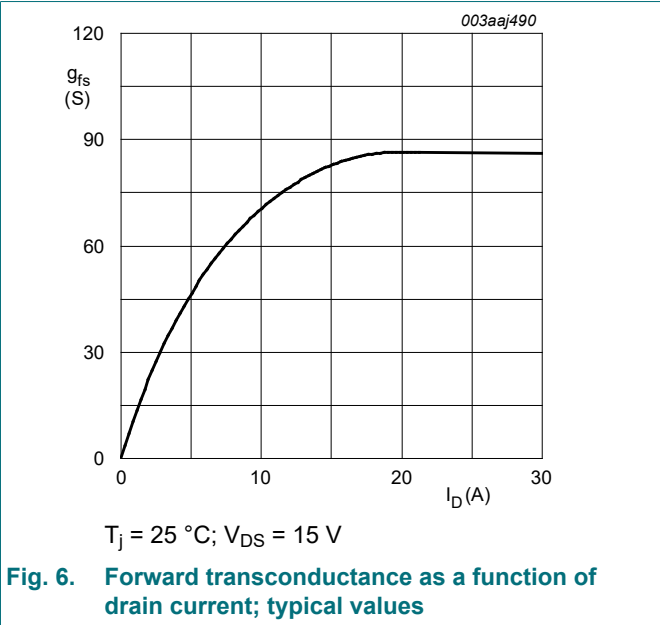
Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics FET1 and FET2							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = -55 °C		90	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C		100	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 25 °C; Fig. 10 ; Fig. 11		1.4	1.7	2.1	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = 175 °C; Fig. 10 ; Fig. 11		0.5	-	-	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _j = -55 °C; Fig. 10 ; Fig. 11		-	-	2.45	V
I _{DSS}	drain leakage current	V _{DS} = 100 V; V _{GS} = 0 V; T _j = 25 °C		-	0.02	1	μA
		V _{DS} = 100 V; V _{GS} = 0 V; T _j = 175 °C		-	-	500	μA
I _{GSS}	gate leakage current	V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C		-	2	100	nA
		V _{GS} = 10 V; V _{DS} = 0 V; T _j = 25 °C		-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 5 V; I _D = 5 A; T _j = 25 °C; Fig. 12		-	38.3	45	mΩ
		V _{GS} = 5 V; I _D = 5 A; T _j = 175 °C; Fig. 12 ; Fig. 13		-	103	124	mΩ
		V _{GS} = 10 V; I _D = 5 A; T _j = 25 °C; Fig. 12		-	35.3	42	mΩ
Dynamic characteristics FET1 and FET2							
Q _{G(tot)}	total gate charge	I _D = 5 A; V _{DS} = 80 V; V _{GS} = 5 V; T _j = 25 °C; Fig. 14 ; Fig. 15		-	18.5	-	nC
Q _{GS}	gate-source charge			-	3.5	-	nC
Q _{GD}	gate-drain charge			-	7.3	-	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 16		-	1614	2152	pF
C _{oss}	output capacitance			-	113	136	pF
C _{rss}	reverse transfer capacitance			-	72	99	pF
t _{d(on)}	turn-on delay time	V _{DS} = 80 V; R _L = 16 Ω; V _{GS} = 5 V; R _{G(ext)} = 5 Ω; T _j = 25 °C		-	10.2	-	ns
t _r	rise time			-	18.1	-	ns

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t _{d(off)}	turn-off delay time			-	26.6	-	ns
t _f	fall time			-	17.5	-	ns
Source-drain diode FET1 and FET2							
V _{SD}	source-drain voltage	I _S = 10 A; V _{GS} = 0 V; T _J = 25 °C; Fig. 17		-	0.78	1.2	V
t _{rr}	reverse recovery time	I _S = 5 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 50 V; T _J = 25 °C		-	29.6	-	ns
Q _r	recovered charge			-	42.9	-	nC



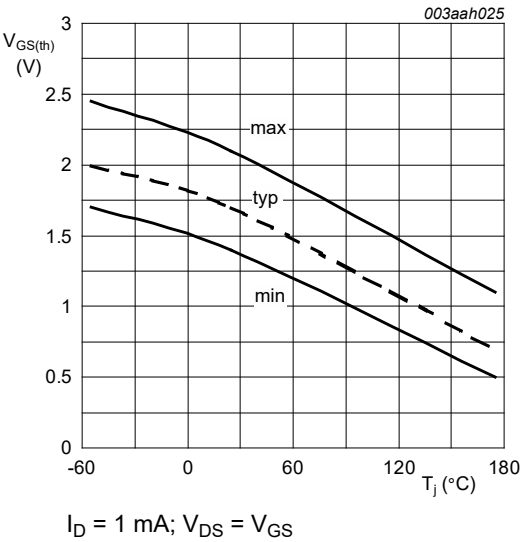


Fig. 10. Gate-source threshold voltage as a function of junction temperature

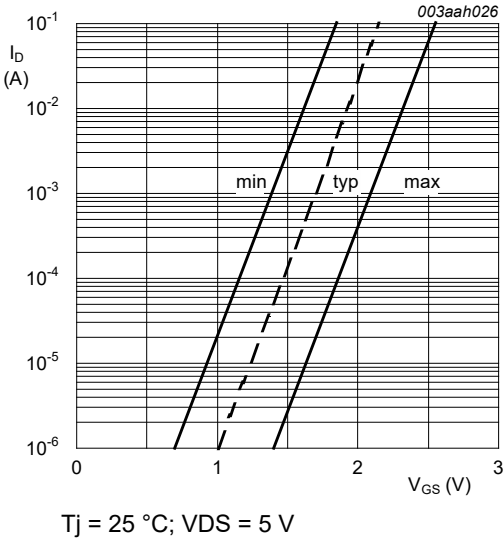


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

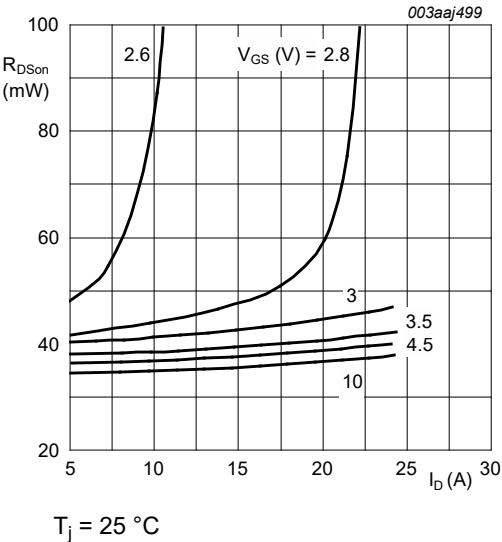


Fig. 12. Drain-source on-state resistance as a function of drain current; typical values

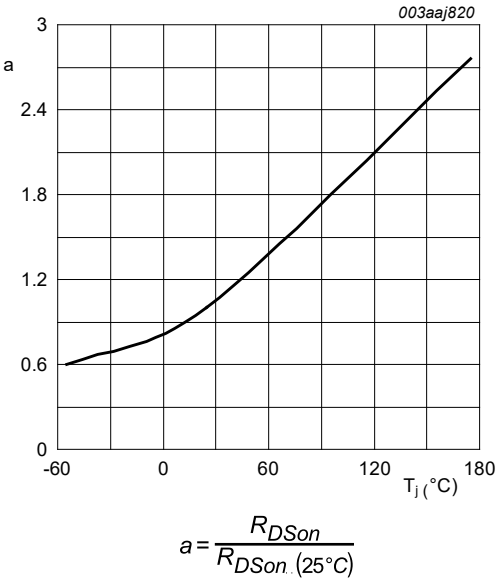


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

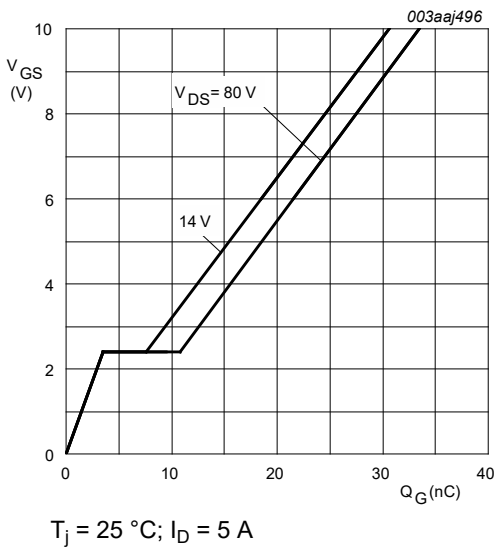


Fig. 14. Gate-source voltage as a function of gate charge; typical values

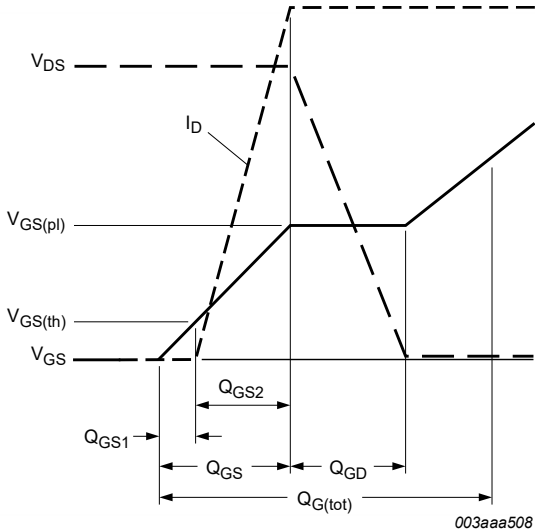


Fig. 15. Gate charge waveform definitions

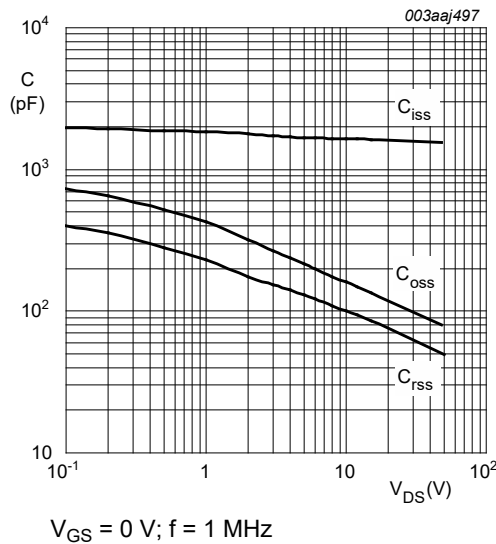


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

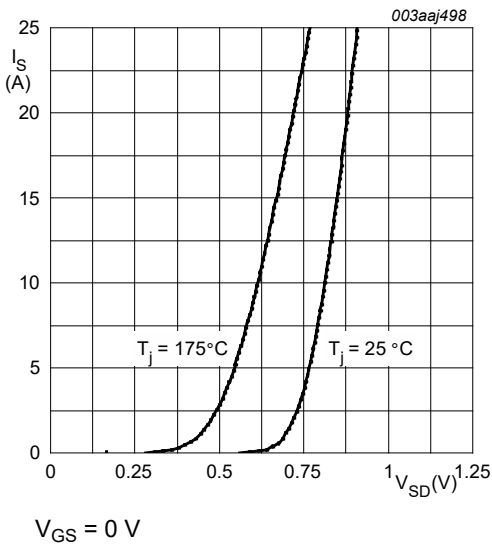


Fig. 17. Source current as a function of source-drain voltage; typical values

11. Package outline

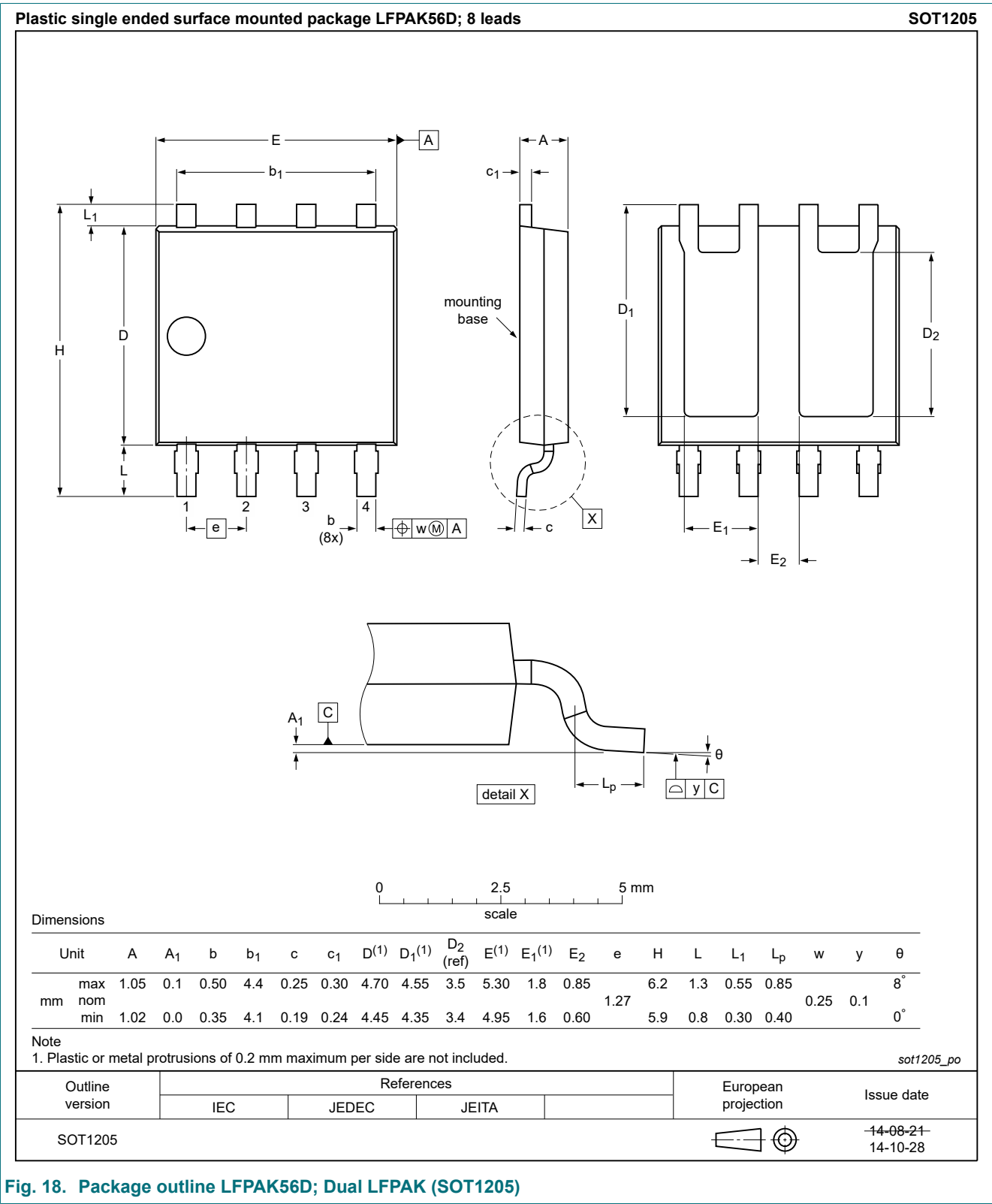


Fig. 18. Package outline LPAK56D; Dual LPAK (SOT1205)

12. Soldering

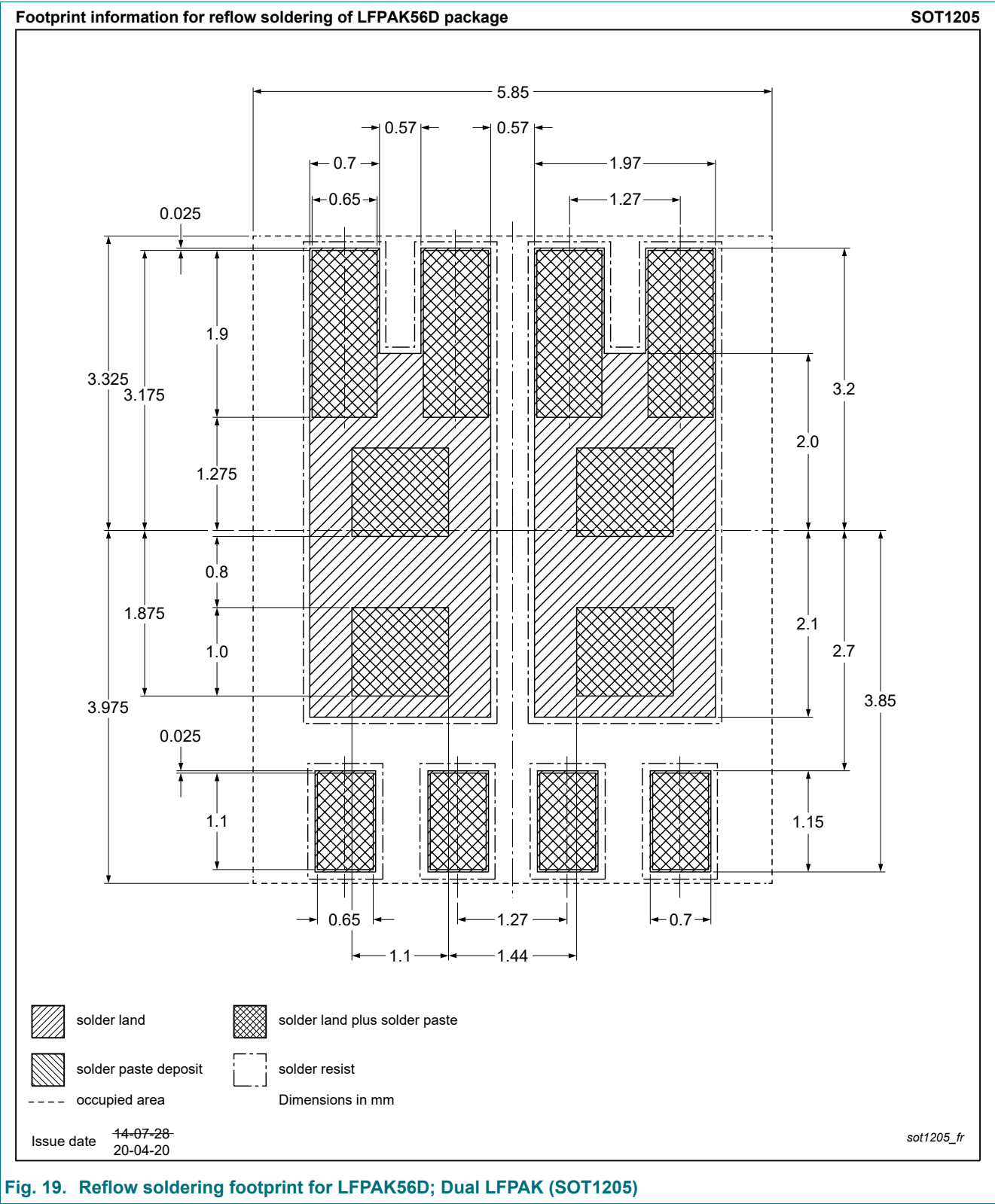


Fig. 19. Reflow soldering footprint for LPAK56D; Dual LPAK (SOT1205)

13. Legal information

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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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