

# MOSFET on Resistance – Rds on mosfet and how to choose it in datasheet

July 14, 2021 by [baua](#)

## MOSFET Rds on

Rds on stands for resistance (R), drain (D), and source (S) means resistance between the drain and source of the mosfet but still it is not clear resistance when. That is why on is used at the end to symbolize that it is resistance when mosfet is on.

when voltage at gate pin is available than Resistance between the drain and source is called mosfet on resistance

when voltage at gate pin is not available than resistance between the drain and source is called Mosfet Rds off or Mosfet off resistance.

Lets understand with an example of what is the Rds in mosfet and how to select it from Onsemi datasheet.

### NVBLSD05N04M8

#### **MOSFET – Power, Single, N-Channel**

**40 V, 300 A, 0.57 mΩ**

##### Features

- Typical  $R_{DS(on)}$  = 0.46 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 80\text{ A}$
- Typical  $Q_{g(tot)}$  = 220 nC at  $V_{GS} = 10\text{ V}$ ,  $I_D = 80\text{ A}$
- UIS Capability
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

##### MAXIMUM RATINGS $T_J = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Rating	Units
Drain-to-Source Voltage	$V_{DS}$	40	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current – Continuous ( $V_{GS} = 10\text{ V}$ ) (Note 1)	$I_D$	300	A
Pulsed Drain Current		See Figure 4	
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	1064	mJ
Power Dissipation	$P_D$	429	W
Derate Above $25^\circ\text{C}$		2.86	W/ $^\circ\text{C}$
Operating and Storage Temperature	$T_J, T_{STG}$	$-55$ to $+175$	$^\circ\text{C}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.35	$^\circ\text{C/W}$
Maximum Thermal Resistance, Junction-to-Ambient (Note 3)	$R_{\theta JA}$	43	$^\circ\text{C/W}$

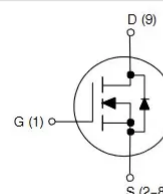


ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)



MO-299A  
CASE 100CU



##### ORDERING INFORMATION

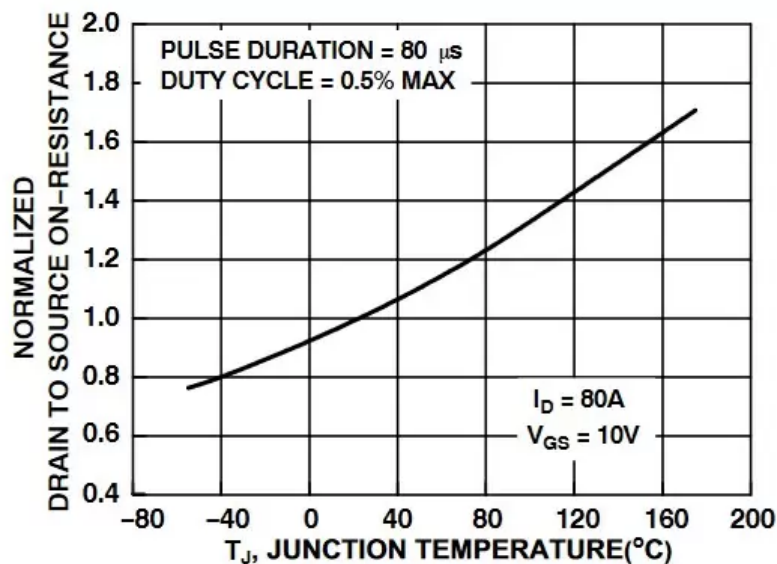
Device	Package	Marking
--------	---------	---------

If you see the datasheet of any MOSFET lets say 40V, 300Amps **NVBLSD05N04M8** Onsemi MOSFET, on going through the datasheet you will see two values of on resistance one is

typical and other is maximum, the question is which value you should choose for your design to be robust.

when you run 300Amps through the MOSFET its junction temperature will increase because of the power dissipation  $I^2 \cdot R$ .

So here in the above expression what you see R is on resistance of mosfet.



If you choose the wrong R<sub>ds on</sub> then you may get wrong power dissipation and FET could probably burn.

The R<sub>ds on</sub> mentioned below is at 25degC, when the current flows through it Junction temperature (T<sub>j</sub>) rises,

Therefore it is recommended to always choose R<sub>ds on</sub> at maximum T<sub>j</sub> which is 175 degC a worst case value in this case.

Also Read [How to choose mosfet threshold voltage](#).

So at 175 degC for this case is 1.7 then on resistance at 175degC =  $1.7 \cdot 0.57\text{mohm} = 0.969\text{mohm}$ , Now as you see the picture is clearly different, so for your designing you should consider Mosfet R<sub>ds on</sub> as 0.969mohm always.

## Conclusion:

So now how to find R<sub>ds on</sub> at 175degC, first step is to find normalization factor at 175 degC then multiply it with max R<sub>ds on</sub>.

You may also be Interested in – [High side FET gate driver design](#) | [Watts to kwh calculator](#)