

## 500V 13A 0.35Ω N-ch Power MOSFET

### Description

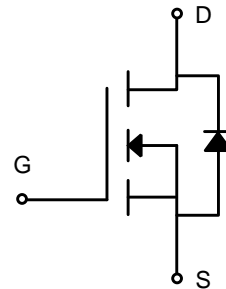
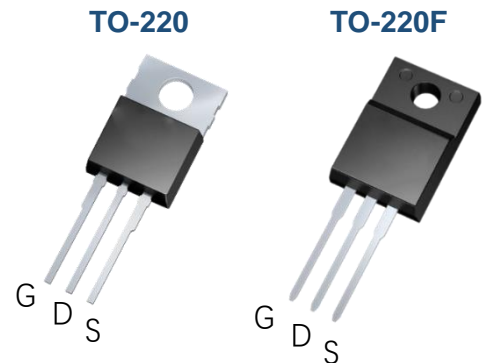
WMOS™ D1 is Wayon's 1<sup>st</sup> generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

### Features

- Typ. $R_{DS(on)}=0.35\Omega@V_{GS}=10V$
- 100% avalanche tested
- Pb-free, Halogen free

### Applications

- SMPS
- Charger
- DC-DC



### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

Parameter	Symbol	WMK13N50D1	WML13N50D1	Unit
Drain-source voltage	$V_{DS}$	500		V
Gate-source voltage	$V_{GS}$	$\pm 30$		V
Continuous drain current	$I_D$	13		A
Pulsed drain current	$I_{DM}$	52		A
Avalanche energy, single pulse	$E_{AS}$	840		mJ
Power dissipation	$P_D$	150	41	W
Derate above 25°C		1.2	0.33	W/°C
Operating junction temperature	$T_j$	-55~150		°C
Storage temperature	$T_{stg}$	-55~150		°C
Continuous diode forward current	$I_S$	13		A
Diode pulse current	$I_{Spulse}$	52		A

### Thermal Characteristic

Parameter	Symbol	WMK13N50D1	WML13N50D1	Unit
Thermal resistance,junction-to-case	$R_{\theta JC}$	0.83	3	°C/W
Thermal resistance,junction-to-ambient	$R_{\theta JA}$	62.5	62.5	°C/W

## Electrical Characteristics of MOSFET

				Min.	Typ.	Max.	
Drain-source break down voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	$T_C=25^\circ C$	500	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	$T_J=25^\circ C$	2.0	3.0	4.0	V
Drain-source leakage current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	1	$\mu A$
		$V_{DS}=400V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	100	$\mu A$
Gate-source leakage current,forward	$I_{GSSF}$	$V_{DS}=0V, V_{GS}=30V$	$T_J=25^\circ C$	-	-	100	nA
Gate-source leakage current,reverse	$I_{GSSR}$	$V_{DS}=0V, V_{GS}=-30V$	$T_J=25^\circ C$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.5A$	$T_J=25^\circ C$	-	0.4	0.5	$\Omega$

## Dynamic Characteristics of MOSFET ( $T_C=25^\circ C$ )

				Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V, V_{GS}=0V$		-	1990	-	pF
Output capacitance	$C_{oss}$			-	185	-	pF
Reverse transfer capacitance	$C_{rss}$			-	8.5	-	pF
Gate to source charge	$Q_{gs}$	$V_{DD}=400V$		-	9	-	nC
Gate to drain charge	$Q_{gd}$	$I_D=13A$		-	15	-	nC
Total gate charge	$Q_g$	$V_{GS}=0$ to 10V		-	40	-	nC

## Switching Characteristics of MOSFET ( $T_C=25^\circ C$ )

				Min.	Typ.	Max.	
Turn-on delay time	$t_{d on}$	$V_{DS}=250V, I_D=13A,$ $R_G=10\Omega, V_{GS}=0$ to 10V		-	28	-	ns
Rise time	$t_r$			-	21	-	ns
Turn-off delay time	$t_{d off}$			-	62	-	ns
Fall time	$t_f$			-	32	-	ns

## Characteristics of Body Diode ( $T_C=25^\circ C$ )

				Min.	Typ.	Max.	
Forward voltage	$V_{SD}$	$I_{SD}=13A, V_{GS}=0V$		-	-	1.5	V
Reverse recovery time	$t_{rr}$	$V_{DS}=250V, I_S=10A, V_{GS}=0V$ $-di/dt=100A/\mu s$		-	550	-	ns
Reverse recovery current	$I_{rr}$			-	12	-	A
Recovery charge	$Q_{rr}$			-	4.4	-	$\mu C$

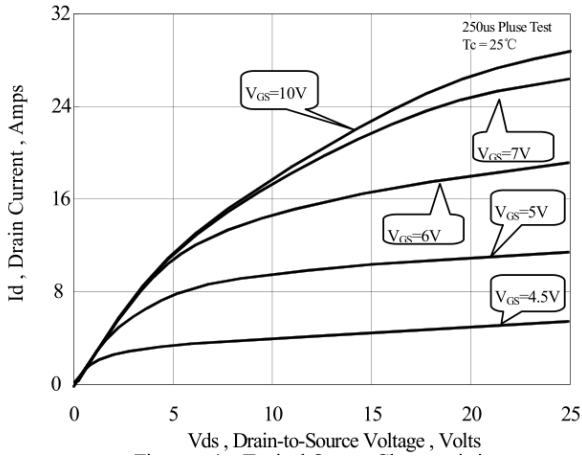


Figure 1. On-Region Characteristics

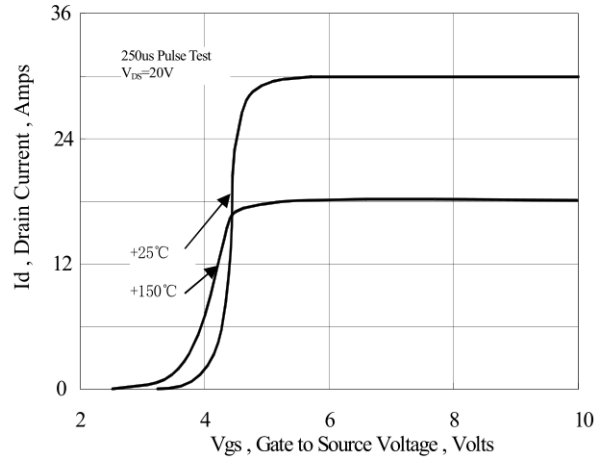


Figure 2. Transfer Characteristics

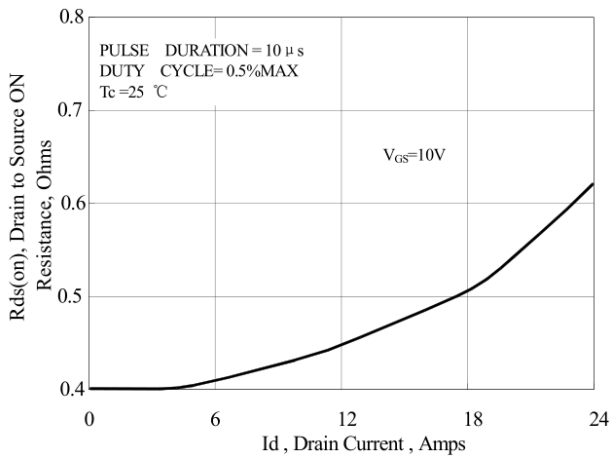


Figure 3. Static Drain-Source On Resistance

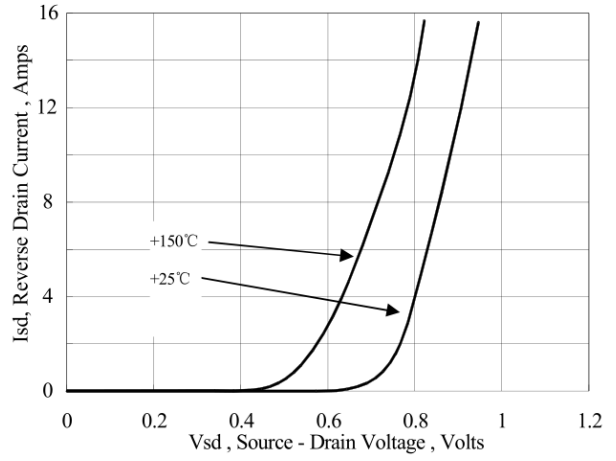


Figure 4. Typical Body Diode Transfer Characteristics

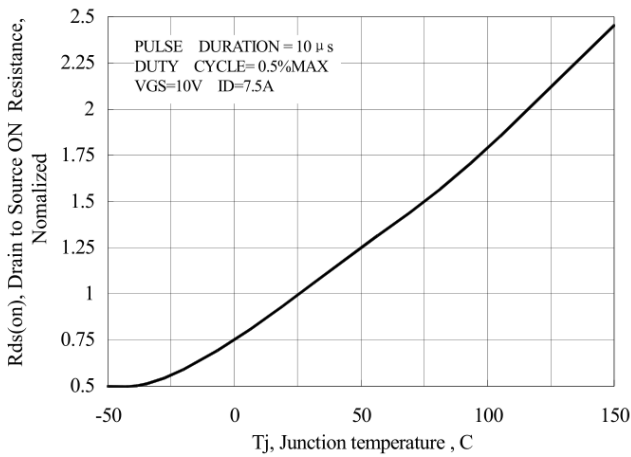


Figure 5. Normalized  $R_{DS(on)}$  vs. Temperature

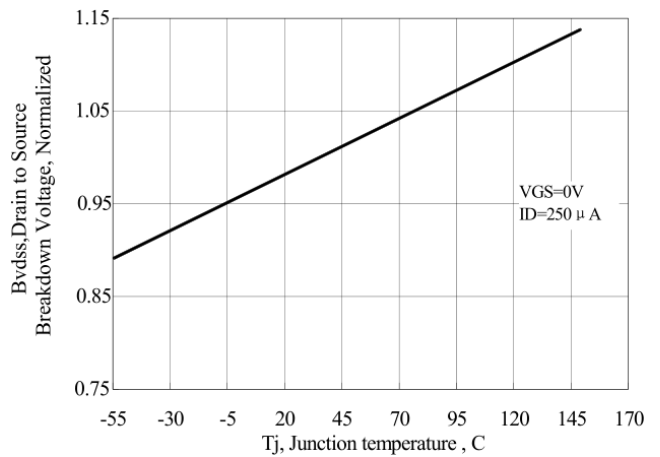


Figure 6. Normalized  $BV_{DSS}$  vs. Temperature

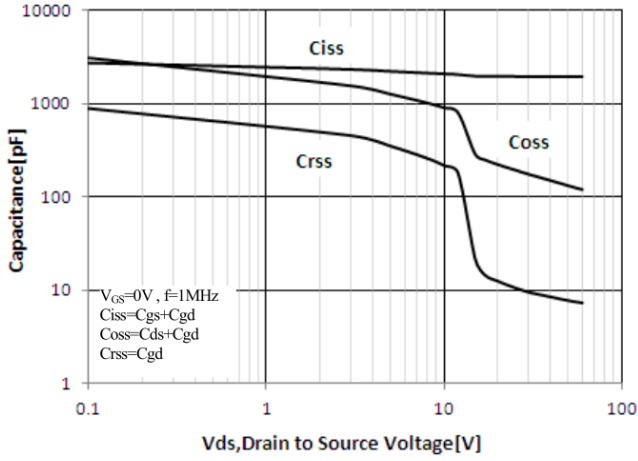


Figure 7. Capacitance Characteristics

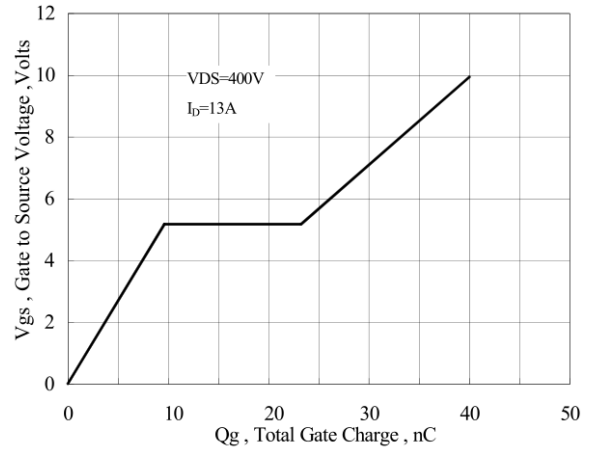


Figure 8. Gate Charge Characteristics

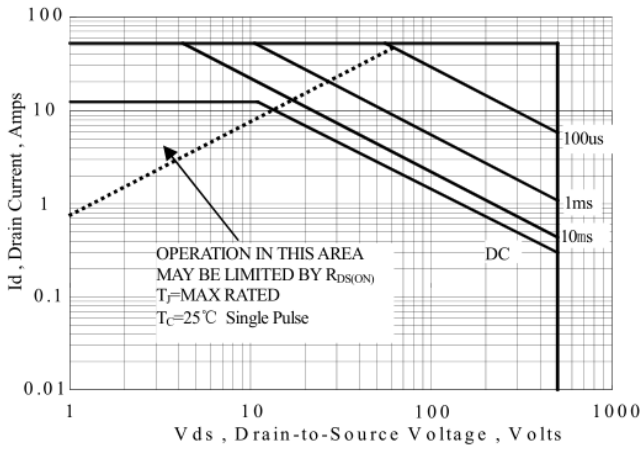


Figure 9. Maximum Safe Operating Area (TO-220)

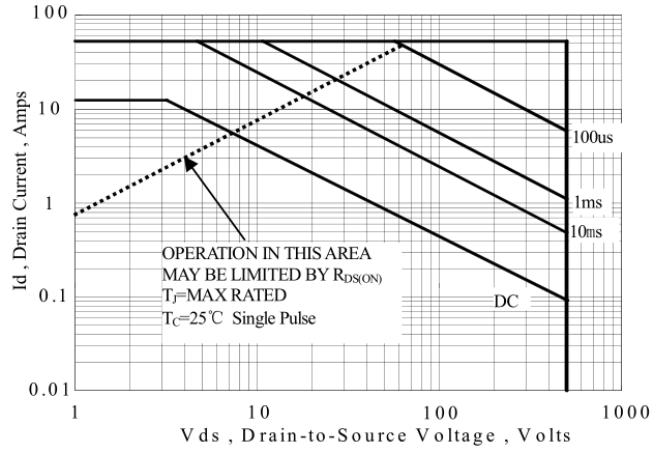
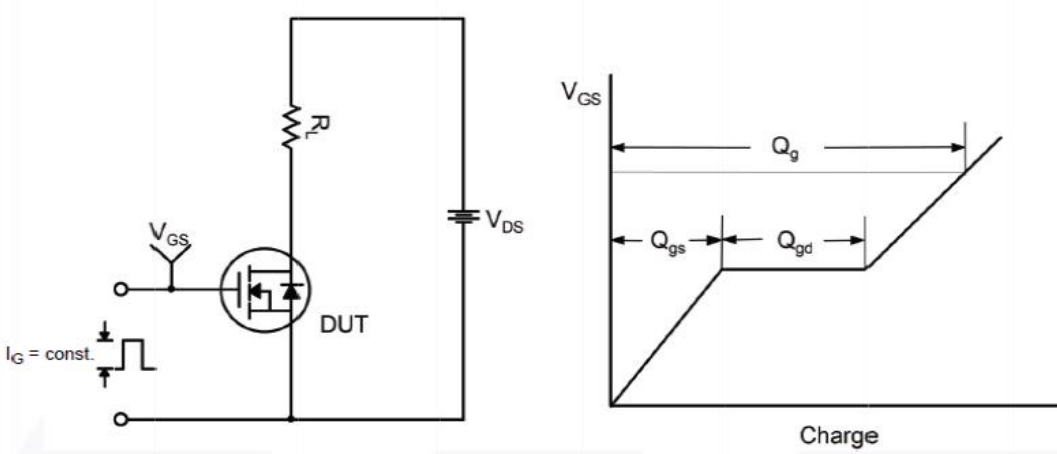
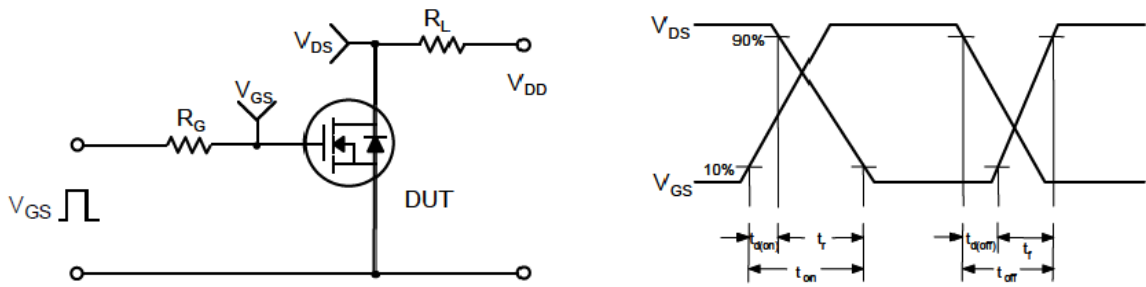


Figure 10. Maximum Safe Operating Area (TO-220F)

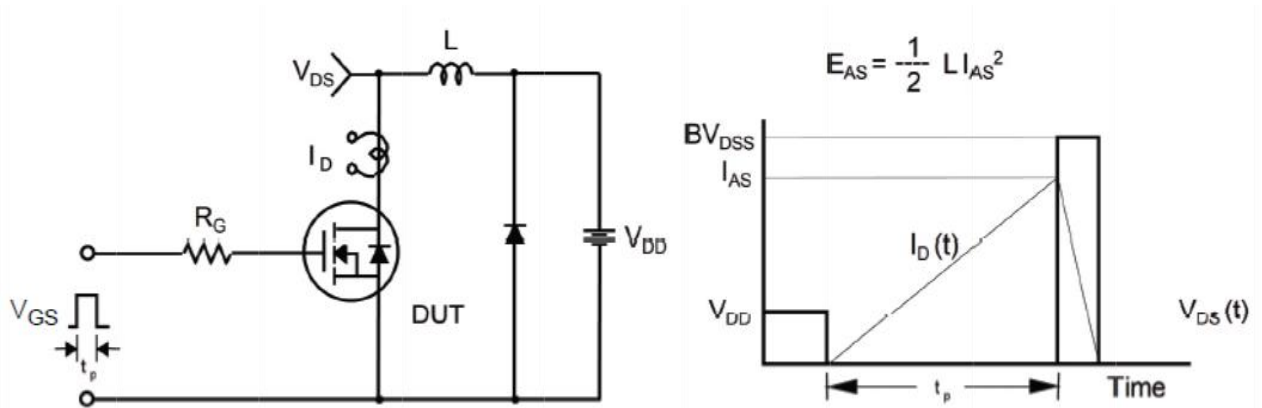
Gate Charge Test Circuit & Waveform



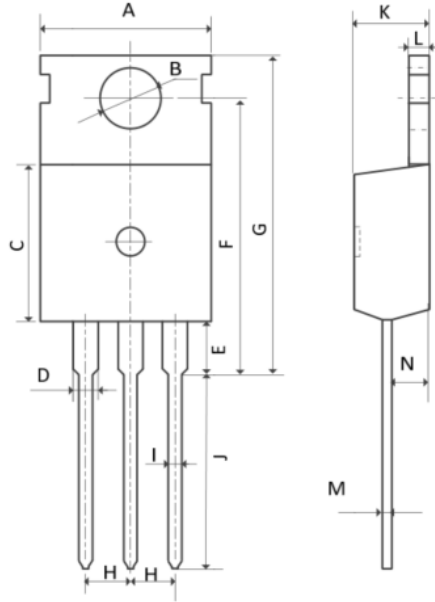
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



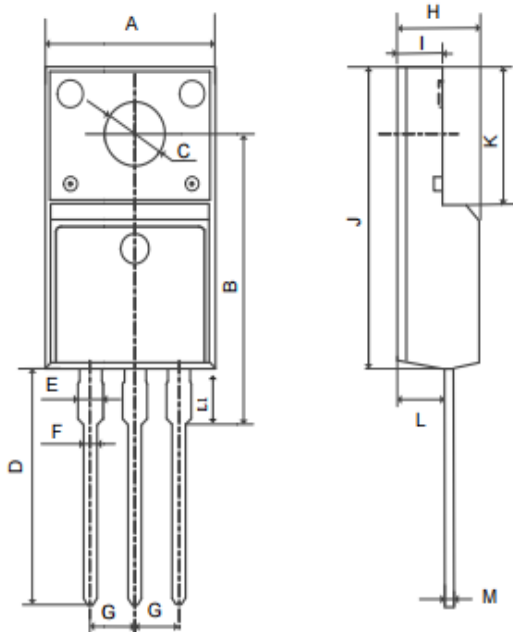
**Mechanical Dimensions for TO-220**



**COMMON DIMENSIONS**

SYMBOL	MM	
	MIN	MAX
A	9.70	10.20
B	3.40	3.80
C	8.90	9.40
D	1.17	1.47
E	2.60	3.40
F	15.10	16.70
G	19.55MAX	
H	2.54REF	
I	0.70	0.95
J	9.35	11.00
K	4.30	4.77
L	1.20	1.45
M	0.40	0.65
N	2.20	2.60

**Mechanical Dimensions for TO-220F**



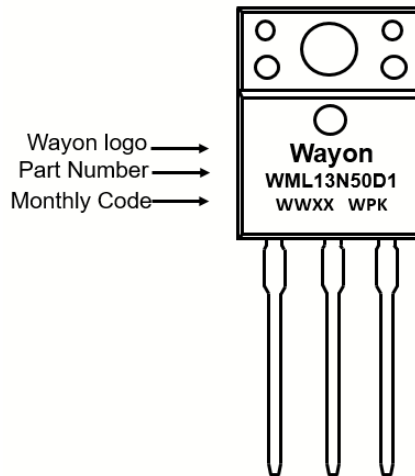
**COMMON DIMENSIONS**

SYMBOL	MM	
	MIN	MAX
A	9.96	10.36
B	15.10	16.10
C	3.03	3.38
D	12.64	13.28
E	1.18	1.58
F	0.70	0.95
G	2.54REF	
H	4.50	4.90
I	2.34	2.74
J	15.57	16.17
K	6.70REF	
L	2.56	2.96
M	0.40	0.65
L1	2.85	3.45

## Ordering Information

Part	Package	Marking	Packing method
WMK13N50D1	TO-220	WMK13N50D1	Tube
WML13N50D1	TO-220F	WML13N50D1	Tube

## Marking Information




## Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201202

Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com

WAYON website: <http://www.way-on.com>

For additional information, please contact your local Sales Representative.

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