BUK6Y20-30P

30 V, P-channel Trench MOSFET

7 March 2018 — Product data sheet

1. General description

P-channel enhancement mode MOSFET in an LFPAK56 (Power SO8) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

This product has been designed and qualified to AEC-Q101 standard for use in high-performance automotive applications such as reverse battery protection.

2. Features and benefits

- High thermal power dissipation capability
- Suitable for thermally demanding environments due to 175 °C rating
- Trench MOSFET technology
- AEC-Q101 qualified

3. Applications

- Reverse battery protection
- Power management
- High-side loadswitch
- Motor drive

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-	-30	V
V_{GS}	gate-source voltage		[1]	-20	-	20	V
I_D	drain current	V_{GS} = -10 V; T_{mb} = 25 °C		-	-	-41	A
P_{tot}	total power dissipation	T_{mb} = 25 °C		-	-	66	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -10 V; I_D = -8.6 A; T_j = 25 °C		-	14	20	mΩ

[1] V_{GS} = -20 V/+5 V according AEC-Q101 at T_j = 175 °C; V_{GS} = -20 V/+20 V according AEC-Q101 at T_j = 150 °C

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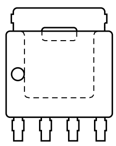
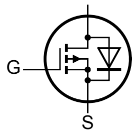
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 **LFPAK56; Power-SO8 (SOT669)**	 *017aaa094*
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
BUK6Y20-30P	LFPAK56; Power-SO8	plastic, single-ended surface-mounted package; 4 terminals; 4.9 mm x 4.45 mm x 1 mm body	SOT669

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK6Y20-30P	6Y2030P

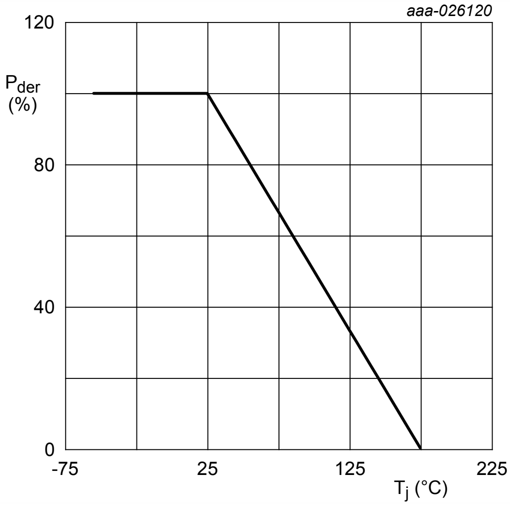
8. Limiting values

Table 5. Limiting values

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

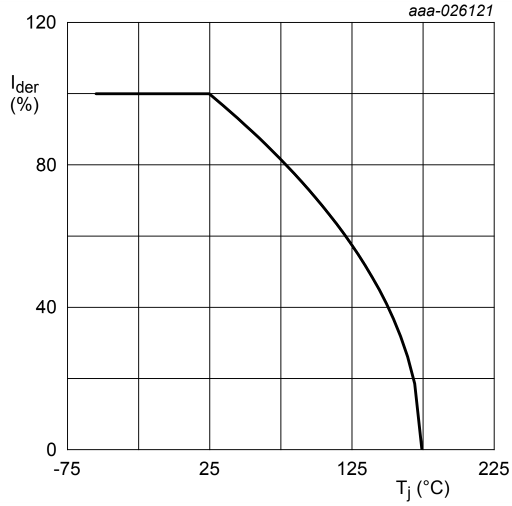
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-30	V
V_{GS}	gate-source voltage		[1]	-20	20	V
I_D	drain current	V_{GS} = -10 V; T_{mb} = 25 °C		-	-41	A
		V_{GS} = -10 V; T_{mb} = 100 °C		-	-29	A
I_{DM}	peak drain current	single pulse; t_p ≤ 10 µs; T_{mb} = 25 °C		-	-164	A
P_{tot}	total power dissipation	T_{mb} = 25 °C		-	66	W
T_j	junction temperature			-55	175	°C
T_{amb}	ambient temperature			-55	175	°C
T_{stg}	storage temperature			-65	175	°C
Source-drain diode						
I_S	source current	T_{mb} = 25 °C		-	-41	A
I_{SM}	peak source current	single pulse; t_p ≤ 10 µs; T_{mb} = 25 °C		-	-164	A
ESD maximum rating						
V_{ESD}	electrostatic discharge voltage	HBM	[2]	-	800	V
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{sup} ≤ -40 V; V_{GS} = -10 V; $T_{j(init)}$ = 25 °C; I_D = -8.6 A; DUT in avalanche (unclamped)		-	3.5	mJ

[1] V_{GS} = -20 V/+5 V according AEC-Q101 at T_j = 175 °C; V_{GS} = -20 V/+20 V according AEC-Q101 at T_j = 150 °C
[2] Measured between all pins.



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

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



$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100 \ \%$$

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

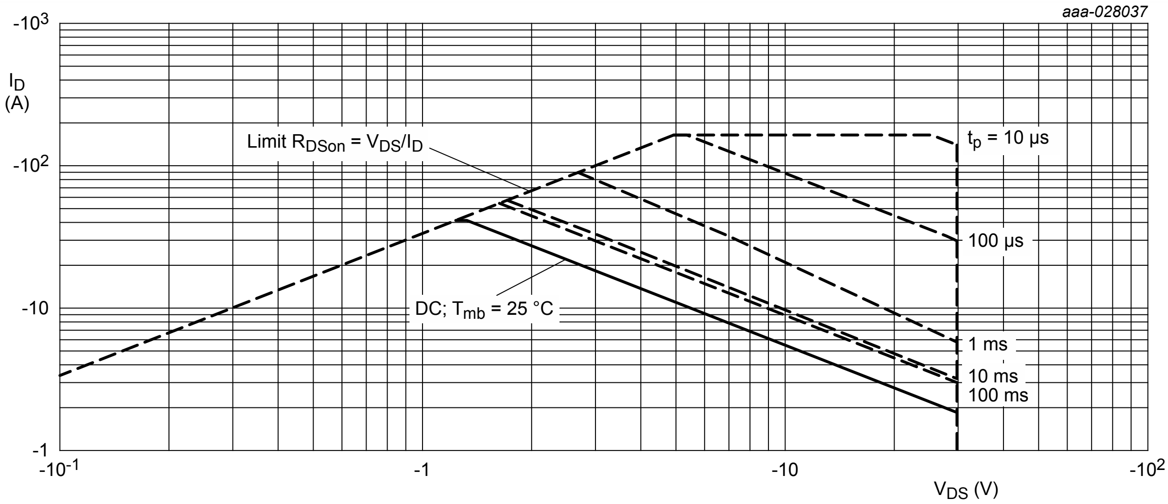


Fig. 3. Safe operating area; junction to mounting base; continuous and peak drain currents as a function of drain-source voltage

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base			-	1.8	2.3	K/W

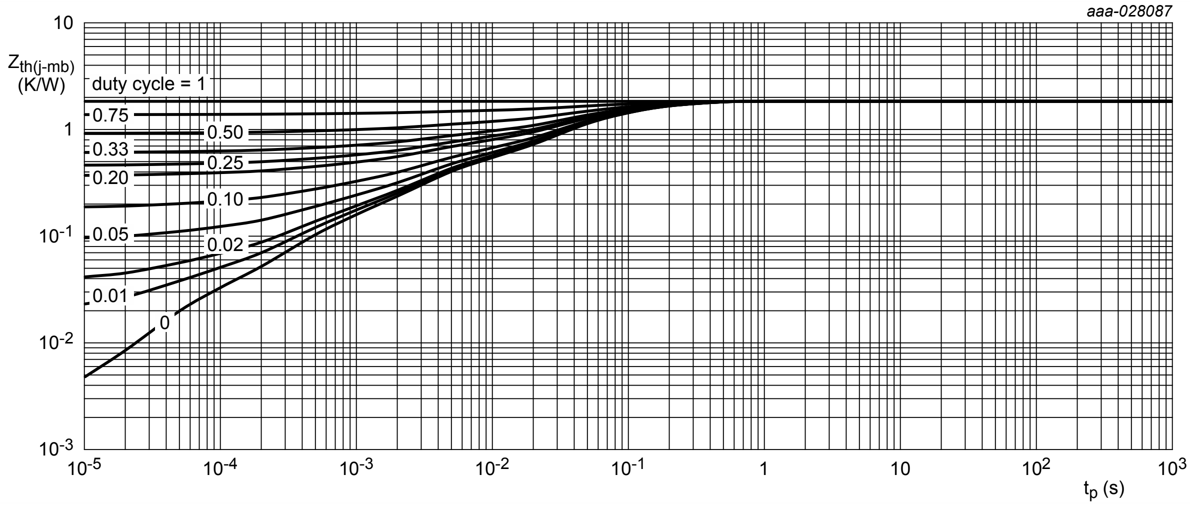
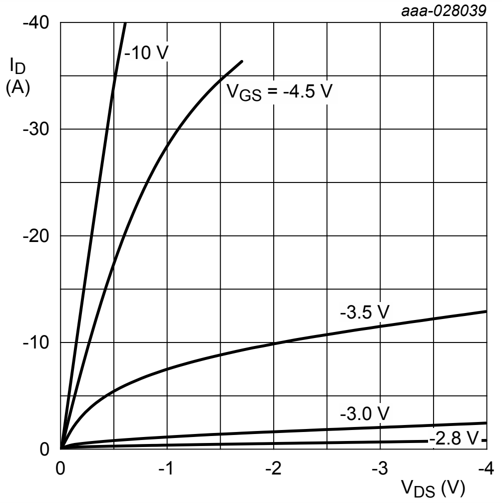


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

10. Characteristics

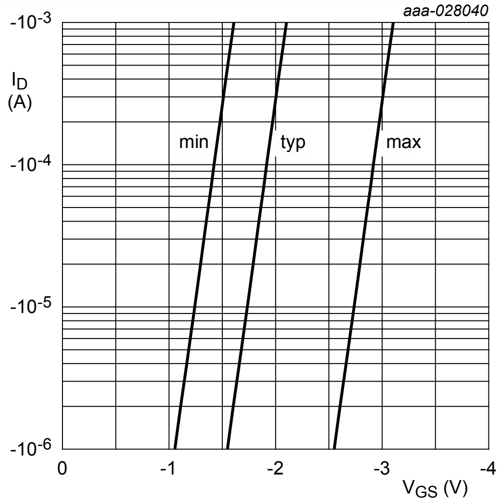
Table 7. Characteristics
T_j = 25 °C unless otherwise specified

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = -250 µA; V_{GS} = 0 V		-30	-	-	V
V_{GSth}	gate-source threshold voltage	I_D = -250 µA; V_{DS} = V_{GS}; T_j = 25 °C		-1.5	-2	-3	V
I_{DSS}	drain leakage current	V_{DS} = -30 V; V_{GS} = 0 V; T_j = 25 °C		-	-	-1	µA
		V_{DS} = -30 V; V_{GS} = 0 V; T_j = 175 °C		-	-	-100	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C		-	-	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C		-	-	-100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = -10 V; I_D = -8.6 A; T_j = 25 °C		-	14	20	mΩ
		V_{GS} = -10 V; I_D = -8.6 A; T_j = 175 °C		-	21	30	mΩ
		V_{GS} = -4.5 V; I_D = -5.4 A		-	35	52	mΩ
g_{fs}	forward transconductance	V_{DS} = -10 V; I_D = -2 A; T_j = 25 °C		-	53	-	S
R_G	gate resistance	f = 1 MHz		-	7	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = -15 V; I_D = -8.6 A; V_{GS} = -10 V		-	24	28	nC
Q_{GS}	gate-source charge			-	4.7	-	nC
Q_{GD}	gate-drain charge			-	5.3	-	nC
C_{iss}	input capacitance	V_{DS} = -15 V; f = 1 MHz; V_{GS} = 0 V		-	1408	-	pF
C_{oss}	output capacitance			-	277	-	pF
C_{rss}	reverse transfer capacitance			-	158	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = -15 V; I_D = -8.6 A; V_{GS} = -10 V; $R_{G(ext)}$ = 6 Ω		-	7	-	ns
t_r	rise time			-	34	-	ns
$t_{d(off)}$	turn-off delay time			-	41	-	ns
t_f	fall time			-	24	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = -41 A; V_{GS} = 0 V; T_j = 25 °C		-	-0.7	-1.2	V
t_{rr}	reverse recovery time	I_S = -8.6 A; dI_S/dt = 100 A/µs; V_{GS} = 0 V; V_{DS} = -15 V; T_j = 25 °C		-	23	-	ns
Q_r	recovered charge			-	13.4	-	nC



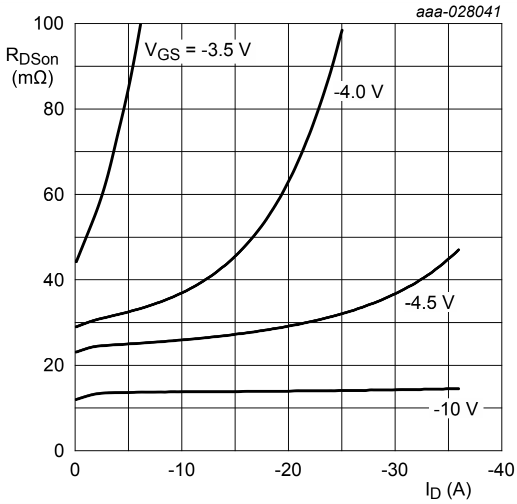
T_j = 25 °C

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



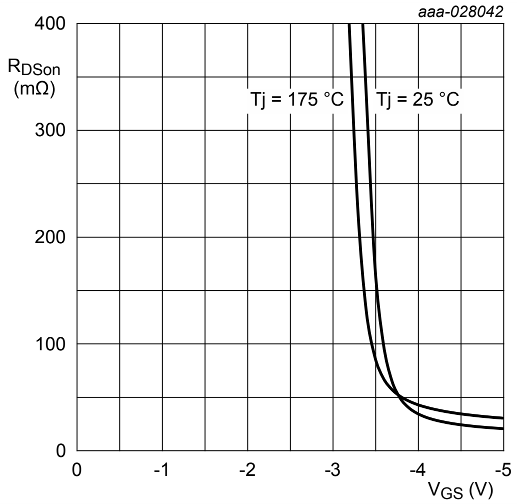
V_{DS} = -5 V; T_j = 25 °C

Fig. 6. Sub-threshold drain current as a function of gate-source voltage



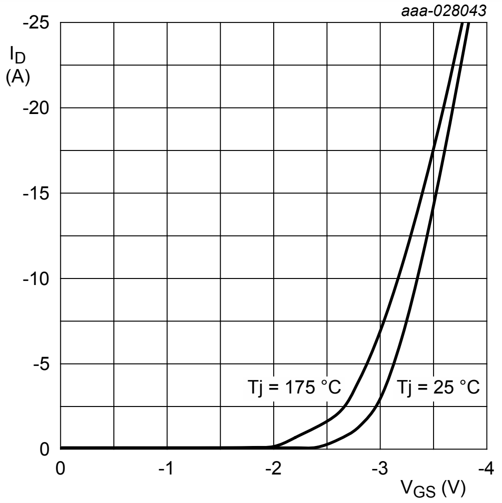
T_j = 25 °C

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



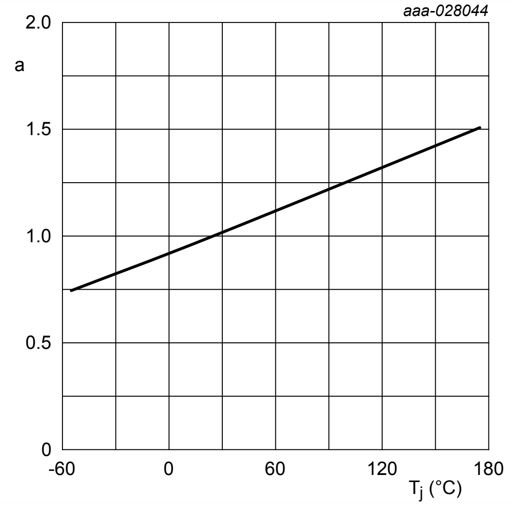
I_D = -8,6 A

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



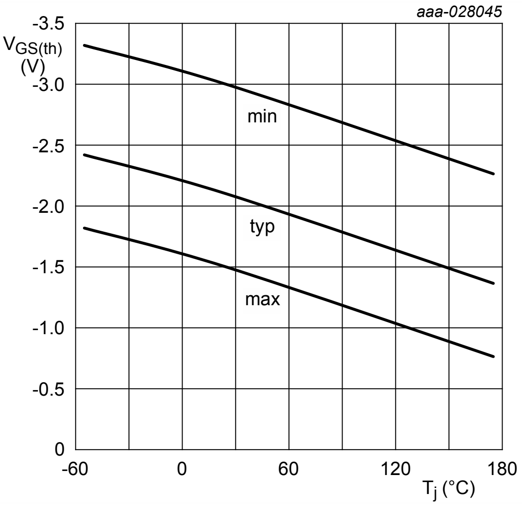
$V_{DS} > I_D \times R_{DSon}$

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



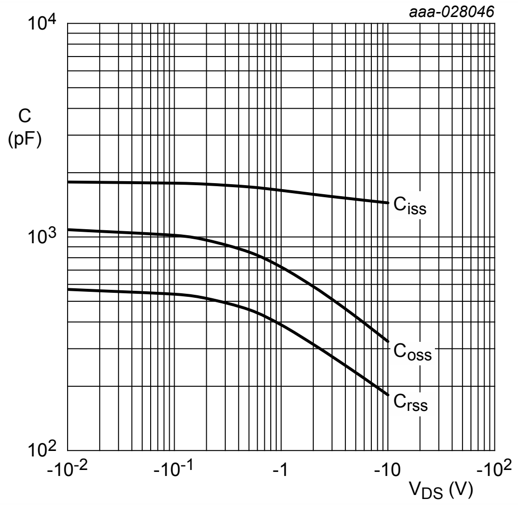
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



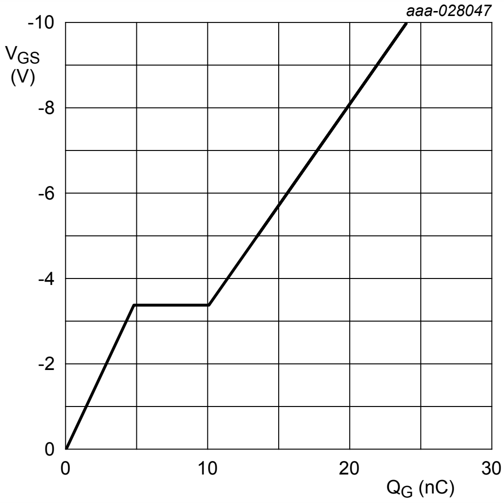
I_D = -250 µA; $V_{DS} = V_{GS}$

Fig. 11. Gate-source threshold voltage as a function of junction temperature



f = 1 MHz; V_{GS} = 0 V

Fig. 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



V_{DS} = -15 V; I_D = -8,6 A; T_{amb} = 25 °C

Fig. 13. Gate-source voltage as a function of gate charge; typical values

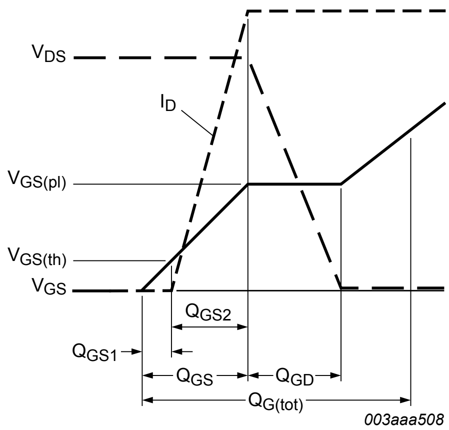
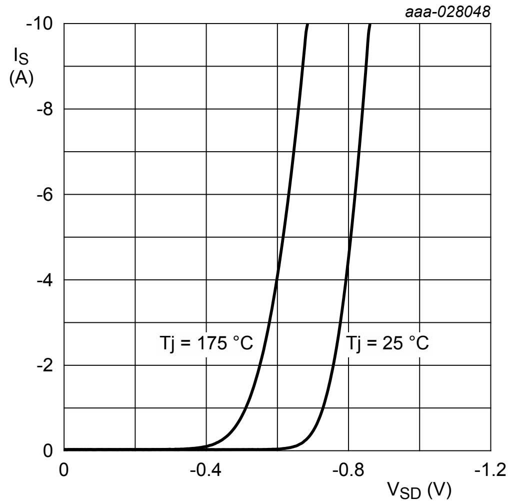


Fig. 14. Gate charge waveform definitions



V_{GS} = 0 V

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

11. Test information

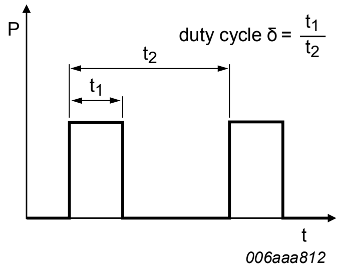


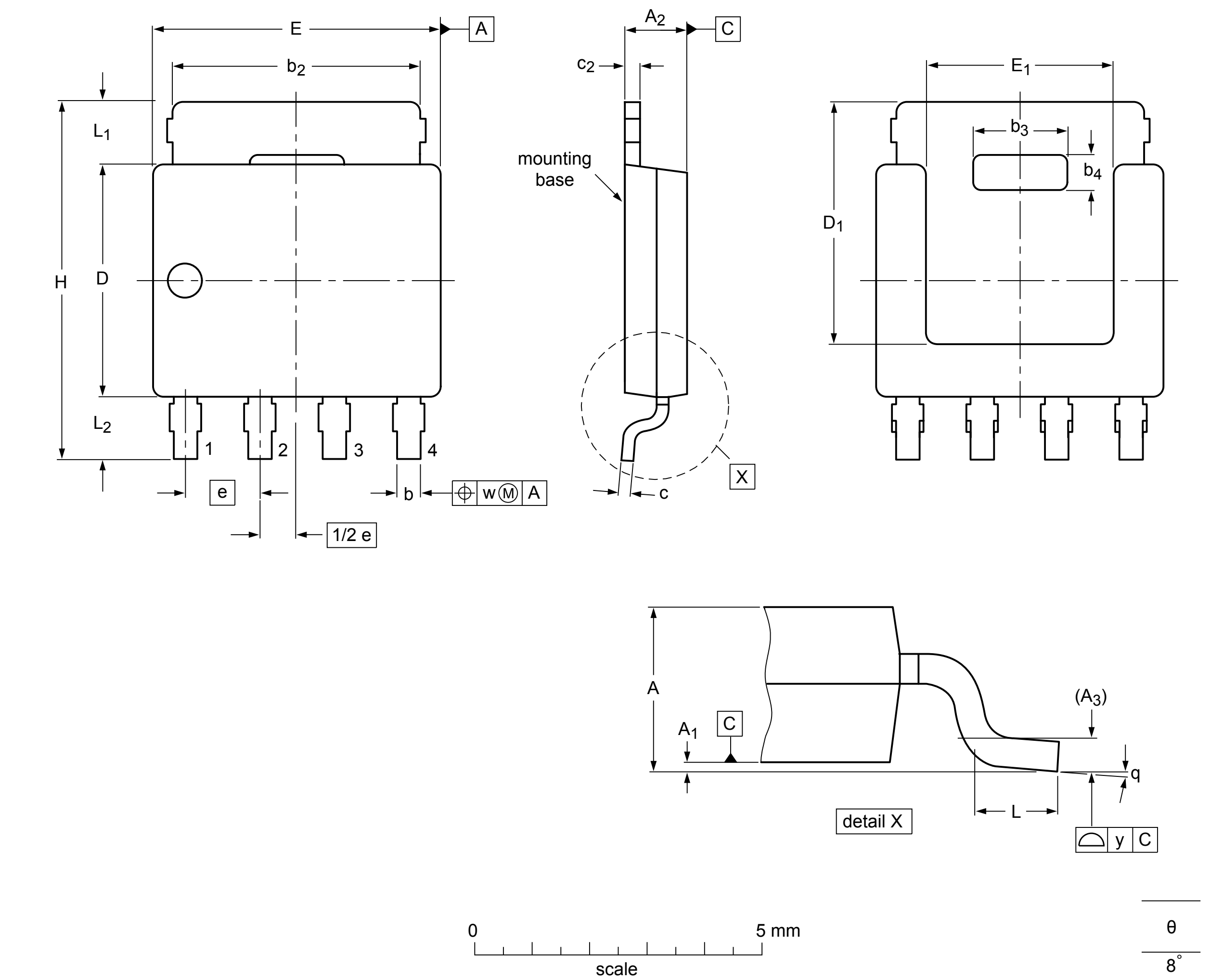
Fig. 16. Duty cycle definition

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline

Plastic single-ended surface-mounted package (LFPAK56; Power-SO8); 4 leads **SOT669**



Dimensions (mm are the original dimensions)

Unit[1]		A	A_1	A_2	A_3	b	b_2	b_3	b_4	c	c_2	D[1]	D_1[1]	E[1]	E_1[1]	e	H	L	L_1	L_2	w	y	θ
mm	max	1.20	0.15	1.10		0.50	4.41	2.2	0.9	0.25	0.30	4.10	4.20	5.0	3.3		6.2	0.85	1.3	1.3			8°
	nom				0.25											1.27					0.25	0.1	
	min	1.01	0.00	0.95		0.35	3.62	2.0	0.7	0.19	0.24	3.80		4.8	3.1		5.8	0.40	0.8	0.8			0°

Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

sot669_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT669		MO-235				~~11-03-25~~ 13-02-27

Fig. 17. Package outline LFPAK56; Power-SO8 (SOT669)

13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BUK6Y20-30P v.2	20180307	Product data sheet	-	20180207
Modification:	• Limiting values: Specifications revised • Characteristics: I_{GSS} specification revised			
BUK6Y20-30P v.1	20180207	Product data sheet	-	-

14. 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.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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15. Contents

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Date of release: 7 March 2018