

General Description

This MOSFET uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a wide variety of applications.

Features

- Low gate charge
- 100% UIS tested, 100% DVDS tested
- High power and current handing capability
- Lead free product is acquired

Applications

- DC/DC converter
- Ideal for high-frequency switching and synchronous rectification



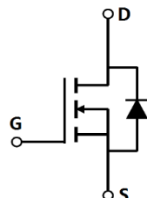
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(ON), max} @ V_{GS}=10V$	3.1	$m\Omega$
I_D	141	A
Q_g	108	nC

Marking Information

Product Name	Package	Marking
OSH04N031DF	TO-252	OSH04N031D

Package & Pin information



Absolute Maximum Ratings at $T_j=25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	40	V
Gate-source voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	141	A
Pulsed Drain Current ¹⁾	$I_{D,pulse}$	564	A
Power Dissipation	P_D	104	W
Single pulsed avalanche energy ²⁾	E_{AS}	240	mJ
Operation and storage temperature	T_{stg}, T_j	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	1.2	$^{\circ}\text{C/W}$

Electrical Characteristics at $T_j=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	40			V	$V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	1.0		2.5	V	$V_{DS}=V_{GS}, I_D=250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		2.4	3.1	$\text{m}\Omega$	$V_{GS}=10\text{ V}, I_D=20\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		3.0	4.0	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}, I_D=20\text{ A}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$
				-100		$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}$
Gate resistance	R_g		1		Ω	$f=1\text{ MHz}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		5815		pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1.0\text{ MHz}$
Output capacitance	C_{oss}		371		pF	
Reverse transfer capacitance	C_{rss}		366		pF	
Turn-on Delay Time	$t_{d(on)}$		16		ns	$V_{GS}=10\text{ V}$, $V_{DS}=20\text{ V}$, $R_G=6\ \Omega$, $I_D=20\text{ A}$
Turn-on Rise Time	t_r		12		ns	
Turn-Off Delay Time	$t_{d(off)}$		122		ns	
Turn-Off Fall Time	t_f		48		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total Gate Charge	Q_g		108		nC	$V_{GS}=10\text{ V}$, $V_{DS}=20\text{ V}$, $I_D=20\text{ A}$
Gate-Source Charge	Q_{gs}		12		nC	
Gate-Drain Charge	Q_{gd}		18		nC	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Source drain current (Body Diode)	I_{SD}			141	A	$T_A=25^\circ\text{C}$
Diode forward voltage ³⁾	V_{SD}			1.2	V	$I_S=20\text{ A}$, $V_{GS}=0\text{ V}$
Reverse Recovery Time	t_{rr}		31		ns	$I_F=20\text{ A}$, $di/dt=100\text{ A/us}$
Reverse Recovery Charge	Q_{rr}		26		nC	

Note: 1) Pulse width limited by maximum allowable junction temperature.
 2) EAS condition: $T_J=25^\circ\text{C}$, $V_{DD}=40\text{ V}$, $V_G=10\text{ V}$, $R_G=25\ \Omega$, $L=0.5\text{ mH}$.
 3) Repetitive Rating: Pulse width limited by maximum junction temperature.

Electrical Characteristics Diagrams

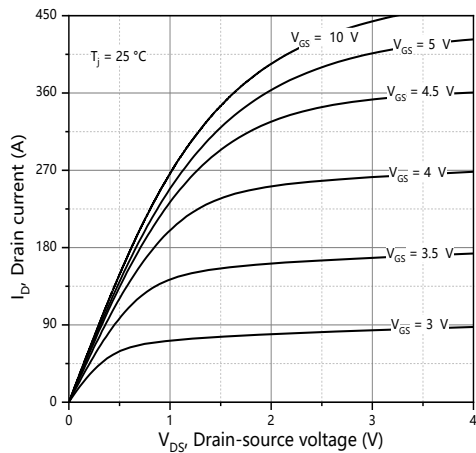


Figure 1. Typ. output characteristics

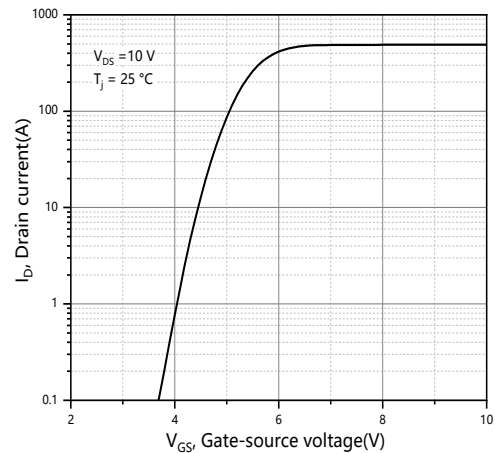


Figure 2. Typ. transfer characteristics

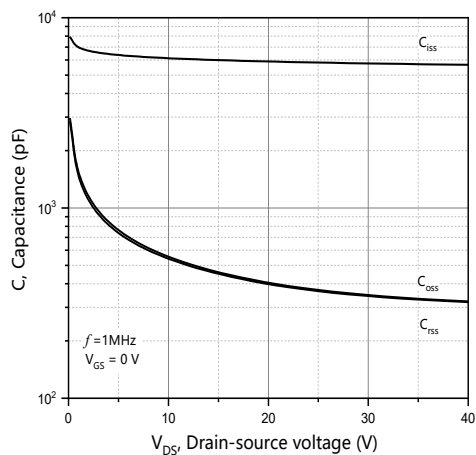


Figure 3. Typ. capacitances

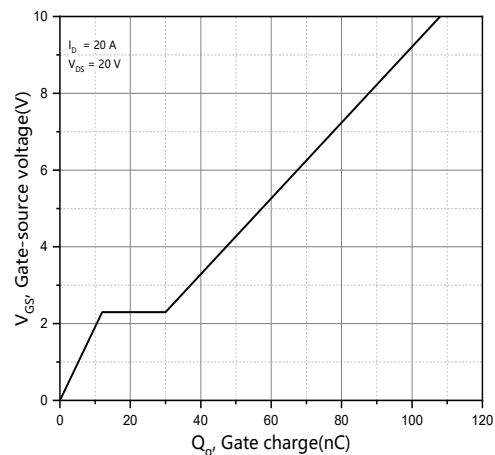


Figure 4. Typ. gate charge

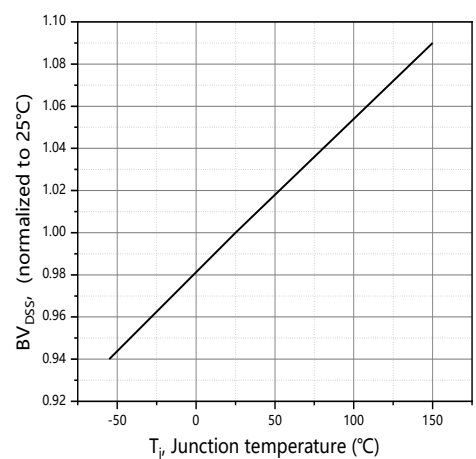


Figure 5. Drain-source breakdown voltage

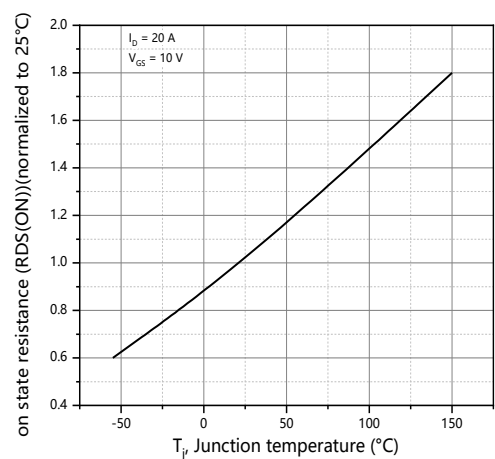


Figure 6. Drain-source on-state resistance

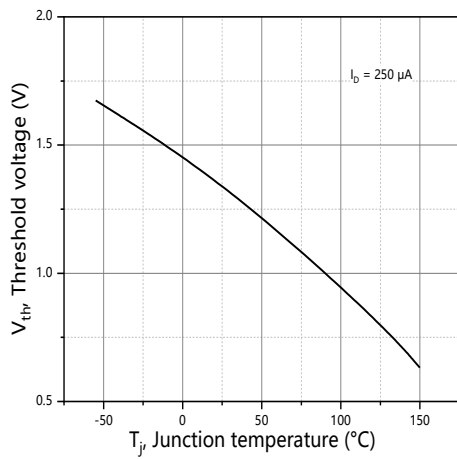


Figure 7. Threshold voltage

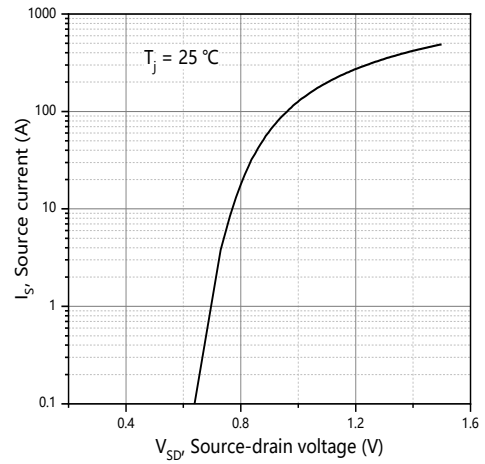


Figure 8. Forward characteristic of body diode

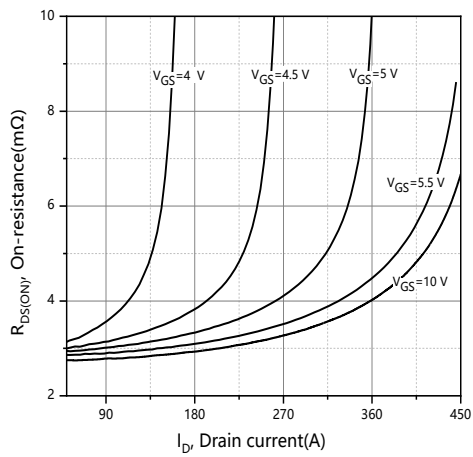


Figure 9. Drain-source on-state resistance

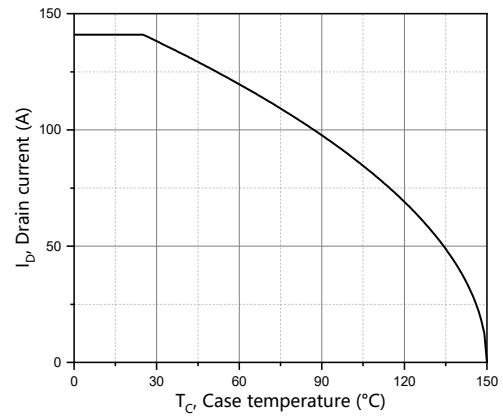


Figure 10. Drain current

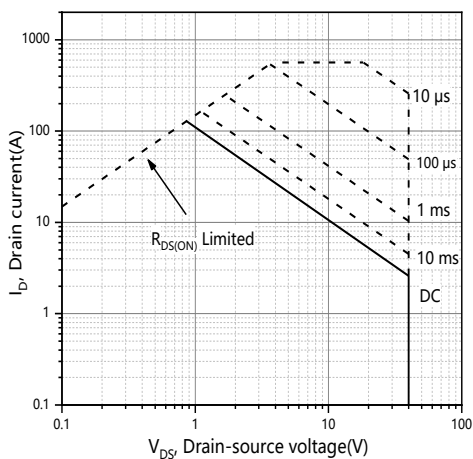


Figure 11. Safe operation area $T_c=25^{\circ}\text{C}$

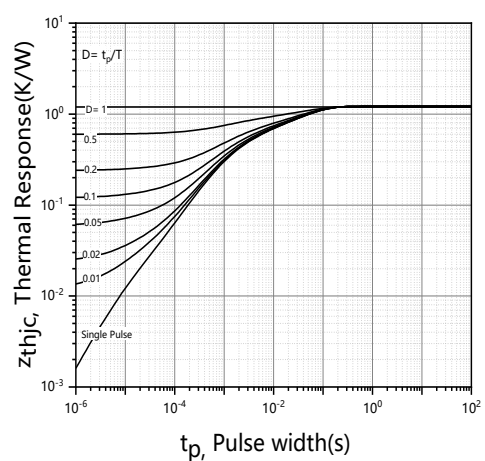
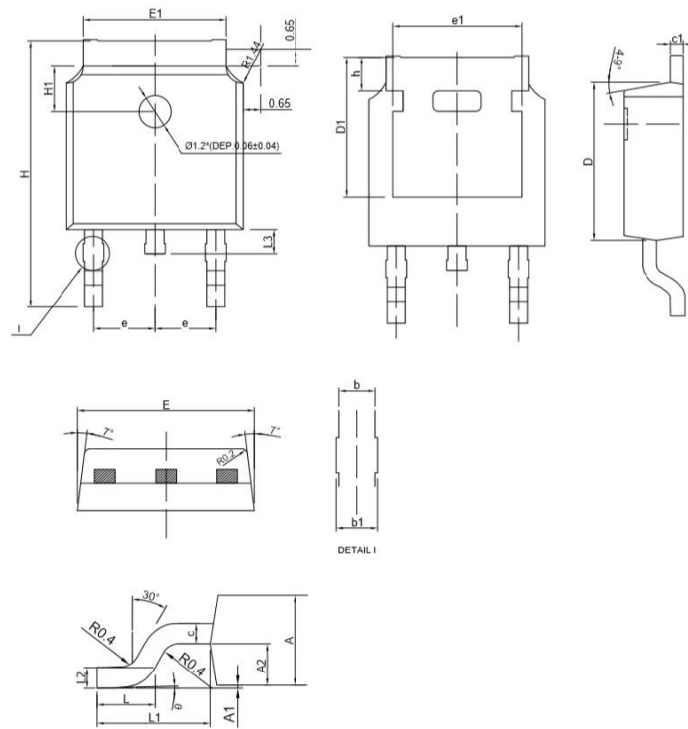


Figure 12. Max. transient thermal impedance

Package Information



Symbol	mm		
	Min.	Typ.	Max.
A	2.200	2.300	2.400
A1	0.000	0.075	0.15
A2	0.97	1.02	1.07
b	0.60	0.67	0.74
b1	0.65	-	1.15
c	0.508	0.528	0.548
c1	0.478	0.508	0.538
D	6.0	6.1	6.2
D1	5.15	5.25	5.35
E	6.5	6.6	6.7
E1	5.184	5.334	5.484
e	2.286BSC		
e1	4.806	4.826	4.846
H	9.8	10.0	10.2
H1	1.5	1.6	1.7
h	1.15	1.25	1.35
L	1.4	1.5	1.6
L1	2.888REF		
L2	0.51BSC		
L3	0.8	0.9	1.0
θ	0°	-	10°

Version1: TO-252-G package outline dimension

Ordering Information

Package Type	Units/ Reel	Reels/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO-252-G	2500	1	2500	6	15000

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