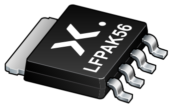


BUK6Y32-60P

60 V, P-channel Trench MOSFET

5 July 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

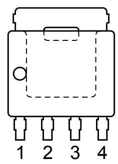
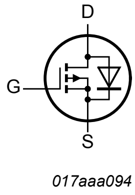
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DS}	drain-source voltage	T_j = 25 °C		-	-	-60	V
V_{GS}	gate-source voltage		[1]	-20	-	20	V
I_D	drain current	V_{GS} = -10 V; T_{mb} = 25 °C		-	-	-40	A
P_{tot}	total power dissipation	T_{mb} = 25 °C		-	-	106	W
Static characteristics							
R_{DSon}	drain-source on-state resistance	V_{GS} = -10 V; I_D = -6.6 A; T_j = 25 °C		-	25	32	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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	S	source	 **LFPAK56; Power-SO8 (SOT669)**	
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
BUK6Y32-60P	LFPAK56; Power-SO8	plastic, single-ended surface-mounted package; 4 terminals	SOT669

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK6Y32-60P	6Y3260P

8. Limiting values

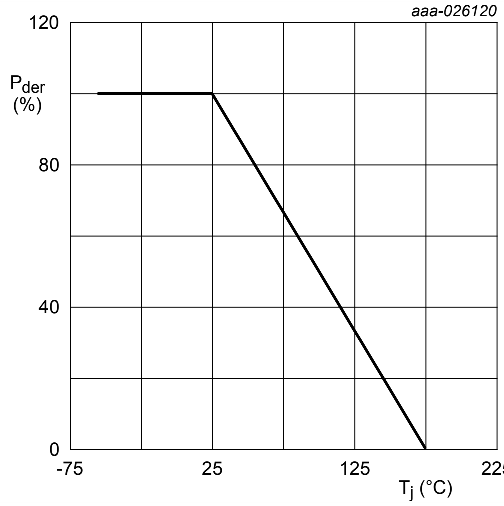
Table 5. Limiting values

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		-	-60	V
V_{GS}	gate-source voltage		[1]	-20	20	V
I_D	drain current	V_{GS} = -10 V; T_{mb} = 25 °C		-	-40	A
		V_{GS} = -10 V; T_{mb} = 100 °C		-	-28	A
I_{DM}	peak drain current	single pulse; $t_p \leq$ 10 μs; T_{mb} = 25 °C		-	-158	A
P_{tot}	total power dissipation	T_{mb} = 25 °C		-	106	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		-	-40	A
I_{SM}	peak source current	single pulse; $t_p \leq$ 10 μs; T_{mb} = 25 °C		-	-158	A
ESD maximum rating						
V_{ESD}	electrostatic discharge voltage	HBM	[2]	-	1000	V
Avalanche ruggedness						
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{sup} \leq$ -60 V; V_{GS} = -10 V; $T_{j(init)}$ = 25 °C; I_D = -8.2 A; DUT in avalanche (unclamped)		-	6.6	mJ

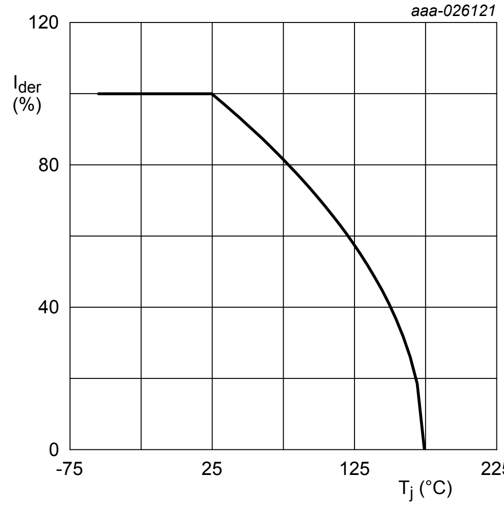
[1] V_{GS} = -20 V/+5 V according AEC-Q101 at T_j = 175 °C; V_{GS} = -20 V/+20 V according AEC-Q101 at T_j = 150 °C

[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

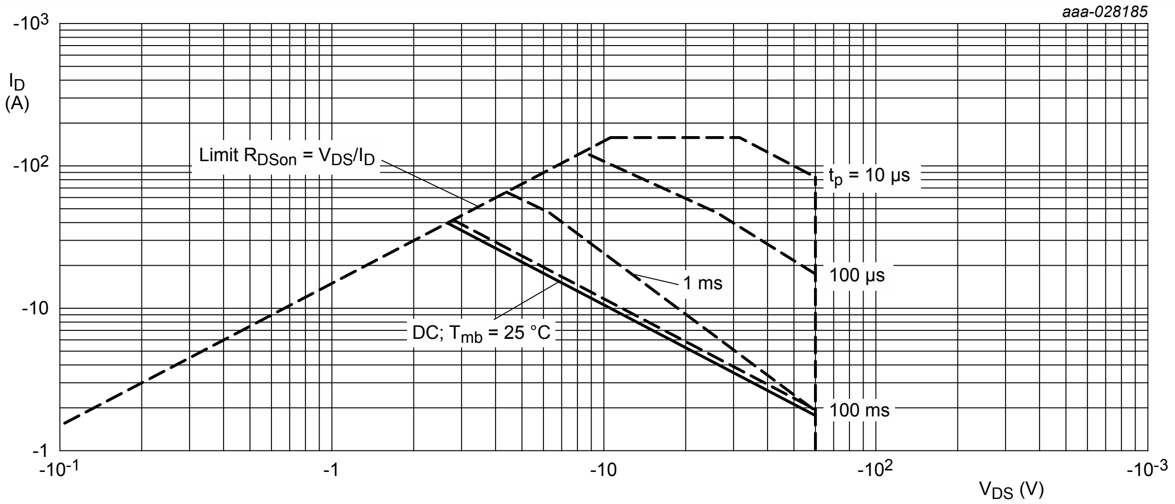


Fig. 3. Safe operating area; junction to mounting base; continuous and peak drain currents as a function of drain-source voltage

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			-	1.1	1.4	K/W

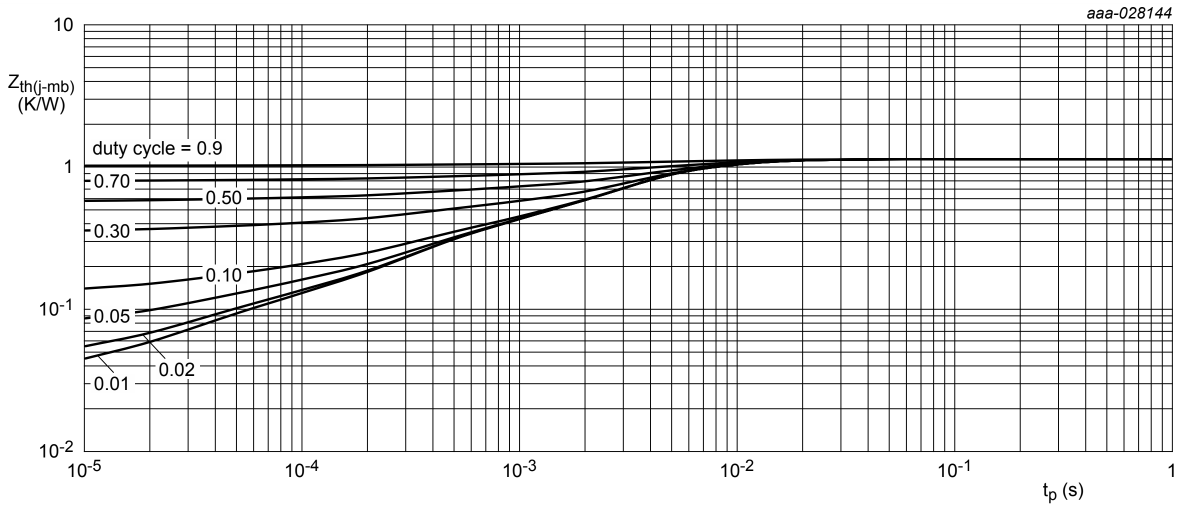
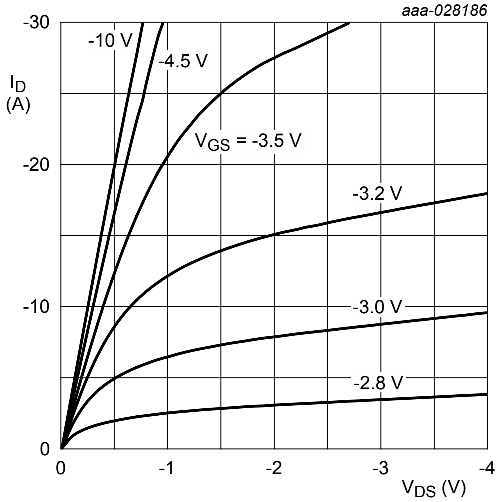


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration; typical values

10. Characteristics

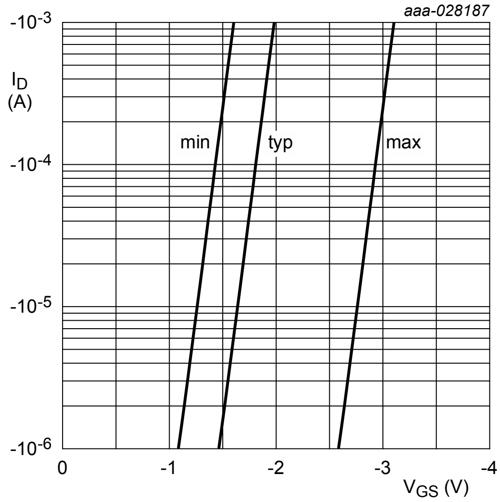
Table 7. Characteristics
T_j = 25 °C unless otherwise specified

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = -250 µA; V_{GS} = 0 V		-60	-	-	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} = -60 V; V_{GS} = 0 V; T_j = 25 °C		-	-	-1	µA
		V_{DS} = -60 V; V_{GS} = 0 V; T_j = 175 °C		-	-	-50	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 = -6.6 A; T_j = 25 °C		-	25	32	mΩ
		V_{GS} = -10 V; I_D = -6.6 A; T_j = 175 °C		-	53	67	mΩ
		V_{GS} = -4.5 V; I_D = -6.4 A		-	29	34	mΩ
g_{fs}	forward transconductance	V_{DS} = -10 V; I_D = -2 A; T_j = 25 °C		-	47	-	S
R_G	gate resistance	f = 1 MHz		-	6.1	-	Ω
Dynamic characteristics							
$Q_{G(tot)}$	total gate charge	V_{DS} = -30 V; I_D = -6.6 A; V_{GS} = -10 V		-	46	52.9	nC
Q_{GS}	gate-source charge			-	7.3	-	nC
Q_{GD}	gate-drain charge			-	9.4	-	nC
C_{iss}	input capacitance	V_{DS} = -30 V; f = 1 MHz; V_{GS} = 0 V		-	2590	-	pF
C_{oss}	output capacitance			-	202	-	pF
C_{rss}	reverse transfer capacitance			-	118	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = -30 V; I_D = -6.6 A; V_{GS} = -10 V; $R_{G(ext)}$ = 6 Ω		-	9	-	ns
t_r	rise time			-	16	-	ns
$t_{d(off)}$	turn-off delay time			-	81	-	ns
t_f	fall time			-	31	-	ns
Source-drain diode							
V_{SD}	source-drain voltage	I_S = -39.5 A; V_{GS} = 0 V; T_j = 25 °C		-	-0.7	-1.2	V
t_{rr}	reverse recovery time	I_S = -6.6 A; dI_S/dt = 100 A/µs; V_{GS} = 0 V; V_{DS} = -30 V; T_j = 25 °C		-	28	-	ns
Q_r	recovered charge			-	29	-	nC



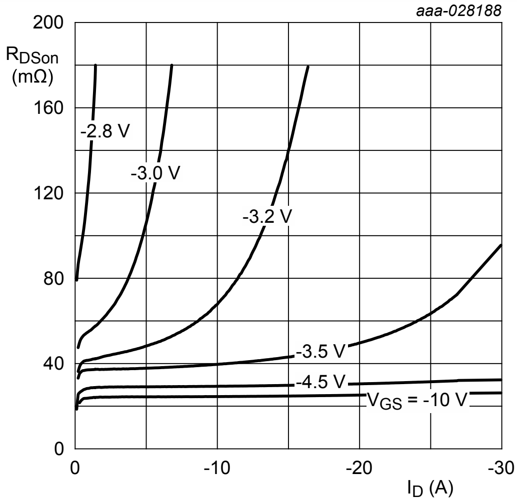
T_j = 25 °C

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



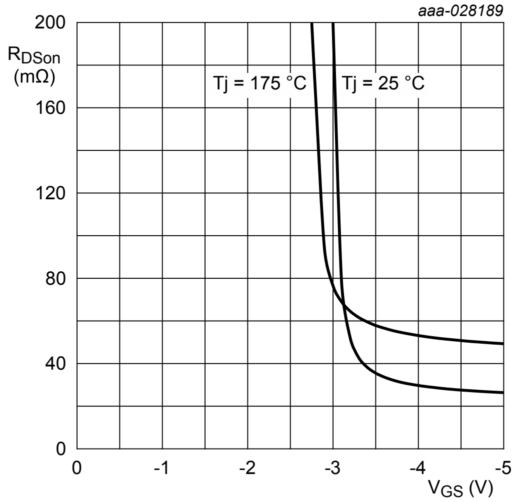
V_{DS} = -5 V; T_j = 25 °C

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



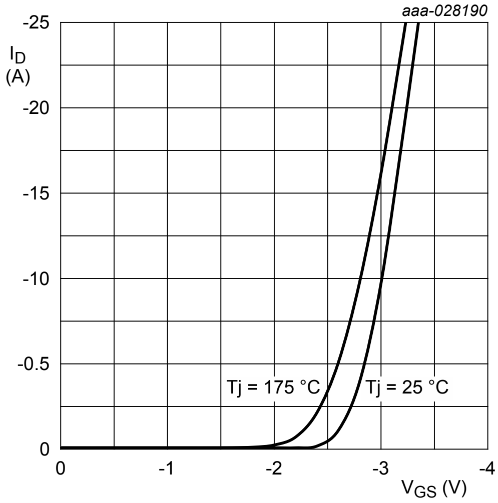
T_j = 25 °C

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



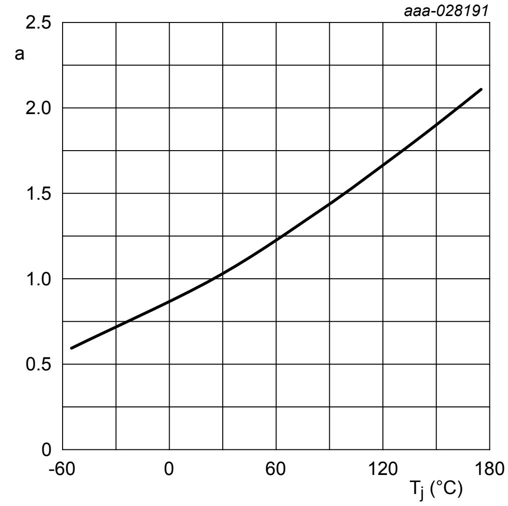
I_D = -7 A

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



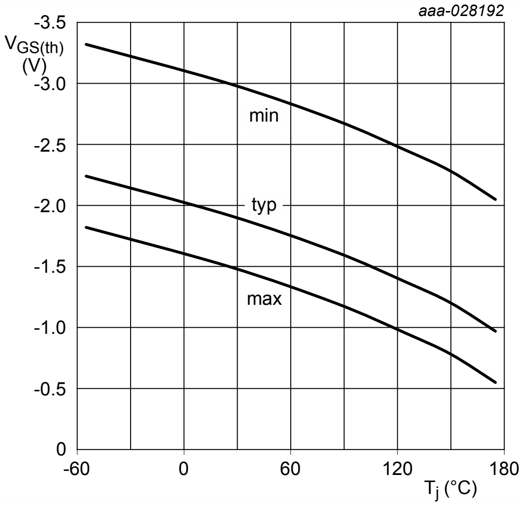
$V_{DS} > I_D \times R_{DSon}$

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



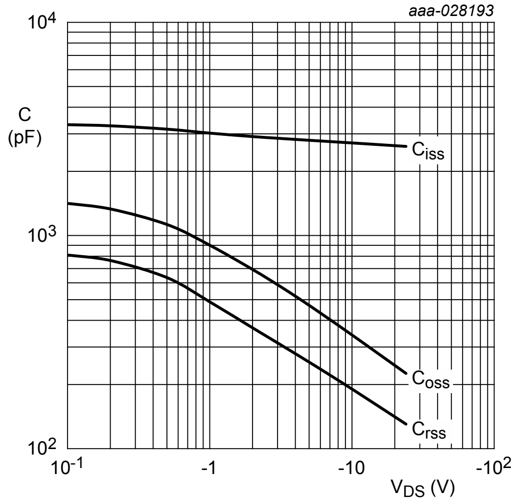
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

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



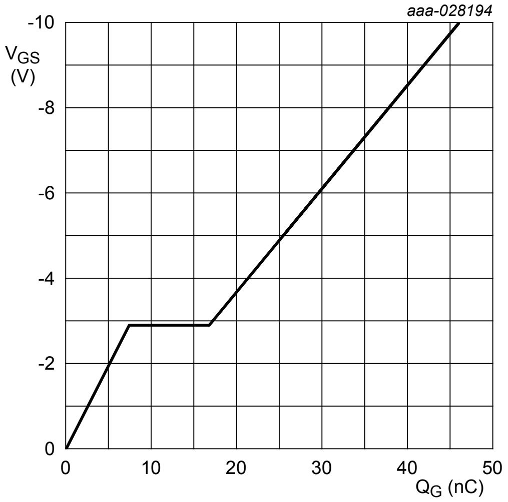
I_D = -250 µA; $V_{DS} = V_{GS}$

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} = -30 V; I_D = -8.2 A; T_{amb} = 25 °C

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

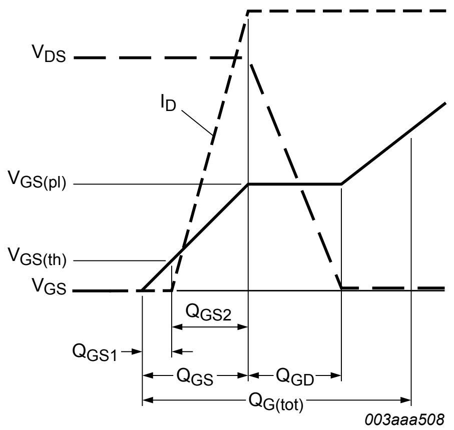
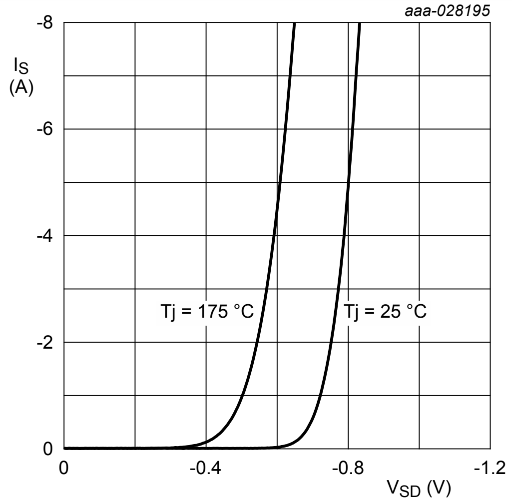


Fig. 14. Gate charge waveform definitions



V_{GS} = 0 V

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

11. Test information

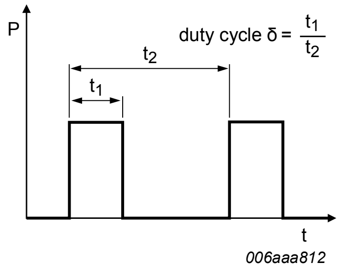


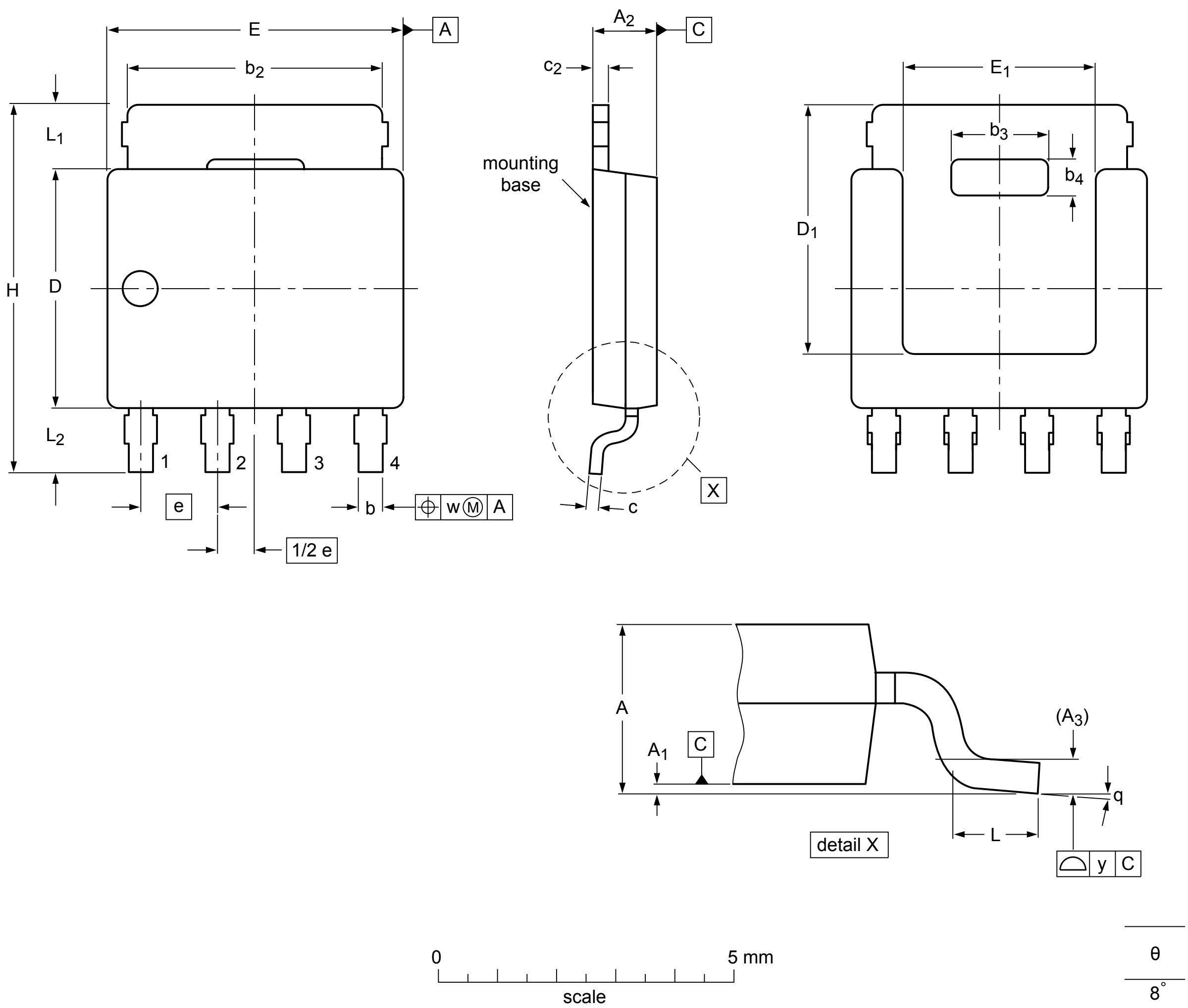
Fig. 16. Duty cycle definition

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
BUK6Y32-60P v.3	20180705	Product data sheet	-	BUK6Y32-60P v.2
Modifications:	• Characteristics: Fig. 5 updated.			
BUK6Y32-60P v.2	20180607	Product data sheet	-	BUK6Y32-60P v.1
BUK6Y32-60P v.1	20180309	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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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Date of release: 5 July 2018