



BUK9M6R7-40H

N-channel 40 V, 6.7 mΩ logic level MOSFET in LPAK33

10 January 2025

Product data sheet

1. General description

Automotive qualified logic level N-channel MOSFET in an LPAK33 package using Trench 9 TrenchMOS technology. This product has been designed and qualified to AEC-Q101 for use in high performance automotive applications.

2. Features and benefits

- Fully automotive qualified to AEC-Q101 at 175 °C
- Trench 9 superjunction technology:
 - Low power losses, high power density
- LPAK copper clip package technology:
 - High robustness and reliability
 - Gull wing leads for high manufacturability and AOI
- Repetitive avalanche rated

3. Applications

- 12 V automotive systems
- Powertrain, chassis, body and infotainment applications
- Medium/Low power motor drive
- DC-DC systems
- LED lighting

4. Quick reference data

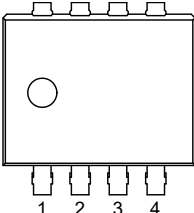
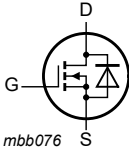
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$25\text{ °C} \leq T_j \leq 175\text{ °C}$	-	-	40	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 2	[1]	-	50	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 1	-	-	65	W
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 20\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11	3.8	5.5	6.7	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$I_D = 20\text{ A}$; $V_{DS} = 20\text{ V}$; $V_{GS} = 4.5\text{ V}$; Fig. 12 ; Fig. 13	-	2.5	5	nC
Source-drain diode						
Q_r	recovered charge	$I_S = 20\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$;	-	16	-	nC
S	softness factor	$V_{DS} = 20\text{ V}$; $T_j = 25\text{ °C}$	-	0.6	-	

[1] 50A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 LFPAK33 (SOT1210)	 mbb076
2	S	source		
3	S	source		
4	G	gate		
mb	D	Mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK9M6R7-40H	LFPAK33	Plastic, single ended surface mounted package (LFPAK33); 8 leads; 0.65 mm pitch	SOT1210

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK9M6R7-40H	96H740

8. Limiting values

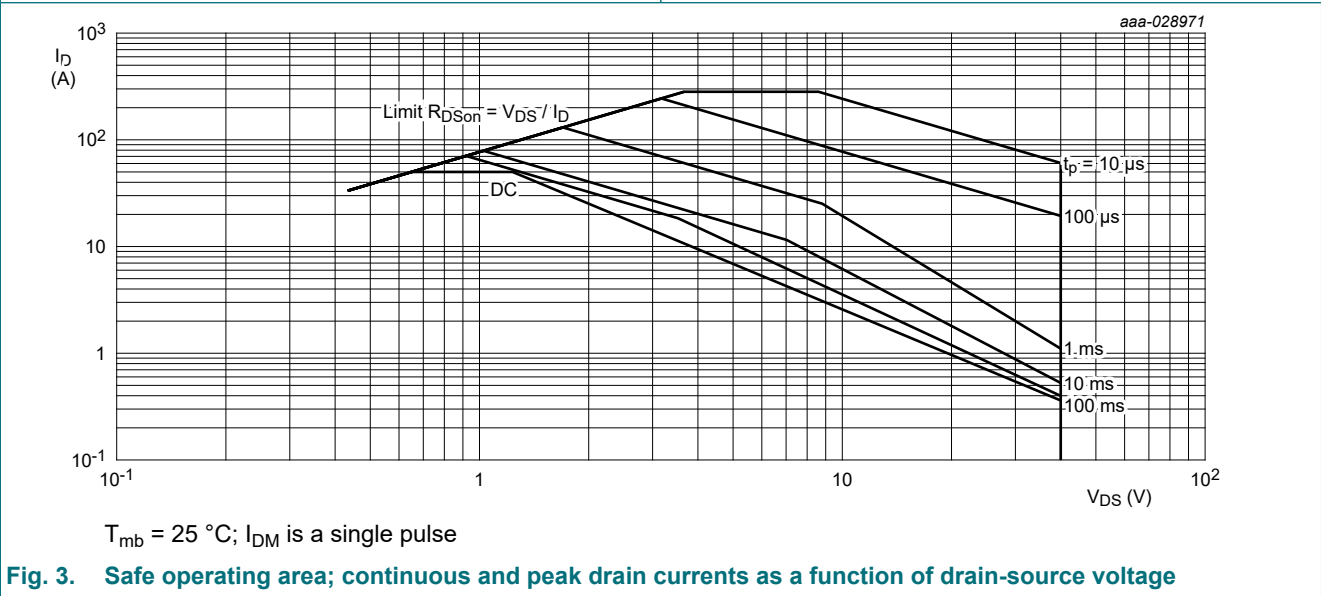
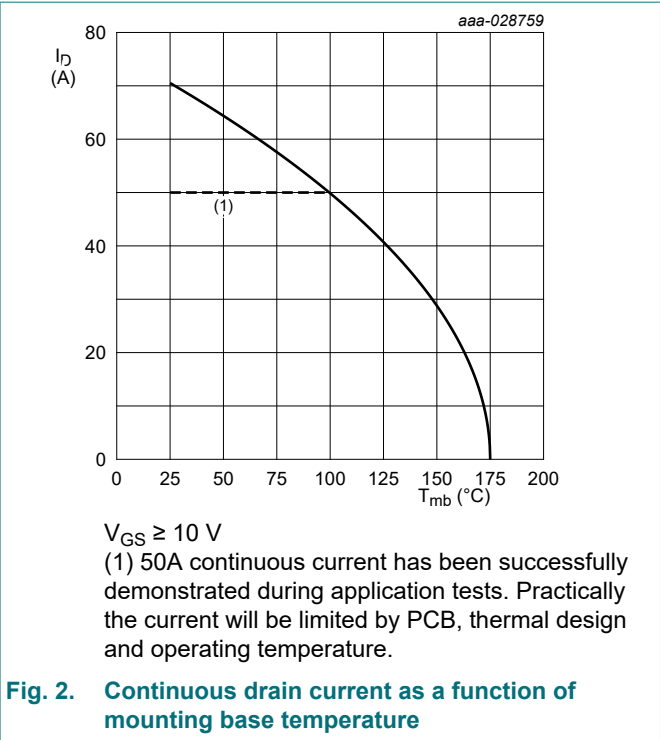
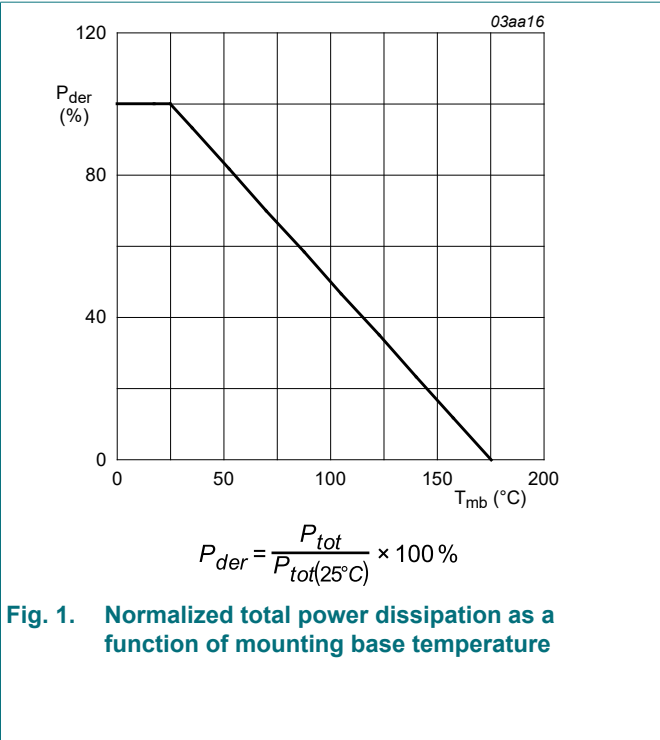
Table 5. Limiting values

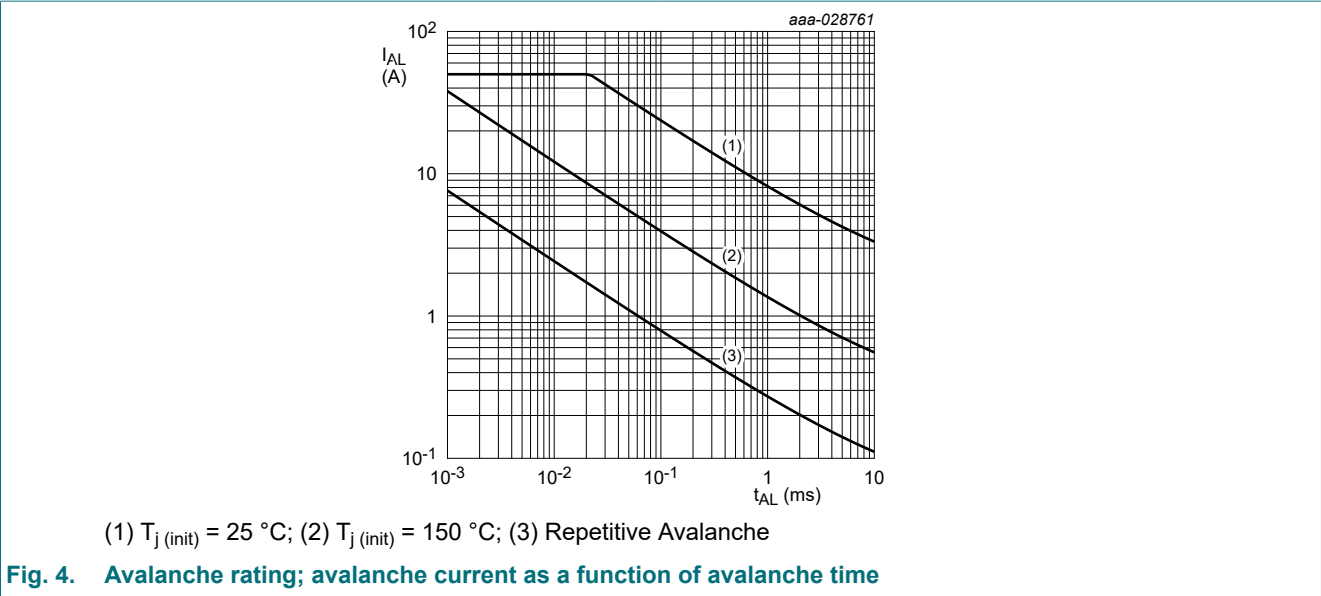
In accordance with the Absolute Maximum Rating System (IEC 60134). Tj = 25 °C unless otherwise stated.

Symbol	Parameter	Conditions		Min	Max	Unit
VDS	drain-source voltage	25 °C ≤ Tj ≤ 175 °C		-	40	V
VGS	gate-source voltage		[1]	-20	20	V
Ptot	total power dissipation	Tmb = 25 °C; Fig. 1		-	65	W
ID	drain current	VGS = 10 V; Tmb = 25 °C; Fig. 2	[2]	-	50	A
		VGS = 10 V; Tmb = 100 °C; Fig. 2		-	50	A
IDM	peak drain current	pulsed; tp ≤ 10 μs; Tmb = 25 °C; Fig. 3		-	282	A
Tstg	storage temperature			-55	175	°C
Tj	junction temperature			-55	175	°C
Source-drain diode						
IS	source current	Tmb = 25 °C		-	50	A
ISM	peak source current	pulsed; tp ≤ 10 μs; Tmb = 25 °C		-	282	A

Symbol	Parameter	Conditions		Min	Max	Unit
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$I_D = 50\text{ A}$; $V_{sup} \leq 40\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; unclamped; Fig. 4	[3] [4]	-	28	mJ

- [1] Refer to application note AN90001 for further information.
- [2] 50A continuous current has been successfully demonstrated during application tests. Practically the current will be limited by PCB, thermal design and operating temperature.
- [3] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [4] Refer to application note AN10273 for further information.

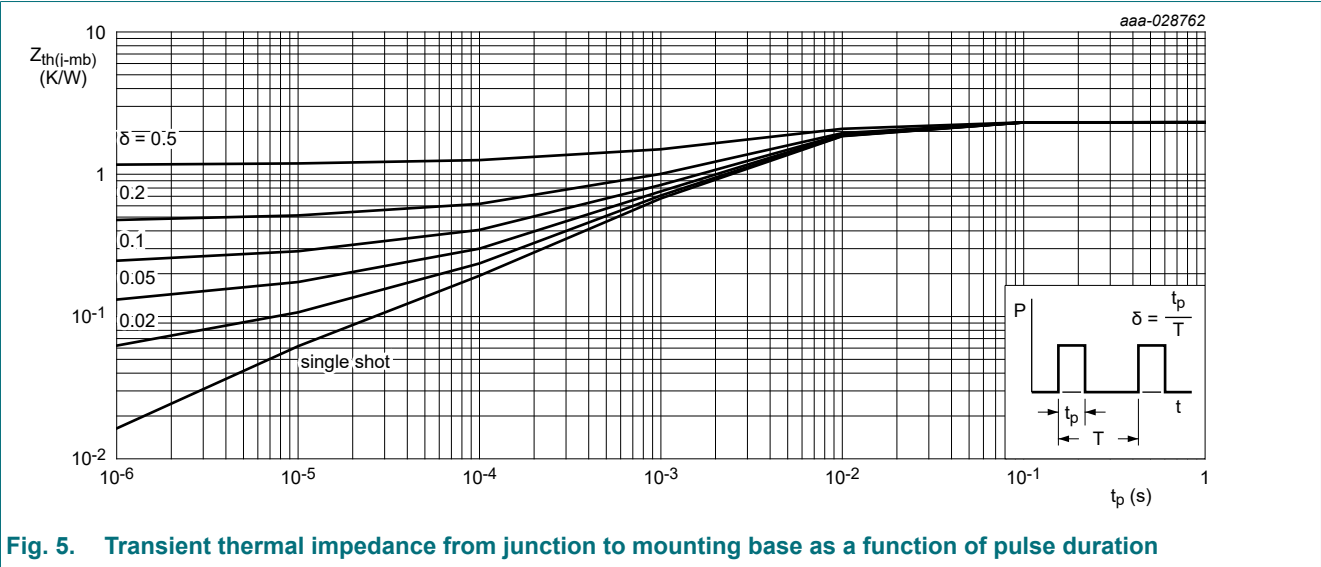




9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5		-	2.09	2.32	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _J = 25 °C		40	43	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _J = -40 °C		-	40.5	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _J = -55 °C		36	40	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} =V _{GS} ; T _J = 25 °C; Fig. 9 ; Fig. 10		1.45	1.77	2.15	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _J = -55 °C		-	-	2.6	V
		I _D = 1 mA; V _{DS} =V _{GS} ; T _J = 175 °C		0.7	-	-	V
I _{DSS}	drain leakage current	V _{DS} = 40 V; V _{GS} = 0 V; T _J = 25 °C		-	0.02	5	μA
		V _{DS} = 16 V; V _{GS} = 0 V; T _J = 125 °C		-	0.51	10	μA
		V _{DS} = 40 V; V _{GS} = 0 V; T _J = 175 °C		-	44	500	μA
I _{GSS}	gate leakage current	V _{GS} = 16 V; V _{DS} = 0 V; T _J = 25 °C		-	2	100	nA
		V _{GS} = -16 V; V _{DS} = 0 V; T _J = 25 °C		-	2	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 20 A; T _J = 25 °C; Fig. 11		3.8	5.5	6.7	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _J = 105 °C		5.2	8	10	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _J = 125 °C		5.7	8.7	10.8	mΩ
		V _{GS} = 10 V; I _D = 20 A; T _J = 175 °C		6.9	10.5	13	mΩ
		V _{GS} = 4.5 V; I _D = 15 A; T _J = 25 °C; Fig. 11		4.9	7	8.6	mΩ
		V _{GS} = 4.5 V; I _D = 15 A; T _J = 105 °C		6.7	9.9	12.9	mΩ
		V _{GS} = 4.5 V; I _D = 15 A; T _J = 125 °C		7.4	10.8	13.9	mΩ
		V _{GS} = 4.5 V; I _D = 15 A; T _J = 175 °C		9	13	16.7	mΩ
R _G	gate resistance	f = 1 MHz; T _J = 25 °C		0.3	0.8	1.9	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 20 A; V _{DS} = 20 V; V _{GS} = 10 V; Fig. 12 ; Fig. 13		-	22	31	nC
		I _D = 20 A; V _{DS} = 20 V; V _{GS} = 4.5 V; Fig. 12 ; Fig. 13		-	10	14	nC
Q _{GS}	gate-source charge			-	4.1	6.2	nC
Q _{GD}	gate-drain charge			-	2.5	5	nC
C _{iSS}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _J = 25 °C; Fig. 14		-	1467	2054	pF
C _{oSS}	output capacitance			-	390	546	pF
C _{rSS}	reverse transfer capacitance			-	59	130	pF
t _{d(on)}	turn-on delay time	V _{DS} = 20 V; R _L = 1 Ω; V _{GS} = 4.5 V; R _{G(ext)} = 5 Ω		-	15	-	ns
t _r	rise time			-	21	-	ns
t _{d(off)}	turn-off delay time			-	14	-	ns
t _f	fall time			-	10	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 20 A; V _{GS} = 0 V; T _J = 25 °C; Fig. 15		-	0.85	1.2	V

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_{rr}	reverse recovery time	$I_S = 20\text{ A}$; $dI_S/dt = -100\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 20\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$		-	23	-	ns
Q_r	recovered charge			-	16	-	nC
S	softness factor			-	0.6	-	
		$I_S = 20\text{ A}$; $dI_S/dt = -500\text{ A}/\mu\text{s}$; $V_{GS} = 0\text{ V}$; $V_{DS} = 20\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$		-	0.43	-	

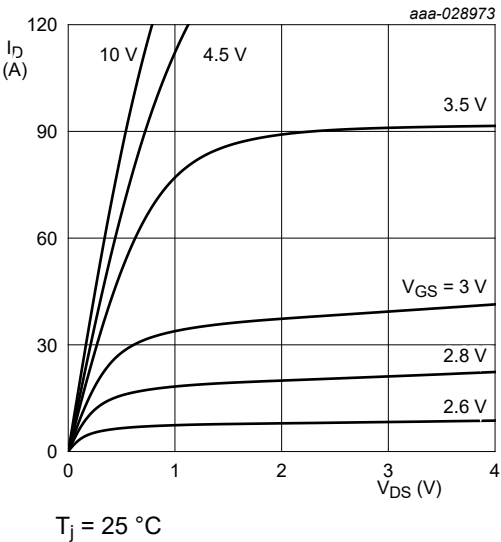


Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values

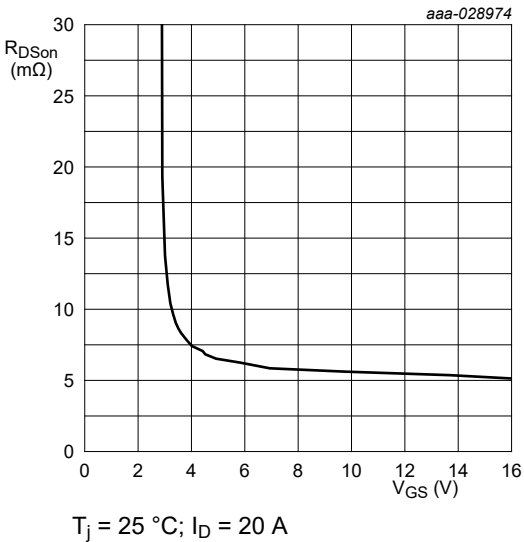


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

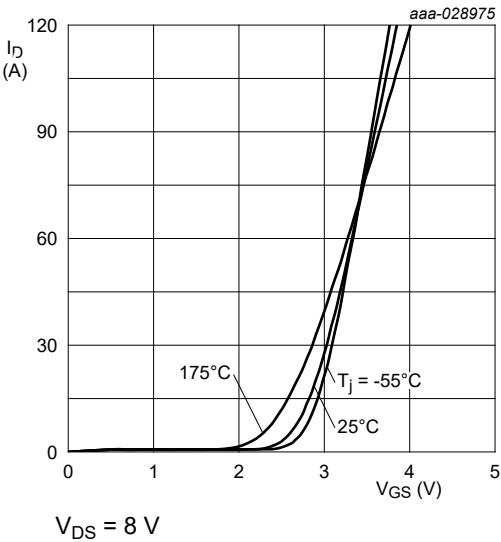


Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

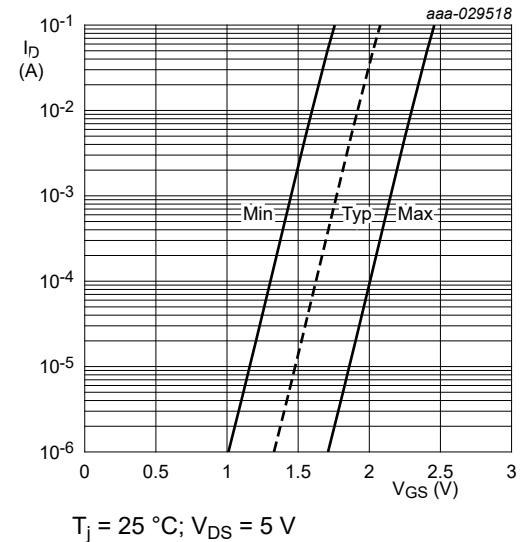


Fig. 9. Sub-threshold drain current as a function of gate-source voltage

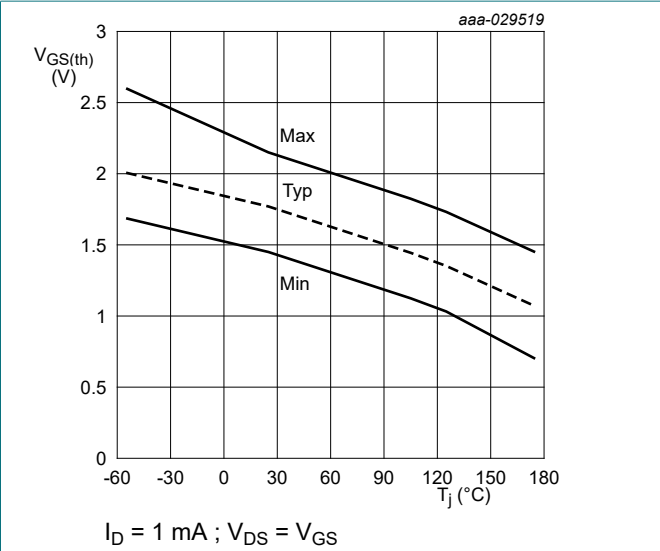


Fig. 10. Gate-source threshold voltage as a function of junction temperature

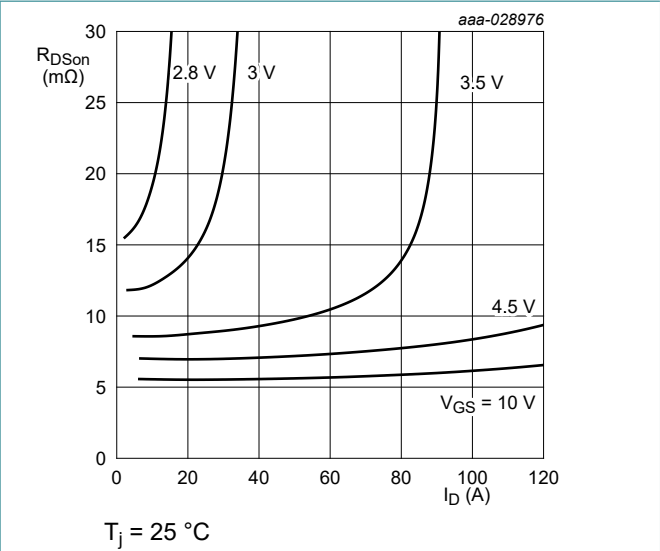


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

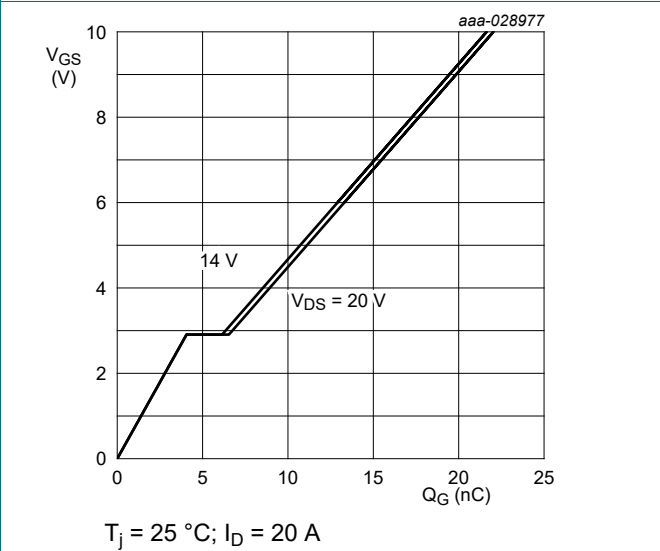


Fig. 12. Gate-source voltage as a function of gate charge; typical values

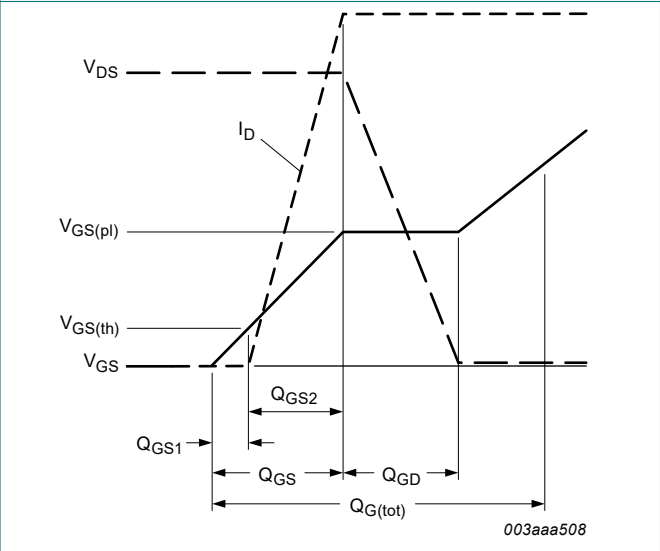


Fig. 13. Gate charge waveform definitions

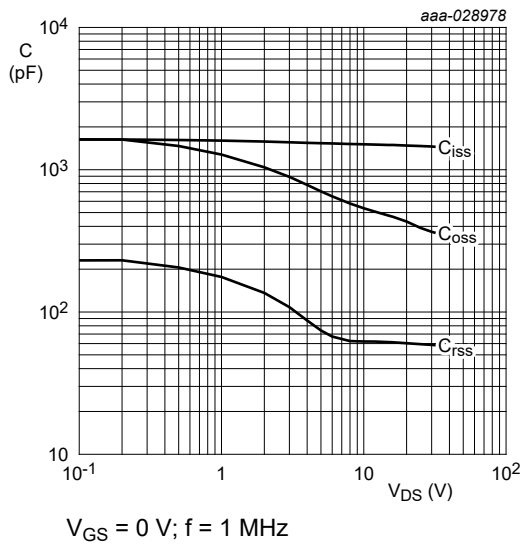


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

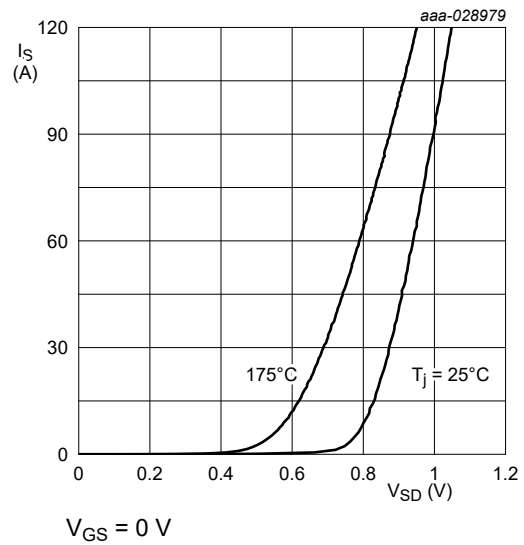


Fig. 15. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

11. Package outline

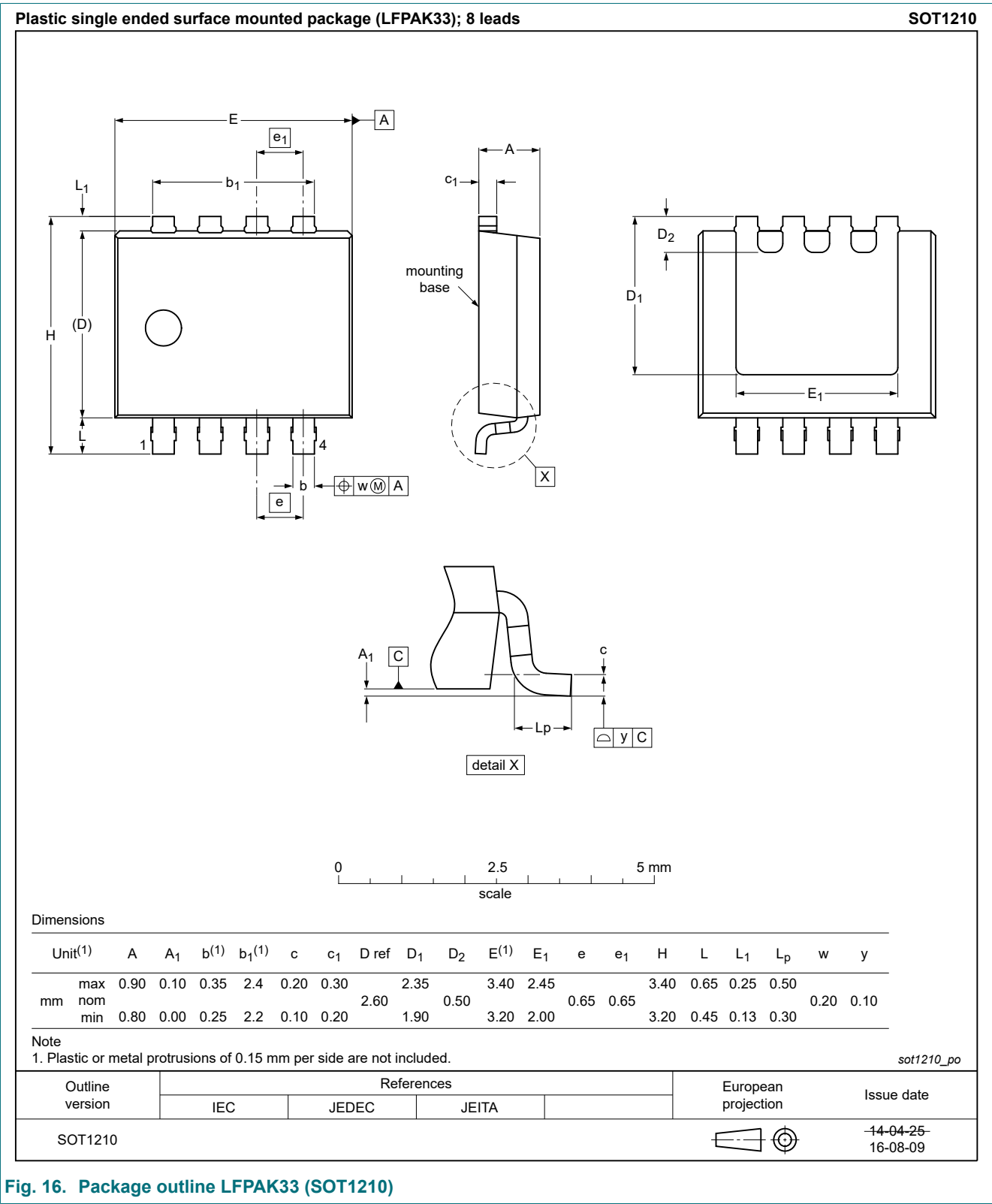


Fig. 16. Package outline LPAK33 (SOT1210)

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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Date of release: 10 January 2025

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