



PSMN041-80YL

N-channel 80 V 41 mΩ logic level MOSFET in LFPAK56

1 May 2013

Product data sheet

1. General description

Logic level gate drive N-channel enhancement mode Field-Effect Transistor (FET) in LFPAK56 package. This product has been designed and qualified for use in a wide range of industrial, communications and domestic equipment.

2. Features and benefits

- High efficiency due to low switching and conduction losses
- Suitable for logic level gate drive
- LFPAK56 package is footprint compatible with other Power-SO8 types
- Qualified to 175 °C

3. Applications

- DC-to-DC converters
- Load switch
- TV power supplies

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	-	80	V
I_D	drain current	$T_{mb} = 25\text{ °C}; V_{GS} = 10\text{ V}; \text{Fig. 1}$	-	-	25	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}; \text{Fig. 2}$	-	-	64	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 25\text{ °C}; \text{Fig. 12}$	-	32.8	41	mΩ
		$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; T_j = 175\text{ °C}; \text{Fig. 13}; \text{Fig. 12}$	-	-	103	mΩ
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}; I_D = 5\text{ A}; V_{DS} = 64\text{ V};$	-	4.3	-	nC
$Q_{G(tot)}$	total gate charge	$T_j = 25\text{ °C}; \text{Fig. 14}; \text{Fig. 15}$	-	21.9	-	nC



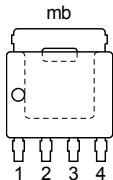
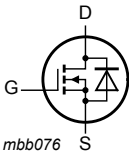
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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 25\text{ A}$; $V_{sup} \leq 80\text{ V}$; $R_{GS} = 50\text{ }\Omega$; unclamped; Fig. 3	-	-	23.9	mJ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 <p>LFAK56; Power-SO8 (SOT669)</p>	 <p><i>mbb076</i></p>
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
PSMN041-80YL	LFAK56; Power-SO8	Plastic single-ended surface-mounted package (LFAK56; Power-SO8); 4 leads	SOT669

7. Marking

Table 4. Marking codes

Type number	Marking code
PSMN041-80YL	04180

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	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	80	V
V_{DGR}	drain-gate voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$; $R_{GS} = 20\text{ k}\Omega$	-	80	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}$; $T_{mb} = 100\text{ °C}$; Fig. 1	-	18	A

Symbol	Parameter	Conditions	Min	Max	Unit
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 1	-	25	A
I_{DM}	peak drain current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$; Fig. 4	-	100	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; Fig. 2	-	64	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
$T_{sld(M)}$	peak soldering temperature		-	260	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	-	54	A
I_{SM}	peak source current	pulsed; $t_p \leq 10\text{ }\mu\text{s}$; $T_{mb} = 25\text{ °C}$	-	100	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(\text{init})} = 25\text{ °C}$; $I_D = 25\text{ A}$; $V_{sup} \leq 80\text{ V}$; $R_{GS} = 50\text{ }\Omega$; unclamped; Fig. 3	-	23.9	mJ

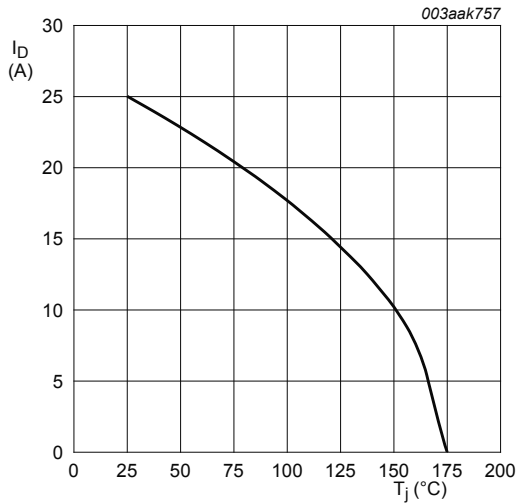


Fig. 1. Continuous drain current as a function of mounting base temperature

$$V_{GS} \geq 10V$$

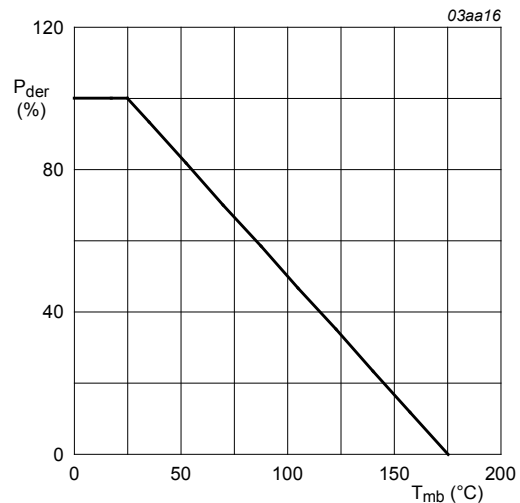


Fig. 2. Normalized total power dissipation as a function of mounting base temperature

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

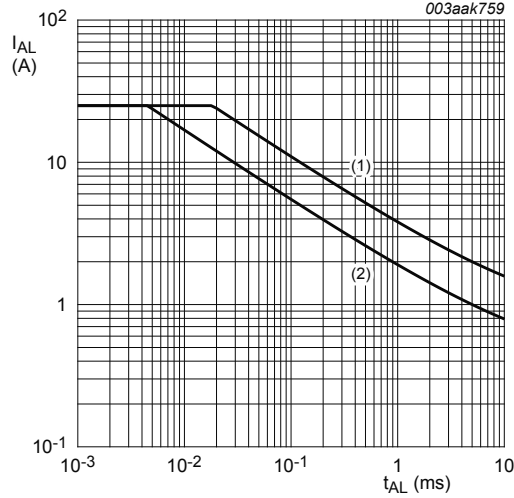


Fig. 3. Avalanche rating; avalanche current as a function of avalanche time

(1) $T_{j (initial)} = 25^{\circ}C$; (2) $T_{j (initial)} = 100^{\circ}C$

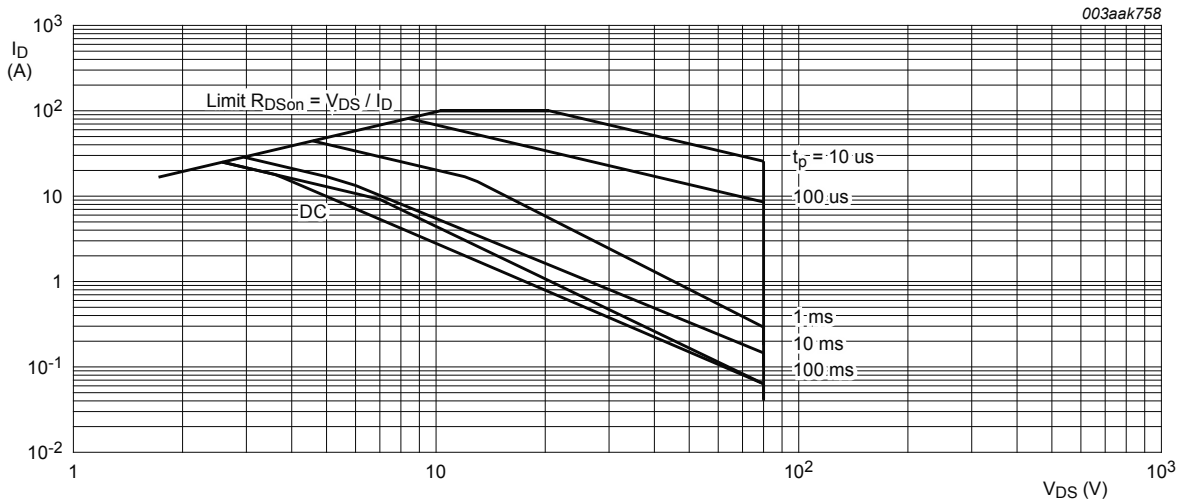


Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C$; I_{DM} is a single pulse

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	-	2.13	2.33	K/W

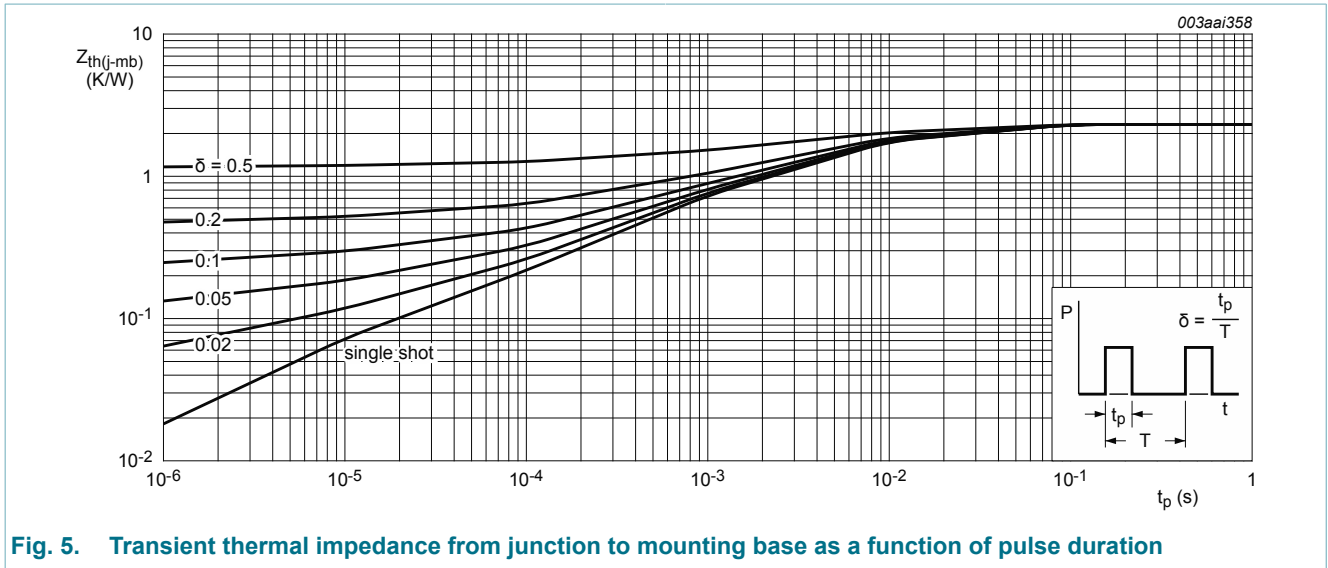


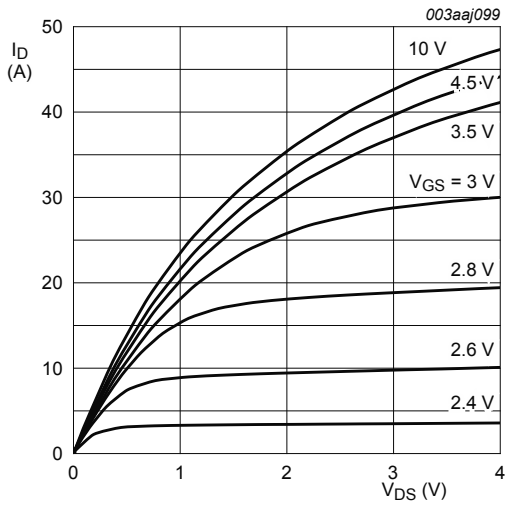
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \text{ }^\circ C$	72	-	-	V
		$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	80	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ C;$ Fig. 10	0.5	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ C;$ Fig. 10	-	-	2.45	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C;$ Fig. 10; Fig. 11	1.4	1.7	2.1	V
I_{DSS}	drain leakage current	$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	0.02	1	μA
		$V_{DS} = 80 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ C$	-	-	500	μA
I_{GSS}	gate leakage current	$V_{GS} = -16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = 16 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ C$	-	-	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. 12	-	32.8	41	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 5 \text{ A}; T_j = 175 \text{ }^\circ C;$ Fig. 13; Fig. 12	-	-	113	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 5 \text{ A}; T_j = 175 \text{ }^\circ C;$ Fig. 13; Fig. 12	-	-	103	mΩ
		$V_{GS} = 5 \text{ V}; I_D = 5 \text{ A}; T_j = 25 \text{ }^\circ C;$ Fig. 12	-	35.7	45	mΩ
R_G	gate resistance	$f = 1 \text{ MHz}$	-	2.02	-	Ω

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 5 A; V _{DS} = 64 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 14 ; Fig. 15	-	21.9	-	nC
		I _D = 5 A; V _{DS} = 64 V; V _{GS} = 5 V; T _j = 25 °C; Fig. 14 ; Fig. 15	-	11.9	-	nC
Q _{GS}	gate-source charge	I _D = 5 A; V _{DS} = 64 V; V _{GS} = 10 V; T _j = 25 °C; Fig. 14 ; Fig. 15	-	2.5	-	nC
Q _{GS(th)}	pre-threshold gate-source charge		-	1.7	-	nC
Q _{GS(th-pl)}	post-threshold gate-source charge		-	0.8	-	nC
Q _{GD}	gate-drain charge		-	4.3	-	nC
V _{GS(pl)}	gate-source plateau voltage	I _D = 5 A; V _{DS} = 64 V; T _j = 25 °C; Fig. 14 ; Fig. 15	-	2.4	-	V
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; Fig. 16	-	1180	-	pF
C _{oss}	output capacitance		-	99	-	pF
C _{rss}	reverse transfer capacitance		-	54	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 60 V; R _L = 10 Ω; V _{GS} = 5 V; R _{G(ext)} = 5 Ω; T _j = 25 °C	-	8.6	-	ns
t _r	rise time		-	11.2	-	ns
t _{d(off)}	turn-off delay time		-	16.1	-	ns
t _f	fall time		-	10.5	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 5 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 17	-	0.8	1.2	V
t _{rr}	reverse recovery time	I _S = 5 A; di/dt = 100 A/μs; V _{GS} = 0 V; V _{DS} = 25 V; T _j = 25 °C	-	21.3	-	ns
Q _r	recovered charge		-	22	-	nC



$T_j = 25^\circ\text{C}; t_p = 300 \mu\text{s}$

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

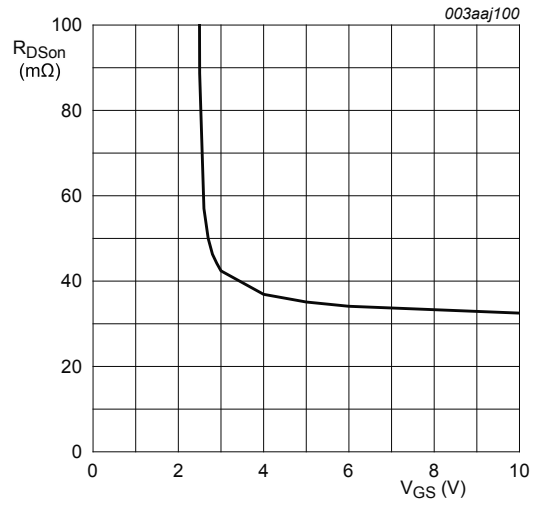


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

$T_j = 25^\circ\text{C}; I_D = 5\text{A}$

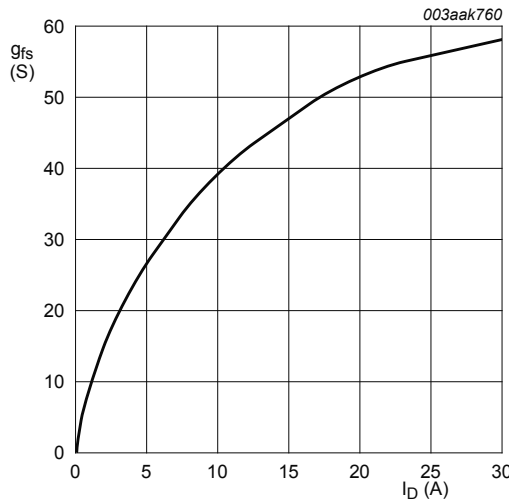


Fig. 8. Forward transconductance as a function of drain current; typical values

$T_j = 25^\circ\text{C}; V_{DS} = 10\text{V}$

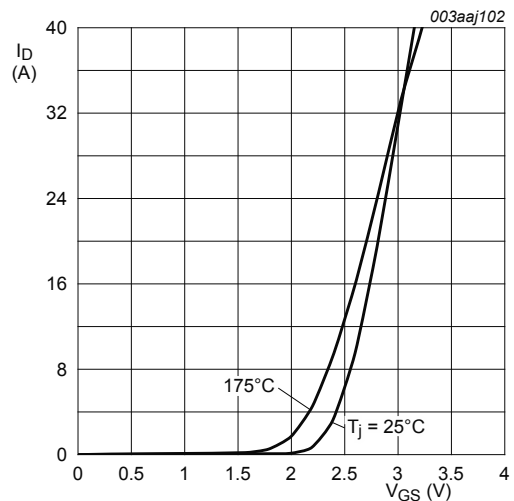


Fig. 9. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$V_{DS} = 10\text{V}$

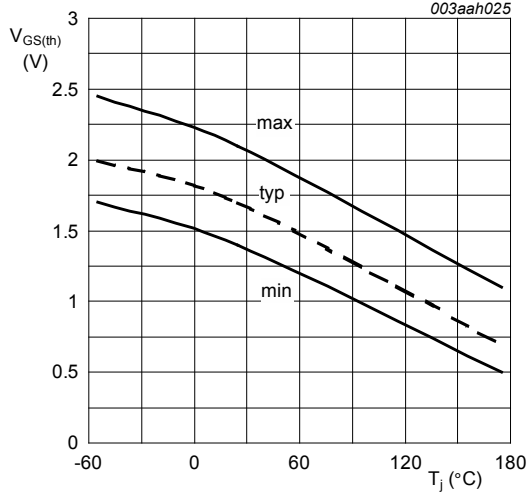


Fig. 10. Gate-source threshold voltage as a function of junction temperature

$$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$$

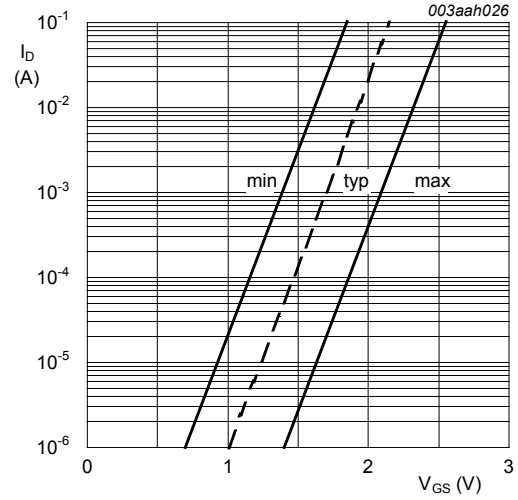
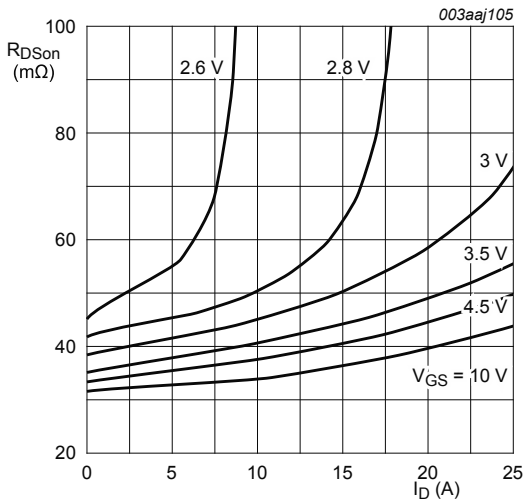


Fig. 11. Sub-threshold drain current as a function of gate-source voltage

$$T_j = 25^\circ\text{C}; V_{DS} = 5\text{V}$$



$$T_j = 25^\circ\text{C}; t_p = 300 \mu\text{s}$$

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

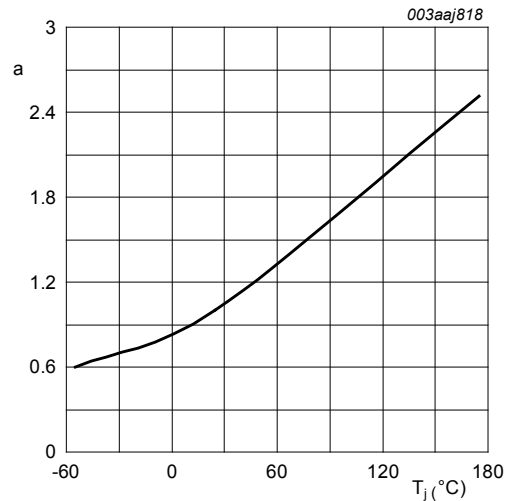


Fig. 13. Normalized drain-source on-state resistance factor as a function of junction temperature

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

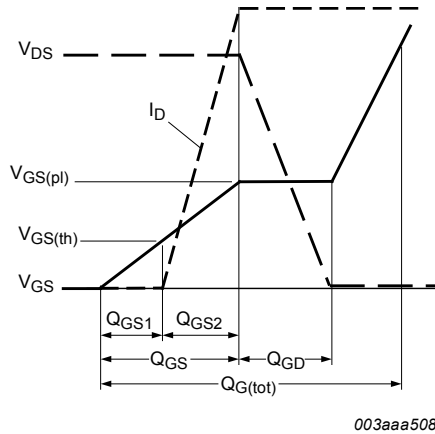


Fig. 14. Gate charge waveform definitions

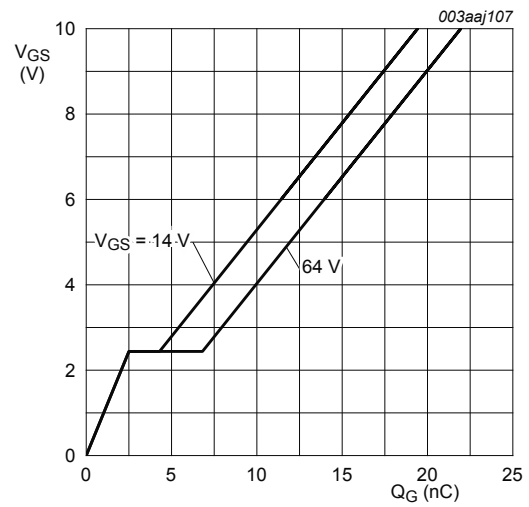


Fig. 15. Gate-source voltage as a function of gate charge; typical values

$T_j = 25^\circ\text{C}; I_D = 5\text{A}$

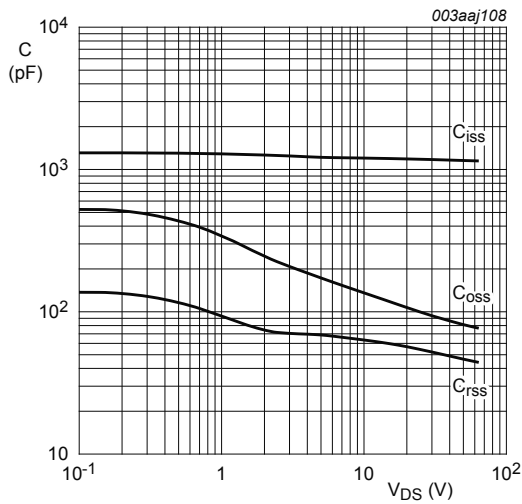


Fig. 16. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

$V_{GS} = 0\text{V}; f = 1\text{MHz}$

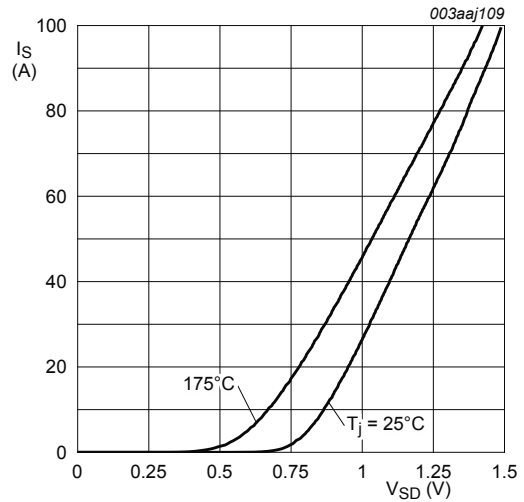


Fig. 17. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

$V_{GS} = 0\text{V}$

11. Package outline



Fig. 18. Package outline LPAK56; Power-SO8 (SOT669)

12. Legal information

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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