

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
- Lead free product is acquired
- High power and current handling capability

Applications

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



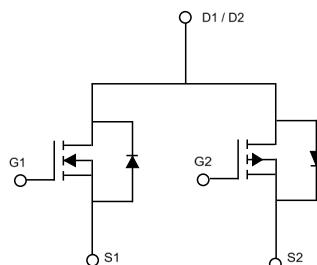
Key Performance Parameters

Parameter	Channel	Value	Unit
V_{DS}	N	40	V
V_{DS}	P	-40	V
$R_{DS(ON), max} @ V_{GS}=10V$	N	15	mΩ
$R_{DS(ON), max} @ V_{GS}=-10V$	P	35	mΩ

Marking Information

Product Name	Package	Marking
OSH04R40D4F	TO-252-4L	OSH04R40D4

Package & Pin information



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

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-source voltage	V_{DS}	40	-40	V
Gate-source voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current	I_D	35.2	-23.1	A
Pulsed Drain Current ¹⁾	$I_{D,pulse}$	140	-92.4	A
Power Dissipation	P_D	3.9	3.1	W
Operation and storage temperature	T_{stg}, T_j	-55 to 150	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Channel	Value	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	N	3.9	$^{\circ}\text{C/W}$
Thermal resistance, junction-to-case	$R_{\theta JC}$	P	3.9	$^{\circ}\text{C/W}$

N-CH 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		2.0	V	$V_{DS}=V_{GS}, I_D=250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		11.3	15	$\text{m}\Omega$	$V_{GS}=10\text{ V}, I_D=10\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		15.4	20	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}, I_D=8\text{ A}$
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	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}$

N-CH Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		1160		pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1.0\text{ MHz}$
Output capacitance	C_{oss}		89		pF	
Reverse transfer capacitance	C_{rss}		82		pF	
Turn-on Delay Time	$t_{d(on)}$		12.6		ns	$V_{GS}=10\text{ V}$, $V_{DD}=20\text{ V}$, $R_L=2\ \Omega$, $R_{GEN}=3\ \Omega$
Turn-on Rise Time	t_r		3.6		ns	
Turn-Off Delay Time	$t_{d(off)}$		30.8		ns	
Turn-Off Fall Time	t_f		3.2		ns	

N-CH Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total Gate Charge	Q_g		24.5		nC	$V_{GS}=10\text{ V}$, $V_{DS}=20\text{ V}$, $I_D=10\text{ A}$
Gate-Source Charge	Q_{gs}		3.7		nC	
Gate-Drain Charge	Q_{gd}		6.2		nC	

N-CH Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Source drain current (Body Diode)	I_{SD}			10	A	$T_A=25^\circ\text{C}$
Diode forward voltage ²⁾	V_{SD}			1.2	V	$I_S=10\text{ A}$, $V_{GS}=0\text{ V}$

P-CH 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	$R_{DS(ON)}$		27	35	$\text{m}\Omega$	$V_{GS}=-10\text{ V}$, $I_D=-5\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		35.4	46	$\text{m}\Omega$	$V_{GS}=-4.5\text{ V}$, $I_D=-4\text{ A}$
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	$V_{DS}=-40\text{ V}$, $V_{GS}=0\text{ V}$

P-CH Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		1130		pF	$V_{GS}=0\text{ V}$, $V_{DS}=-20\text{ V}$, $f=1.0\text{ MHz}$
Output capacitance	C_{oss}		82.5		pF	
Reverse transfer capacitance	C_{rss}		68.6		pF	
Turn-on Delay Time	$t_{d(on)}$		18		ns	$V_{GS}=-10\text{ V}$, $V_{DS}=-20\text{ V}$, $R_L=4\text{ }\Omega$, $R_{GEN}=3\text{ }\Omega$
Turn-on Rise Time	t_r		4.8		ns	
Turn-Off Delay Time	$t_{d(off)}$		88.8		ns	
Turn-Off Fall Time	t_f		26.4		ns	

P-CH Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total Gate Charge	Q_g		60.5		nC	$V_{GS}=-10\text{ V}$, $V_{DS}=-20\text{ V}$, $I_D=-5\text{ A}$
Gate-Source Charge	Q_{gs}		8.6		nC	
Gate-Drain Charge	Q_{gd}		13.9		nC	

P-CH Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Source drain current (Body Diode)	I_{SD}			-6.4	A	$T_A=25^{\circ}\text{C}$
Diode forward voltage ²⁾	V_{SD}			-1.2	V	$I_S=-5\text{ A}$, $V_{GS}=0\text{ V}$

Note: 1) Pulse width limited by maximum allowable junction temperature.

2) Repetitive Rating: Pulse width limited by maximum junction temperature.

N- Channel Electrical Characteristics Diagrams

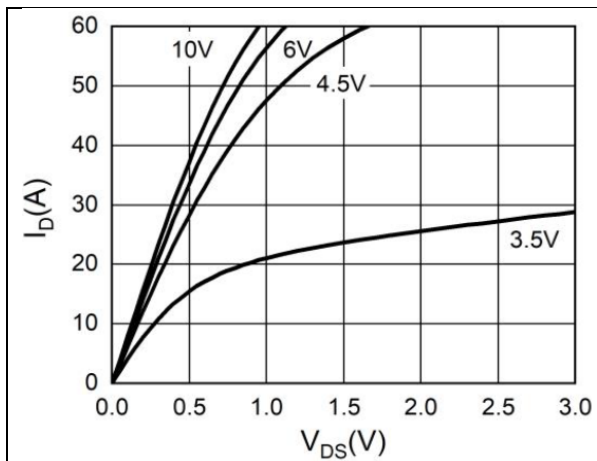


Figure 1. Typ. output characteristics

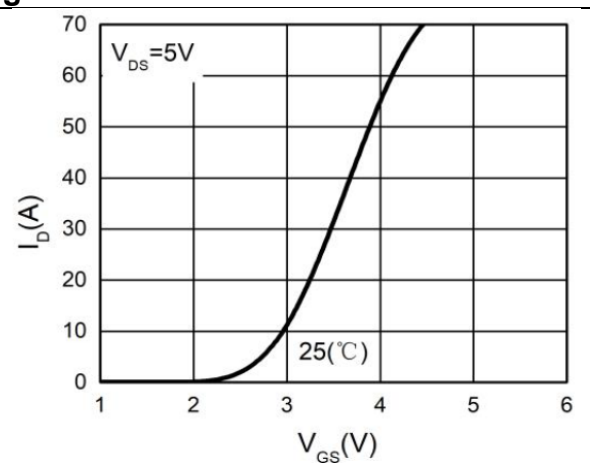


Figure 2. Typ. transfer characteristics

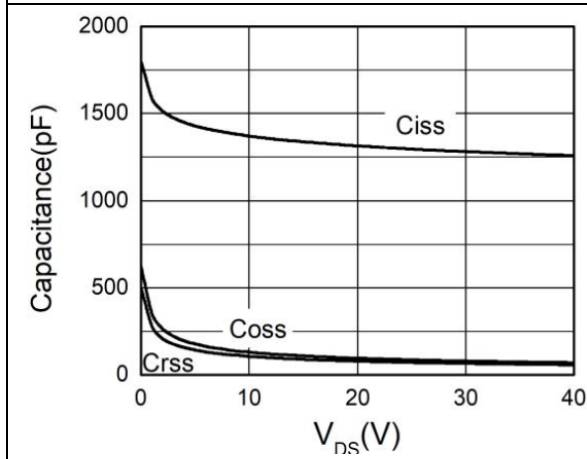


Figure 3. Typ. capacitances

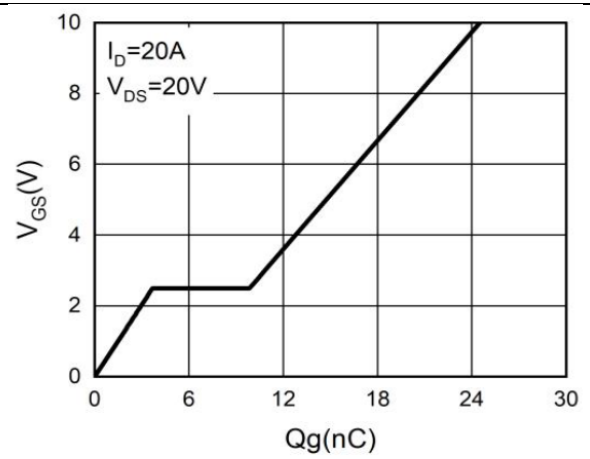


Figure 4. Gate charge

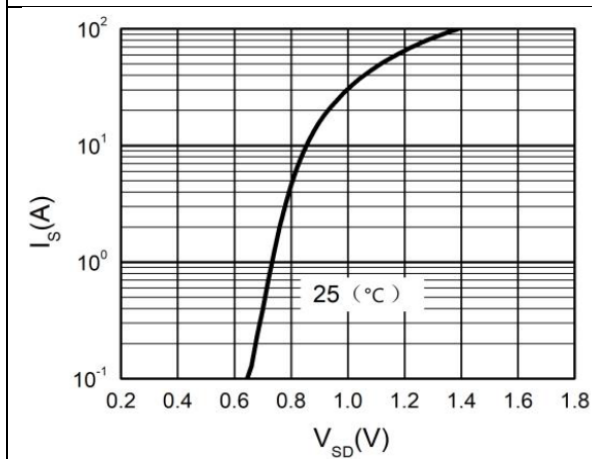


Figure 5. Body-diode characteristics

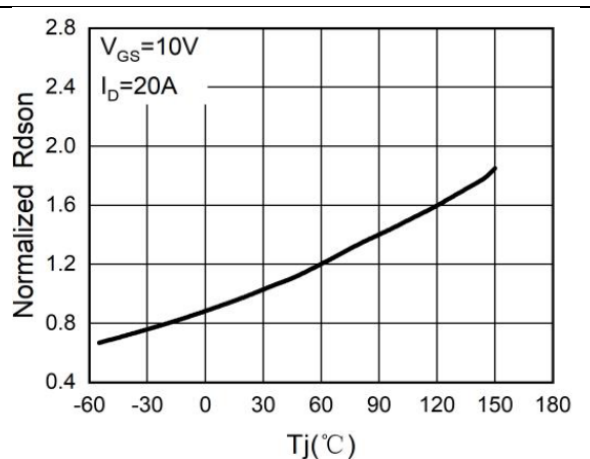


Figure 6. $R_{DS(ON)}$ vs junction temperature

P- Channel Electrical Characteristics Diagrams

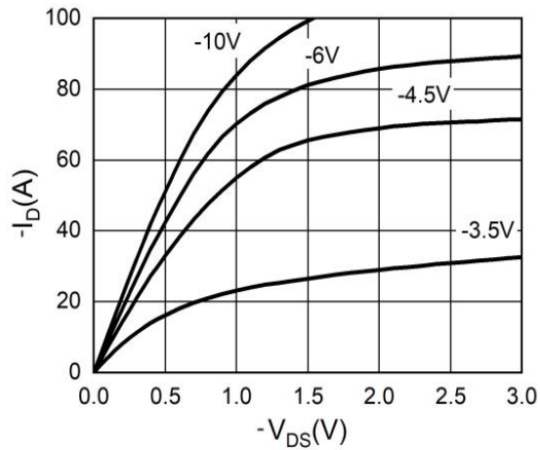


Figure 1. Typ. output characteristics

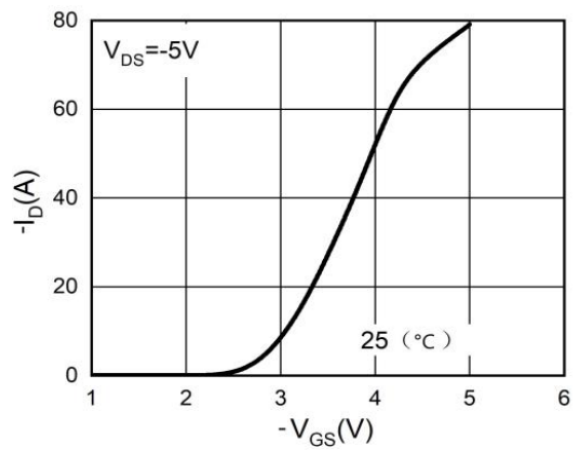


Figure 2. Typ. transfer characteristics

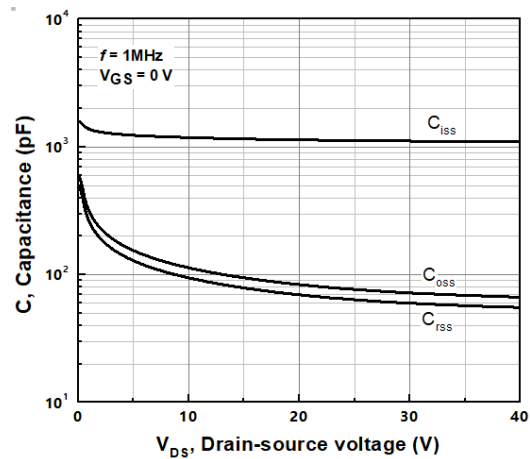


Figure 3. Capacitance

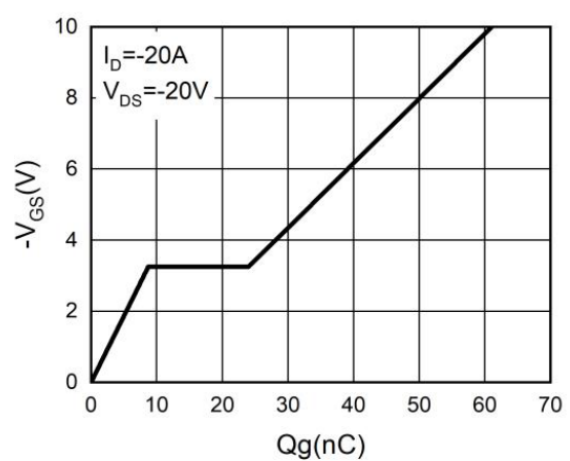


Figure 4. Gate charge

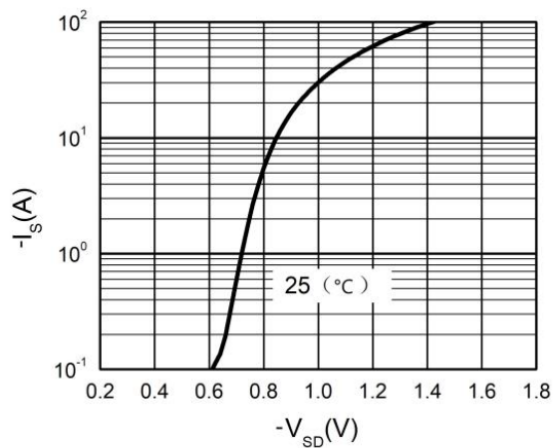


Figure 5. Body-diode characteristics

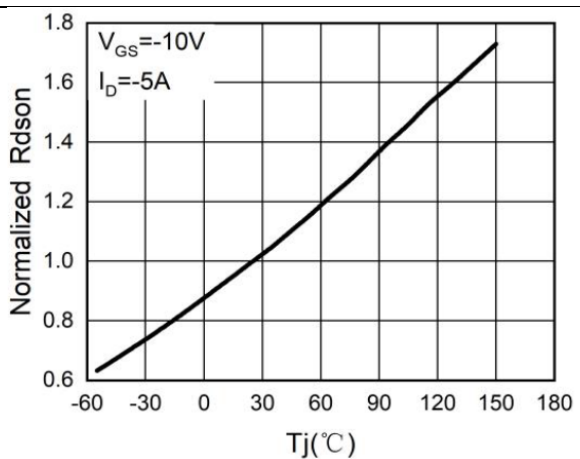
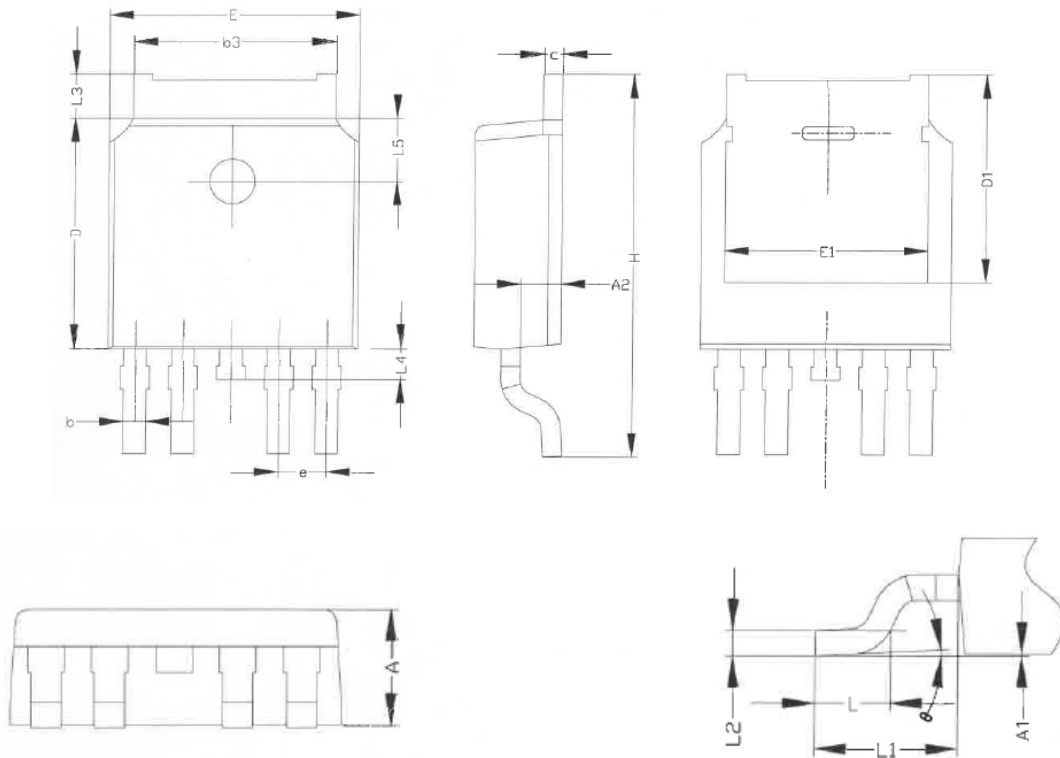


Figure 6. $R_{DS(on)}$ vs junction temperature

Package Information



Symbol	mm		
	Min.	NOM	Max.
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.55	0.62	0.70
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	5.10	-	-
e	1.27BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
L5	1.65	1.80	1.95
θ	0°	-	8°

Version : TO-252-4L-P package outline dimension

Ordering Information

Package Type	Units/ Reel	Reels/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO-252-4L-P	2500	2	5000	5	25000

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