



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 handling capability
- Lead free product is acquired



Applications

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

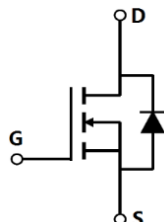
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(ON), typ} @ V_{GS}=10V$	2.4	$m\Omega$
I_D	141	A
Q_g	108	nC

Marking Information

Product Name	Package	Marking
OSH04N031PF	TO220	OSH04N031P

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 ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	141	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		89	
Pulsed Drain Current ²⁾	$I_{D,pulse}$	564	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	141	A
Power Dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	104	W
Power Dissipation ³⁾ , $T_C=100^{\circ}\text{C}$		42	
Single pulsed avalanche energy ⁴⁾	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-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	m Ω	$V_{GS}=10\text{ V}, I_D=20\text{ A}$
			3	4		$V_{GS}=4.5\text{ V}, I_D=20\text{ A}$
Forward transconductance	g_{FS}		44		S	$V_{DS}=5\text{ V}, I_D=15\text{ A}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=20\text{ V}$
				-100		$V_{GS}=-20\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_j=25^{\circ}\text{C}$
				100		$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_j=125^{\circ}\text{C}$
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	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}		371		pF	
Reverse transfer capacitance	C_{rss}		366		pF	
Turn-on delay time	$t_{d(on)}$		16		ns	$V_{GS}=10\text{ V}$, $V_{DS}=20\text{ V}$, $R_G=6\ \Omega$, $I_D=20\text{ A}$
Rise time	t_r		12		ns	
Turn-off delay time	$t_{d(off)}$		122		ns	
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
Diode forward voltage	V_{SD}			1.2	V	$I_S=20\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		31		ns	$I_F=20\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		26		nC	

Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) $V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $L=0.5\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

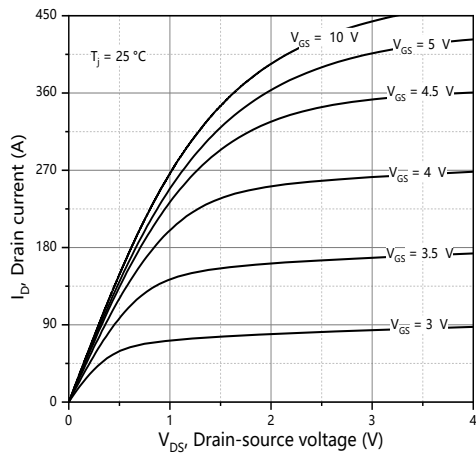


Figure 1. Typ. output characteristics

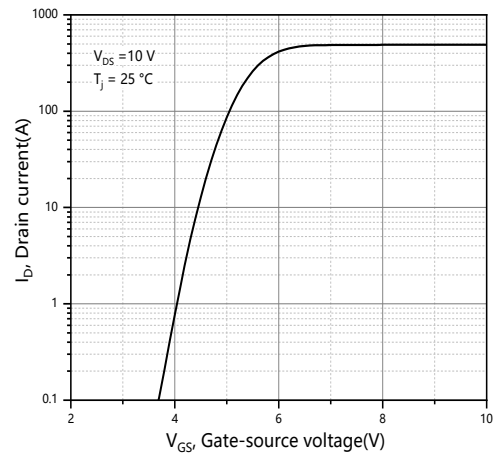


Figure 2. Typ. transfer characteristics

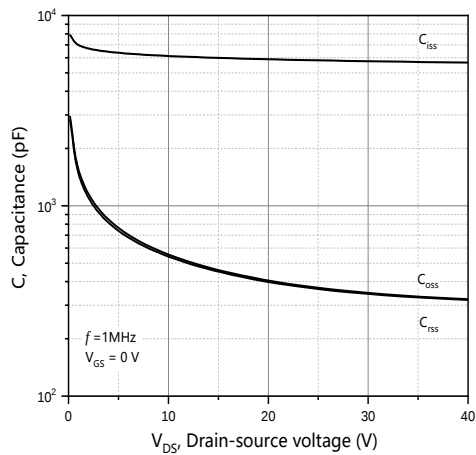


Figure 3. Typ. capacitances

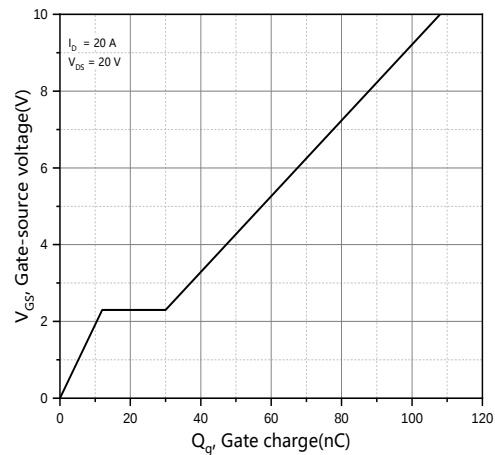


Figure 4. Typ. gate charge

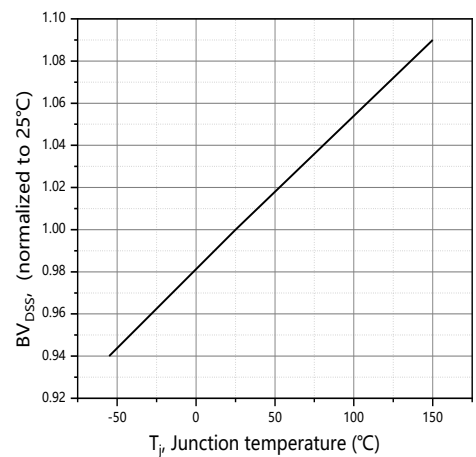


Figure 5. Drain-source breakdown voltage

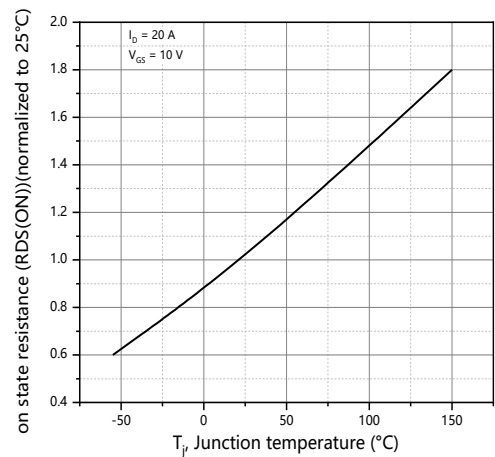


Figure 6. Drain-source on-state resistance

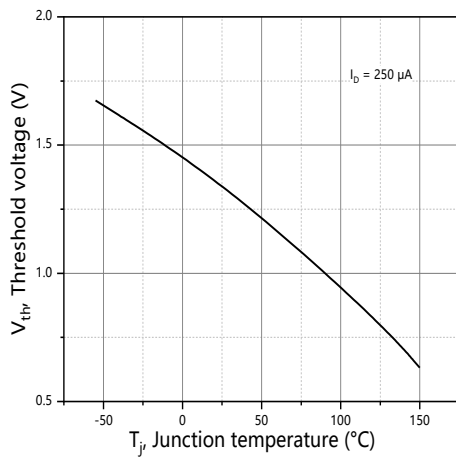


Figure 7. Threshold voltage

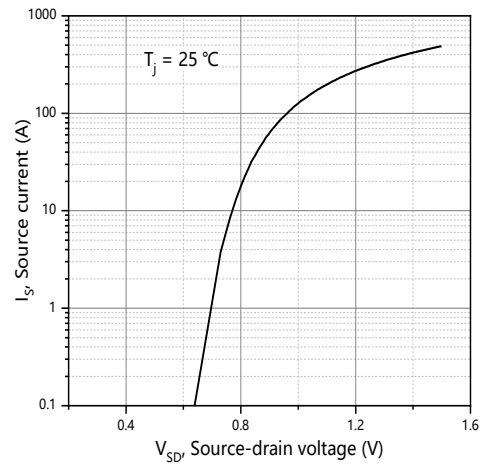


Figure 8. Forward characteristic of body diode

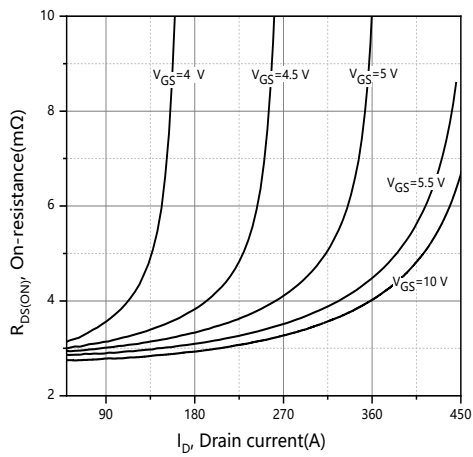


Figure 9. Drain-source on-state resistance

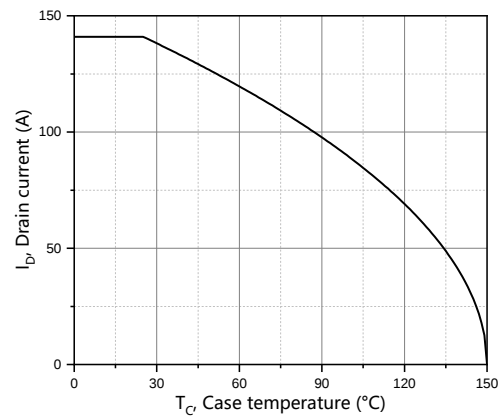


Figure 10. Drain current

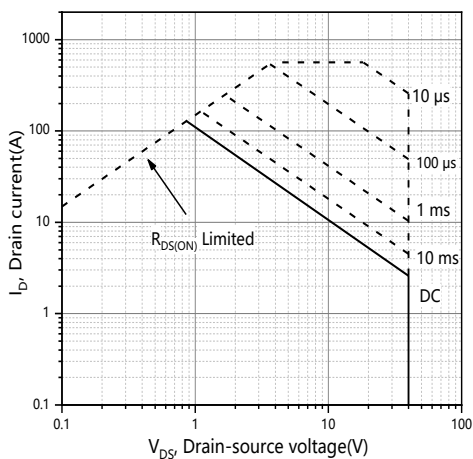


Figure 11. Safe operation area $T_C=25^{\circ}\text{C}$

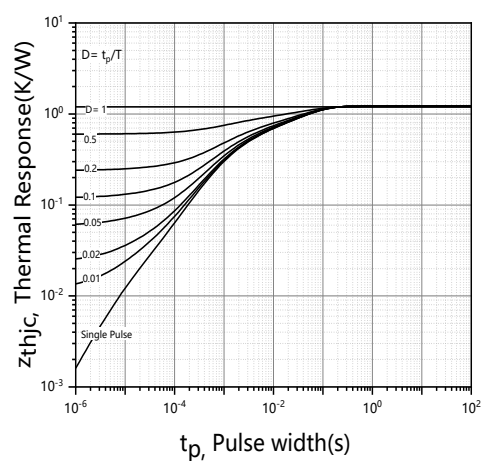
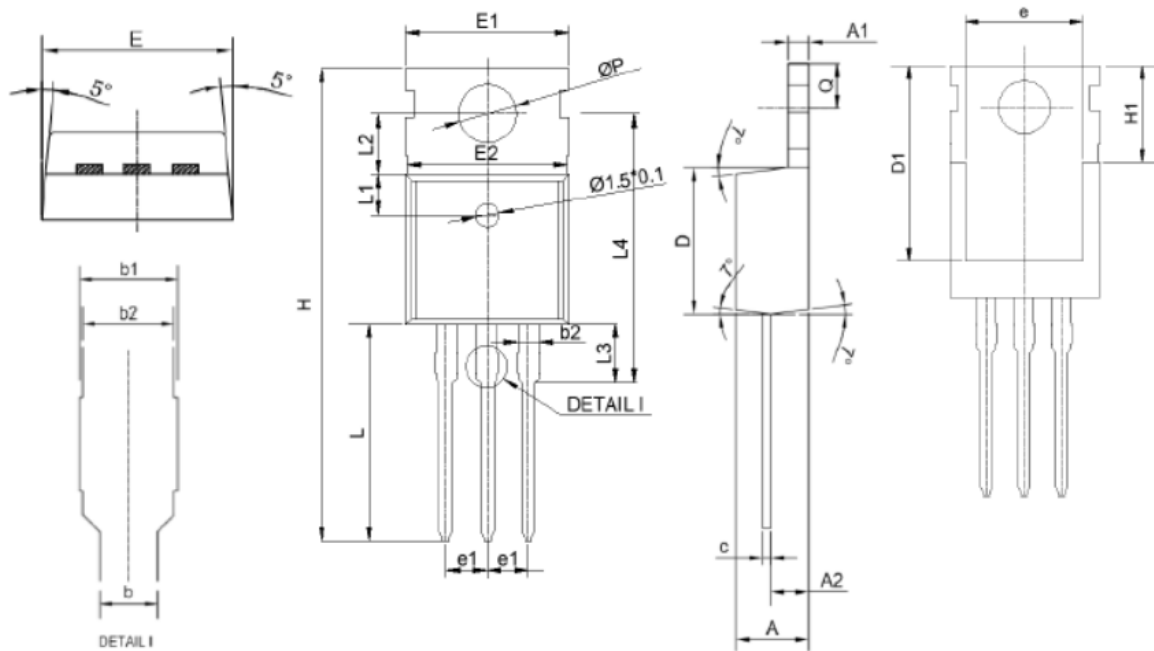


Figure 12. Max. transient thermal impedance

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.56	4.57	4.58
A1	1.28	1.30	1.32
A2	2.30	2.40	2.50
b	0.70	0.80	0.90
b1	1.27	1.37	1.47
b2	1.26	1.27	1.28
c	0.45	0.50	0.60
D	9.14	9.15	9.16
D1	13.2	13.21	13.22
E	9.95	10.05	10.15
E1	10.0	10.05	10.1
E2	9.87	9.88	9.89
e	7.50	8.00	8.40
e1	2.53	2.54	2.55
H	28.80	29.00	29.20
H1	6.40	6.50	6.60
L	13.05	13.35	13.65
L1	2.40	2.50	2.60
L2	3.60	3.70	3.80
L3	2.92	3.00	3.08
L4	15.82	15.90	15.98
Q	2.73	2.80	2.87
P	3.60	-	3.65

Version : TO220-G package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220-G	50	20	1000	5	5000

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