

General Description

The HSBG2024 is the high cell density trench N-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications.

The HSBG2024 meets the RoHS and Green Product requirement with full function reliability approved.

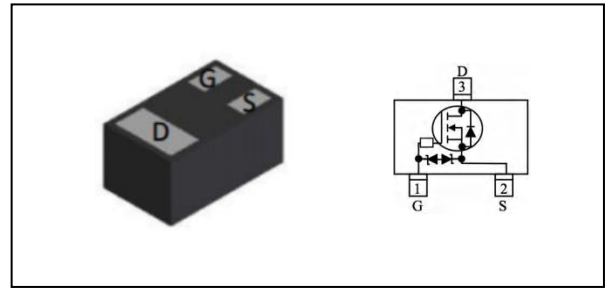
Features

- Small Single Switch
- Load Switch
- ESD Protected Gate
- Low Gate Threshold Voltage

Product Summary

V_{DS}	20	V
$R_{DS(ON),typ}$	190	mΩ
I_D	1.4	A

DFN1006 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	±8	V
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, V_{GS} @ 4.5V ¹	1.4	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, V_{GS} @ 4.5V ¹	1.11	A
I_{DM}	Pulsed Drain Current ²	3.5	A
$P_D@T_A=25^{\circ}C$	Total Power Dissipation ³	0.7	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	---	200	°C/W



Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=4.5V, I_D=550mA$	---	190	230	$m\Omega$
		$V_{GS}=2.5V, I_D=450mA$	---	234	305	
		$V_{GS}=1.8V, I_D=350mA$	---	303	455	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	0.5	0.7	1	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=16V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=16V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 8V, V_{DS}=0V$	---	---	± 10	μA
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=550mA$	1	---	---	S
Q_g	Total Gate Charge (4.5V)	$V_{DS}=10V, V_{GS}=4.5V, I_D=1000mA$	---	1.2	---	nC
Q_{gs}	Gate-Source Charge		---	2.1	---	
Q_{gd}	Gate-Drain Charge		---	0.31	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=10V, V_{GS}=4.5V, R_G=6\Omega, I_D=500mA$	---	1.2	---	ns
T_r	Rise Time		---	24	---	
$T_{d(off)}$	Turn-Off Delay Time		---	15	---	
T_f	Fall Time		---	14	---	
C_{iss}	Input Capacitance	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	---	44	---	pF
C_{oss}	Output Capacitance		---	9	---	
C_{rss}	Reverse Transfer Capacitance		---	5	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,4}	$V_G=V_D=0V$, Force Current	---	---	1.4	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.1	V

Note :

1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

3.The power dissipation is limited by 150°C junction temperature

4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.



Typical Characteristics

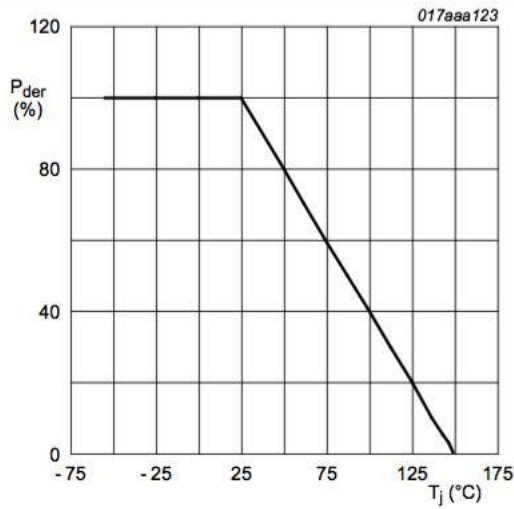


Fig. 1. Normalized total power dissipation as a function of junction temperature

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

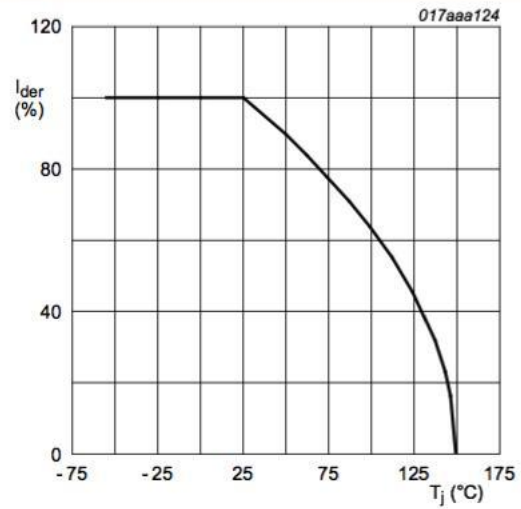


Fig. 2. Normalized continuous drain current as a function of junction temperature

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

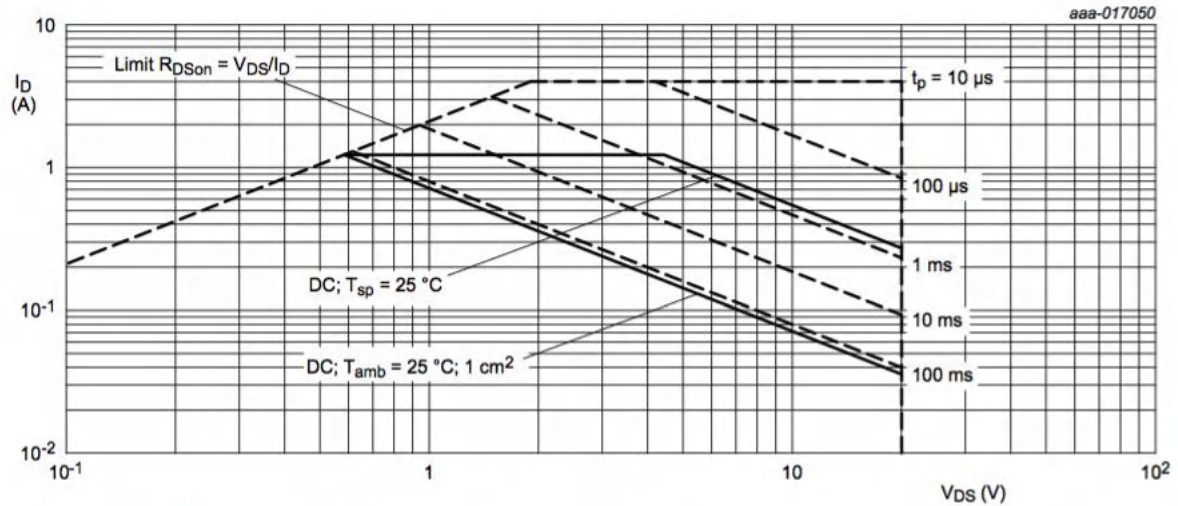
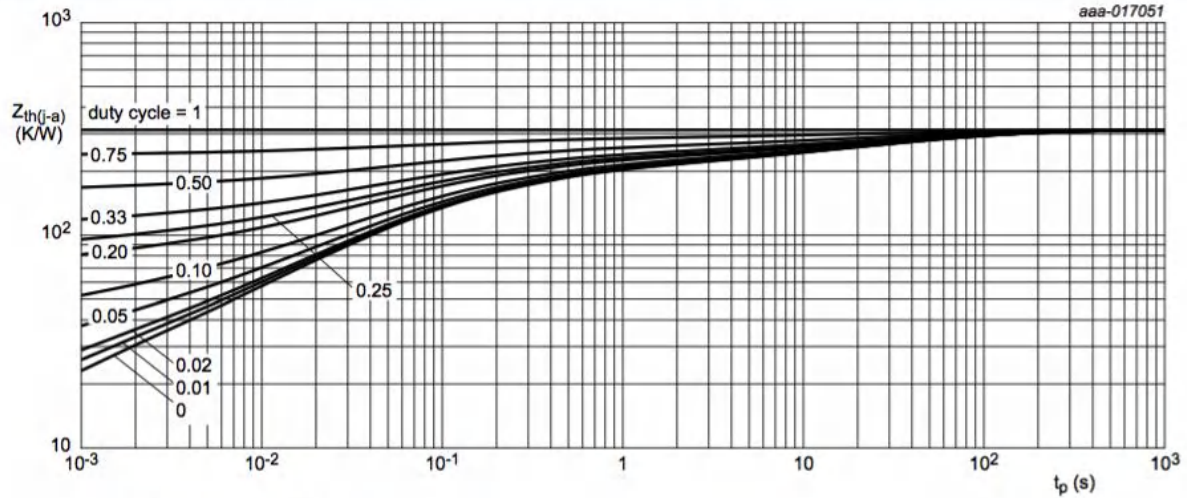
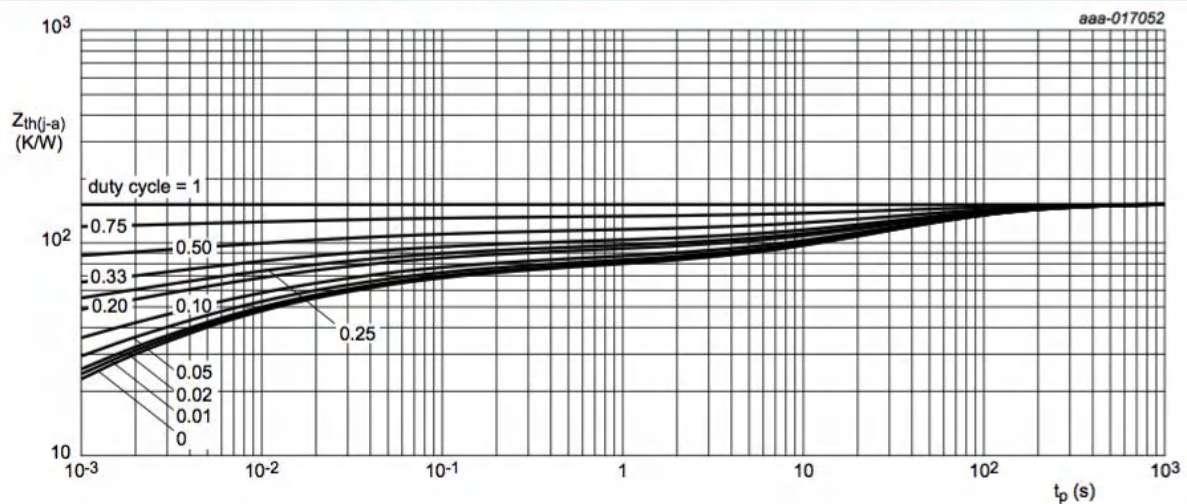


Fig. 3. Safe operating area; junction to ambient; continuous and peak drain currents as a function of drain-source voltage



FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for drain = 1 cm^2

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

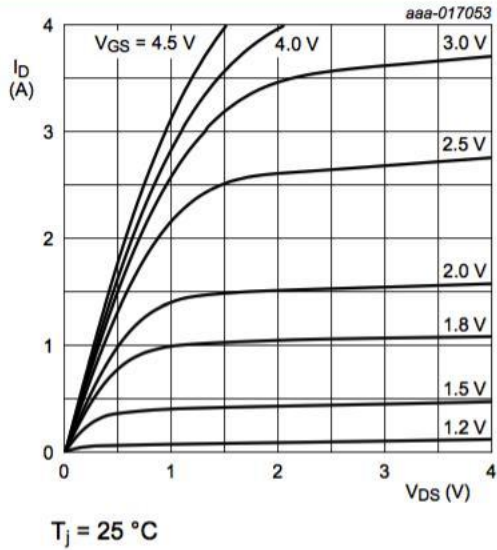


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

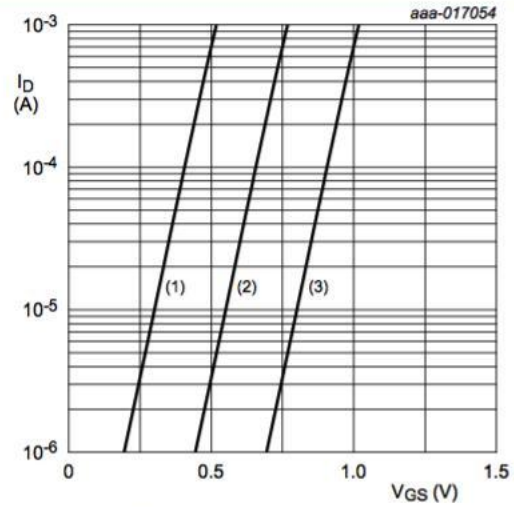


Fig. 7. Sub-threshold drain current as a function of gate-source voltage
(1) minimum values
(2) typical values
(3) maximum values

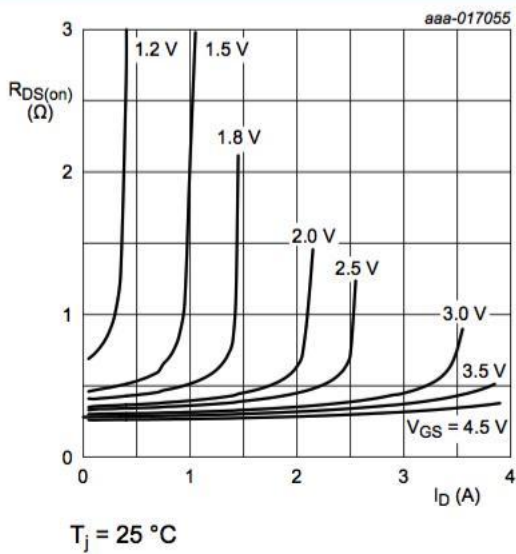


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

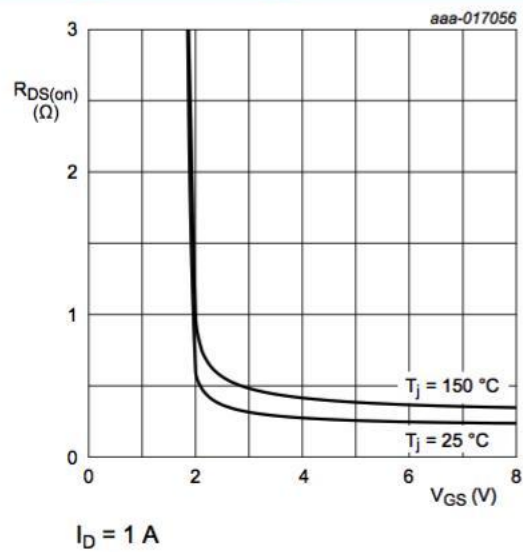


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

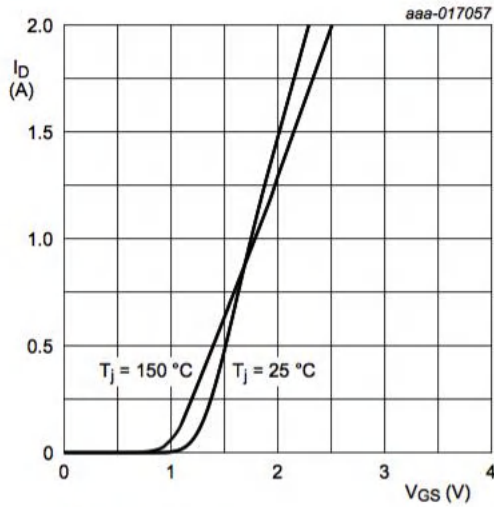


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

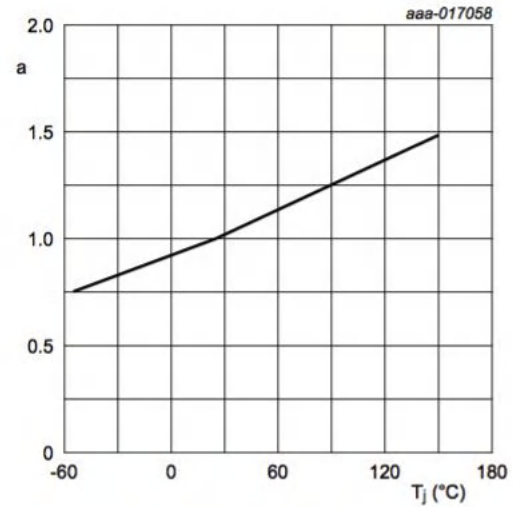
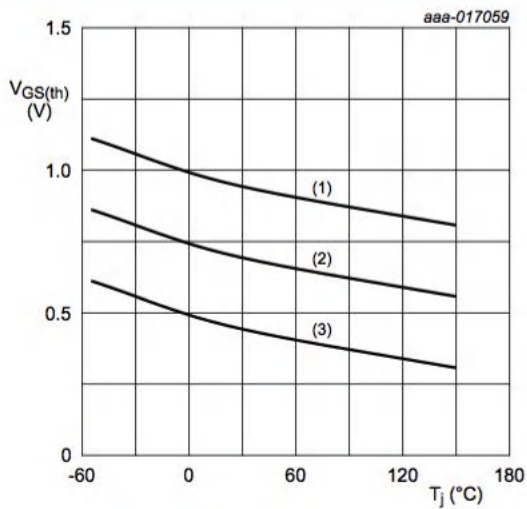


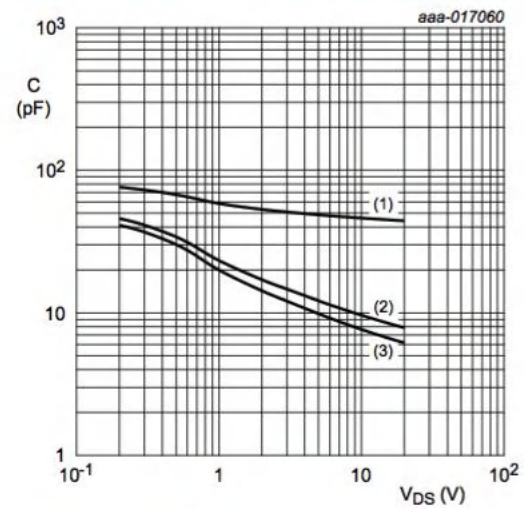
Fig. 11. Normalized drain-source on-state resistance as a function of ambient temperature; typical values

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



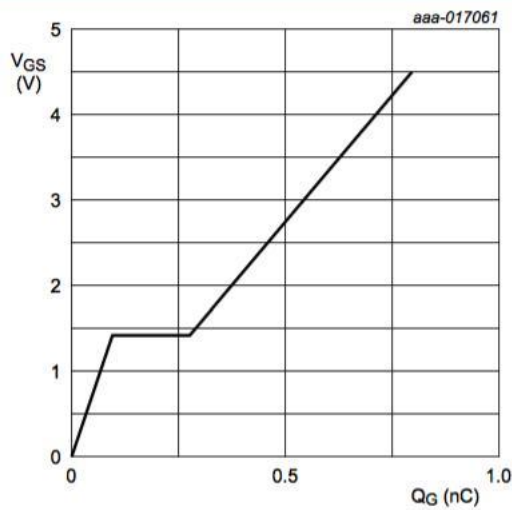
$I_D = 250\text{ }\mu\text{A}$; $V_{DS} = V_{GS}$
(1) maximum values
(2) typical values
(3) minimum values

Fig. 12. Gate-source threshold voltage as a function of ambient temperature



$f = 1\text{ MHz}$; $V_{GS} = 0\text{ V}$
(1) C_{iss}
(2) C_{oss}
(3) C_{rss}

Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



$V_{DS} = 10 \text{ V}$; $I_D = 0.5 \text{ A}$
 $T_{amb} = 25 \text{ }^{\circ}\text{C}$

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

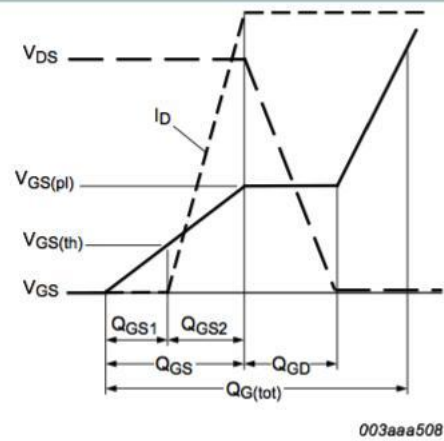
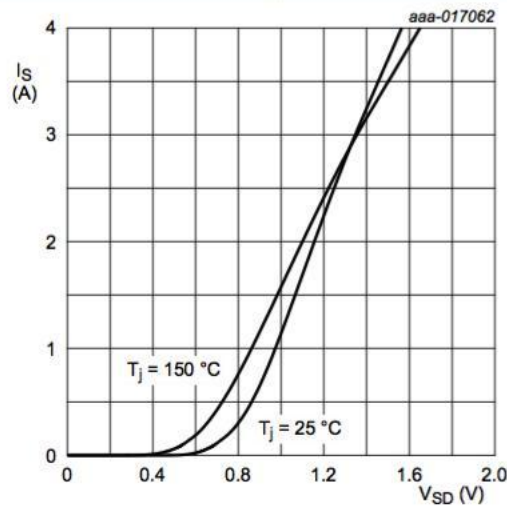


Fig. 15. Gate charge waveform definitions



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

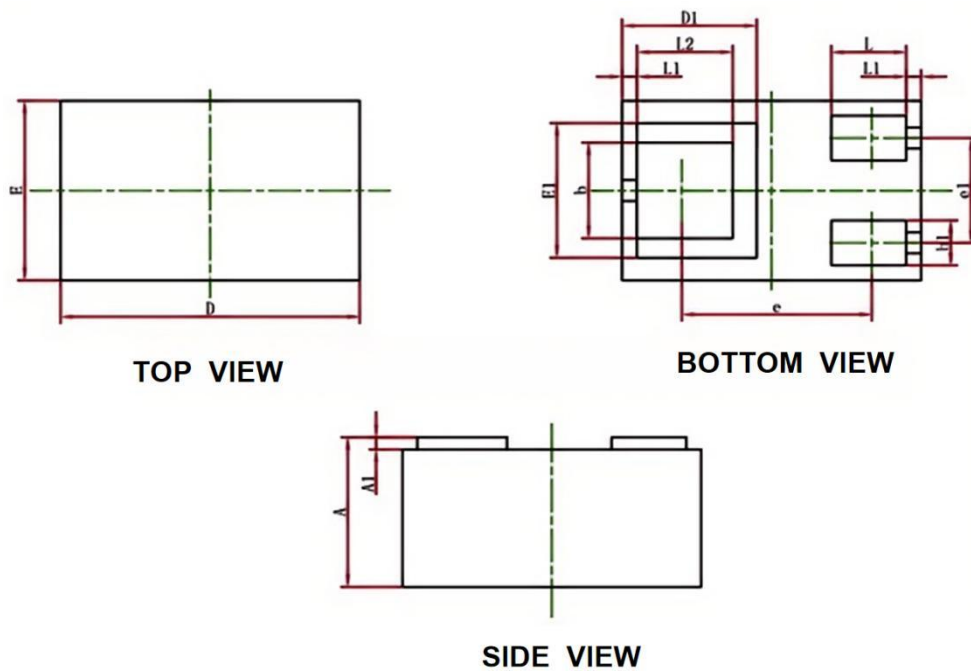
Fig. 16. Source current as a function of source-drain voltage; typical values



Ordering Information

Part Number	Package code	Packaging
HSBG2024	DFN1006-3	10000/Tape&Reel

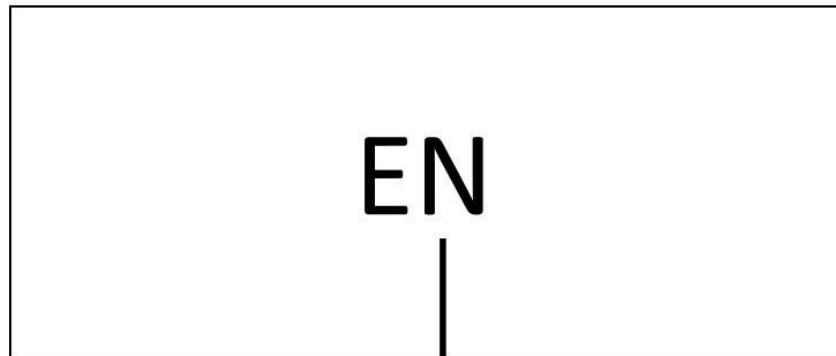
DFN1006-3 Package Outline



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.450	0.550	0.018	0.022
AL	0.010	0.100	0.000	0.004
D	0.950	1.050	0.037	0.041
E	0.550	0.650	0.022	0.026
D1	0.450REF.		0.0178REF.	
E1	0.450REF.		0.0178REF.	
b	0.270	0.370	0.011	0.015
bl	0.100	0.200	0.004	0.008
e	0.635REF.		0.025REF.	
el	0.300	0.400	0.012	0.016
L	0.200	0.300	0.008	0.012
L1	0.050REF.		0.002REF.	
L2	0.270	0.370	0.011	0.015



HSBG2024 Marking



Part Number