

500V 13A 0.35Ω N-ch Power MOSFET

Description

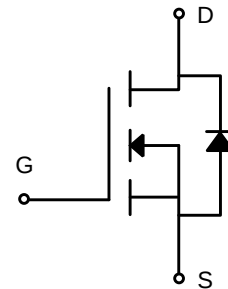
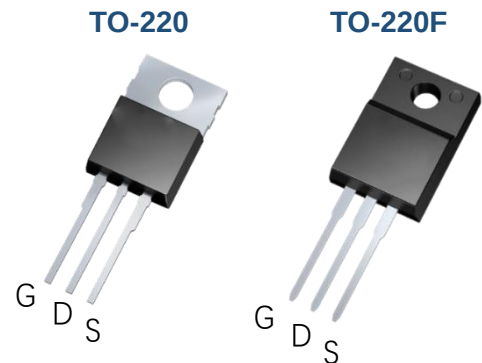
WMOS™ D1 is Wayon's 1st generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

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 ($T_C=25^{\circ}C$)

Parameter	Symbol	WMK13N50D1	WML13N50D1	Unit
Drain-source voltage	V_{DS}	500		V
Gate-source voltage	V_{GS}	± 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

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	μA
		$V_{DS}=400V$, $V_{GS}=0V$	$T_J=125^\circ C$	-	-	100	μA
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	Ω

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	-	μC

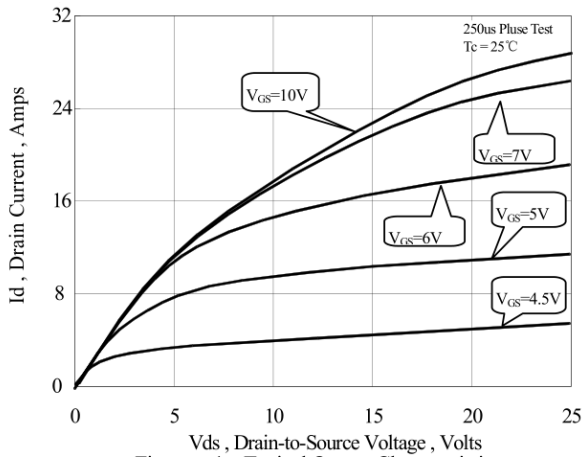


Figure 1. On-Region Characteristics

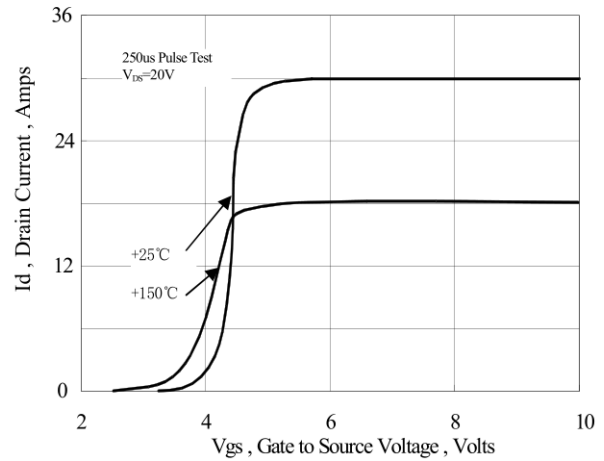


Figure 2. Transfer Characteristics

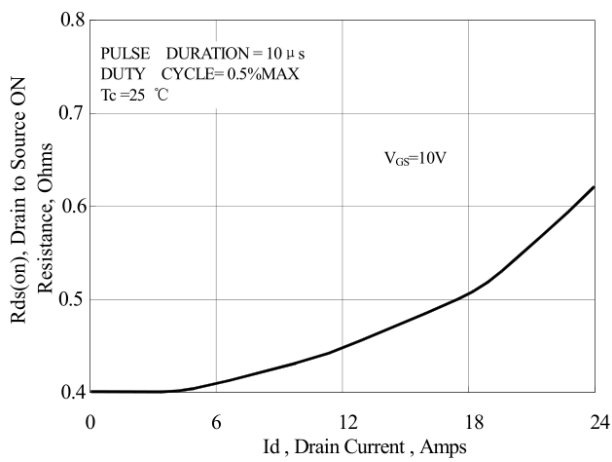


Figure 3. Static Drain-Source On Resistance

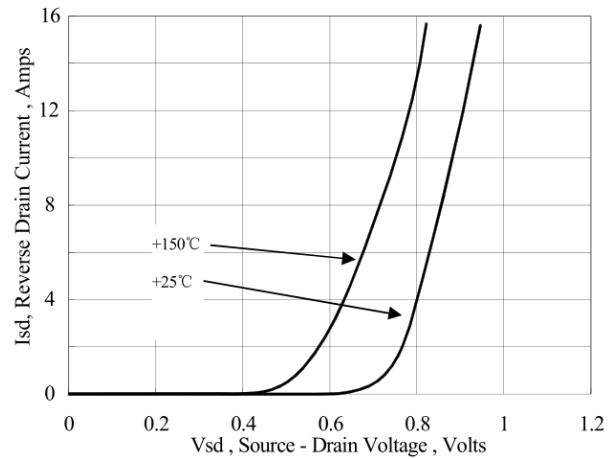
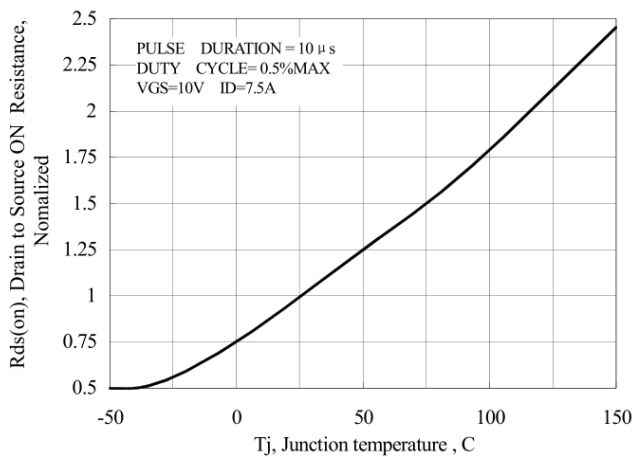
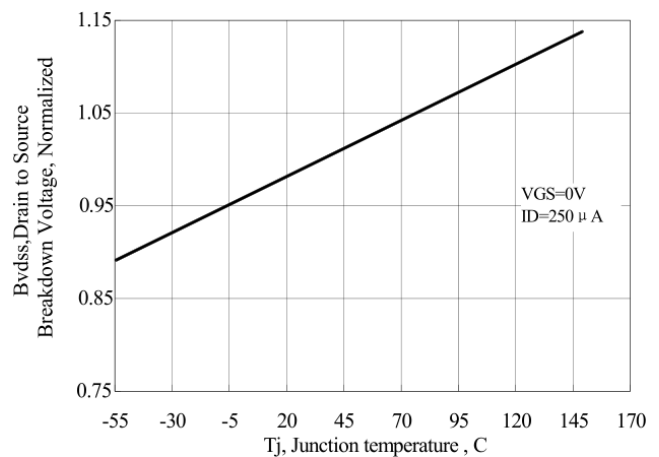


Figure 4. Typical Body Diode Transfer Characteristics

Figure 5. Normalized $R_{DS(on)}$ vs. TemperatureFigure 6. Normalized BV_{DSS} vs. Temperature

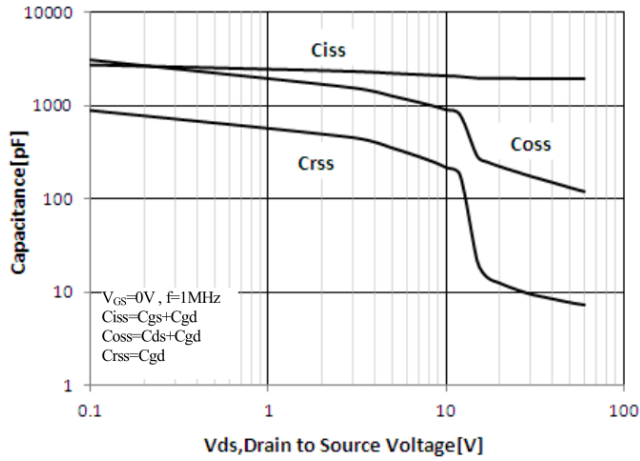


Figure 7. Capacitance Characteristics

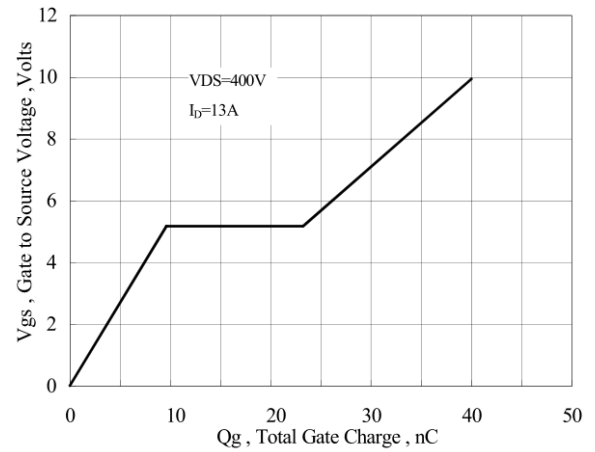
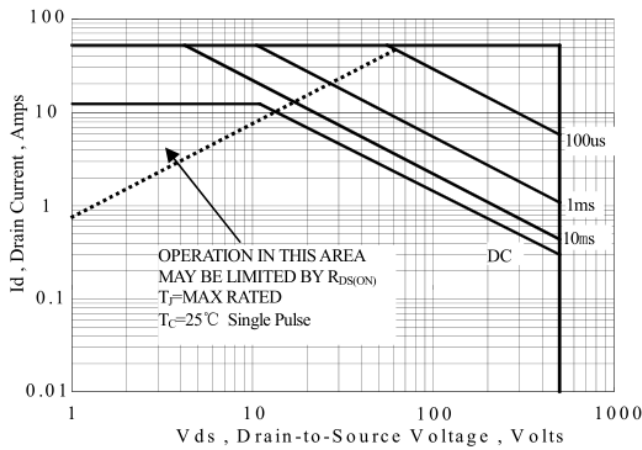
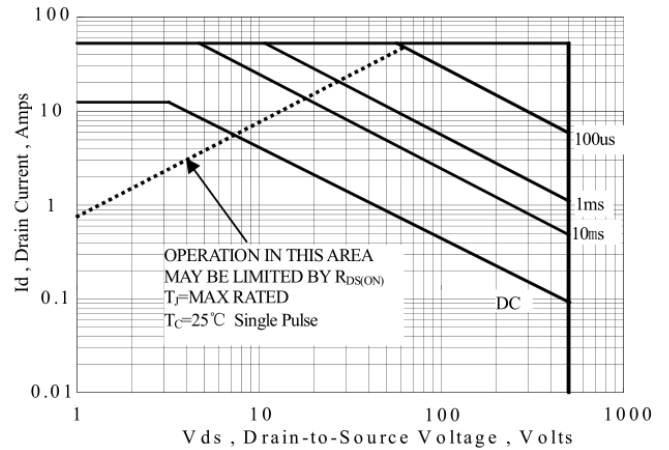
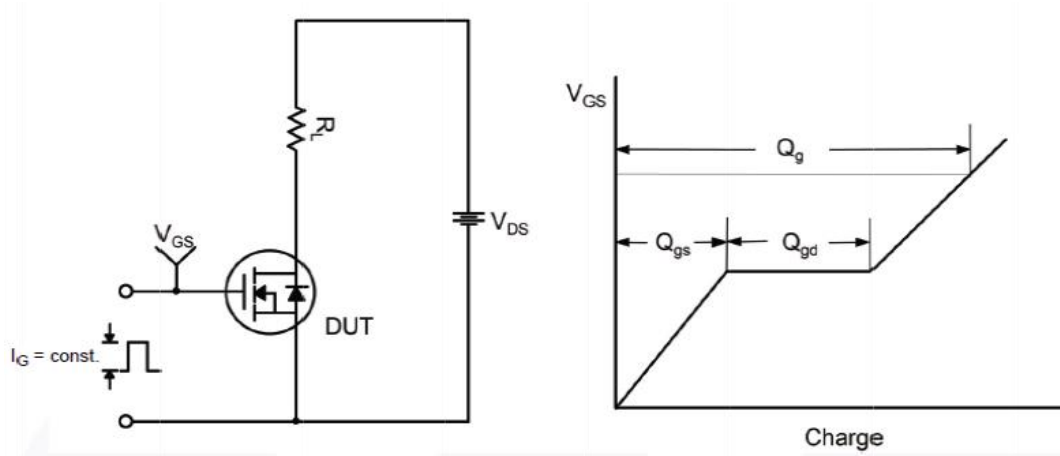


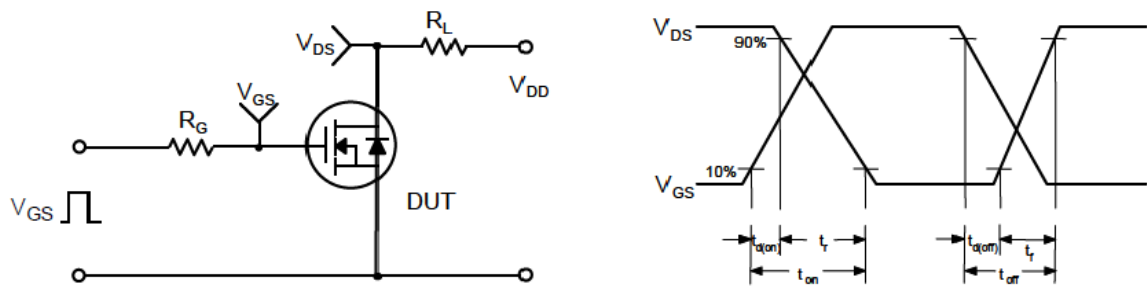
Figure 8. Gate Charge Characteristics

Figure 9. Maximum Safe Operating Area
(TO-220)Figure 10. Maximum Safe Operating Area
(TO-220F)

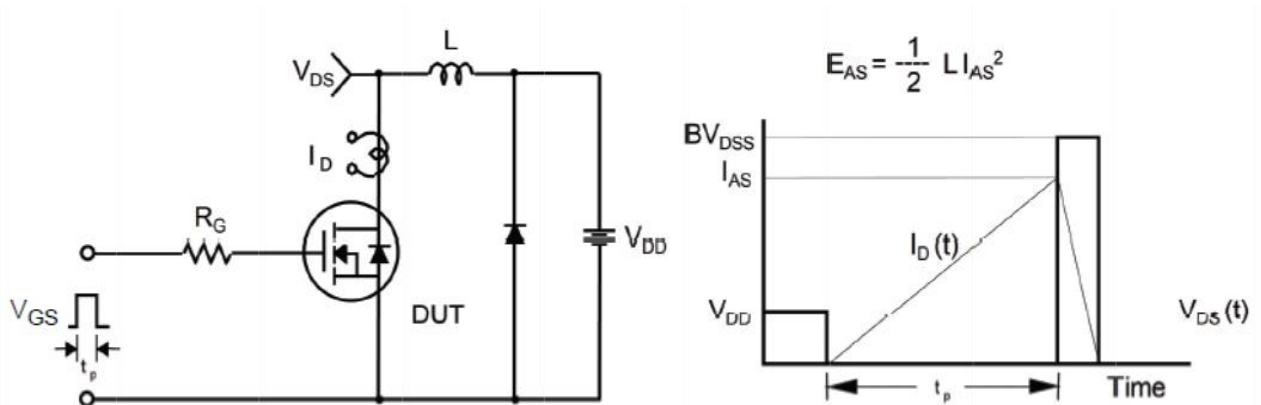
Gate Charge Test Circuit & Waveform



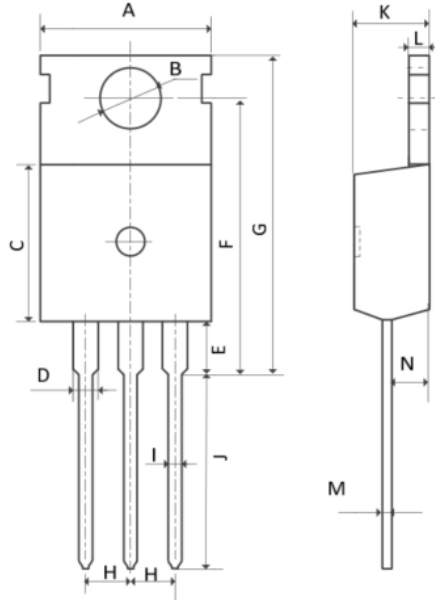
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



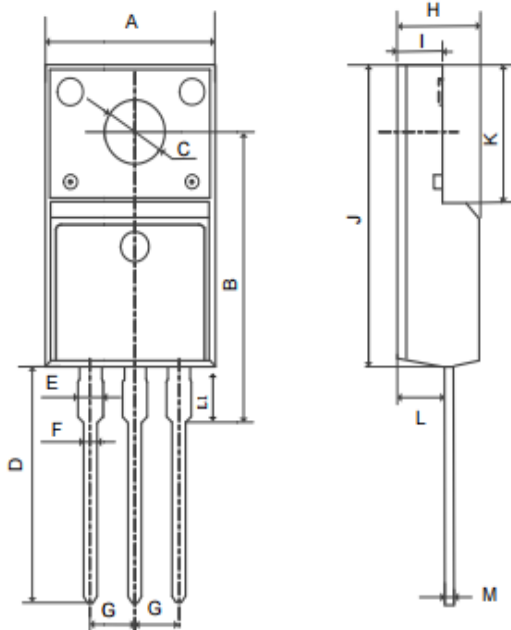
Mechanical Dimensions for TO-220



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



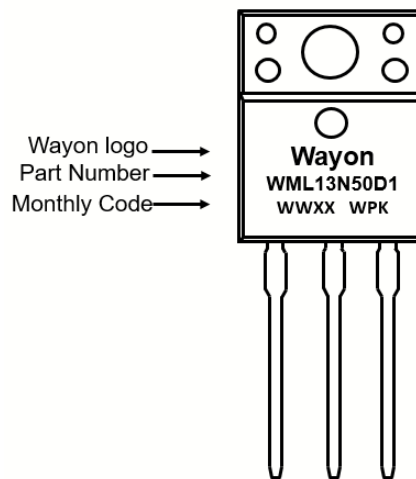
COMMON DIMENSIONS

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

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