

## 600V 0.025Ω Super Junction Power MOSFET

### Description

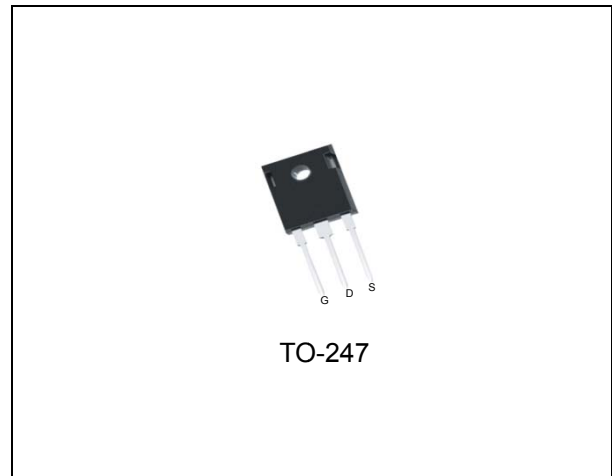
WMOS™ F2 is Wayon's 2<sup>nd</sup> generation super junction MOSFET family with fast body diode. F2 series provide all benefits of a fast switching SJ-MOSFET while offering an extremely fast body diode. WMOS™ F2 makes especially resonant switching applications more reliable.

### Features

- $V_{DS} = 650V @ T_{j,max}$
- Typ.  $R_{DS(on)} = 0.025\Omega$
- 100% UIS tested
- Pb-free plating, Halogen free

### Applications

LED Lighting, Charger, Adapter, PC, LCD TV, Server



### Absolute Maximum Ratings

Parameter	Symbol	WMJ90N60F2	Unit
Drain-source voltage	$V_{DSS}$	600	V
Continuous drain current <sup>1)</sup> ( $T_C = 25^\circ C$ )	$I_D$	90	A
( $T_C = 100^\circ C$ )		50	A
Pulsed drain current <sup>2)</sup>	$I_{DM}$	295	A
Gate-source voltage	$V_{GS}$	$\pm 30$	V
Avalanche energy, single pulse <sup>3)</sup>	$E_{AS}$	1100	mJ
Avalanche energy, repetitive <sup>2)</sup>	$E_{AR}$	1.4	mJ
Avalanche current, repetitive <sup>2)</sup>	$I_{AR}$	7	A
Power dissipation ( $T_C = 25^\circ C$ )	$P_D$	430	W
- Derate above $25^\circ C$		3.44	W/°C
Operating and storage temperature range	$T_{j}, T_{stg}$	-55 to +150	°C
Continuous diode forward current	$I_S$	90	A
Diode pulse current	$I_{S,pulse}$	295	A

### Thermal Characteristics

Parameter	Symbol	WMJ90N60F2	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.29	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	°C/W

**Electrical Characteristics**  $T_c = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.25\text{mA}$	2.5	3.5	4.5	V
Drain cut-off current	$I_{DSS}$	$V_{DS}=600\text{ V}, V_{GS}=0\text{V},$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	-	-	60	$\mu\text{A}$
Gate leakage current, forward	$I_{GSSF}$	$V_{GS}=20\text{V}, V_{DS}=0\text{V}$	-	-	300	nA
Gate leakage current, reverse	$I_{GSSR}$	$V_{GS}=-20\text{V}, V_{DS}=0\text{V}$	-	-	-300	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=30\text{A}$ $T_j = 25^\circ\text{C}$	-	0.025	0.033	$\Omega$
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS}= 100\text{V}, V_{GS}= 0\text{V},$ $f = 1\text{ MHz}$	-	8200	-	pF
Output capacitance	$C_{oss}$		-	250	-	
Reverse transfer capacitance	$C_{rss}$		-	4.2	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 300\text{V}, I_D = 30\text{A}$ $R_G = 25\Omega, V_{GS}=10\text{V}$	-	90	-	ns
Rise time	$t_r$		-	79	-	
Turn-off delay time	$t_{d(off)}$		-	460	-	
Fall time	$t_f$		-	75	-	
<b>Gate charge characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DD}=480\text{V}, I_D=30\text{A},$ $V_{GS}=0\text{ to }10\text{V}$	-	35	-	nC
Gate to drain charge	$Q_{gd}$		-	42	-	
Gate charge total	$Q_g$		-	142	-	
Gate plateau voltage	$V_{plateau}$		-	5.0	-	V
<b>Reverse diode characteristics</b>						
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=30\text{A}$	-	-	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=50\text{V}, I_F=30\text{A},$ $di_f/dt=100\text{A}/\mu\text{s}$	-	200	-	ns
Reverse recovery charge	$Q_{rr}$		-	3.9	-	$\mu\text{C}$
Peak reverse recovery current	$I_{rrm}$		-	35	-	A

## Notes:

- Limited by  $T_{j\max}$ . Maximum duty cycle  $D=0.5$ .
- Repetitive rating: pulse width limited by maximum junction temperature.
- $I_{AS} = 7\text{ A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , starting  $T_j = 25^\circ\text{C}$ .

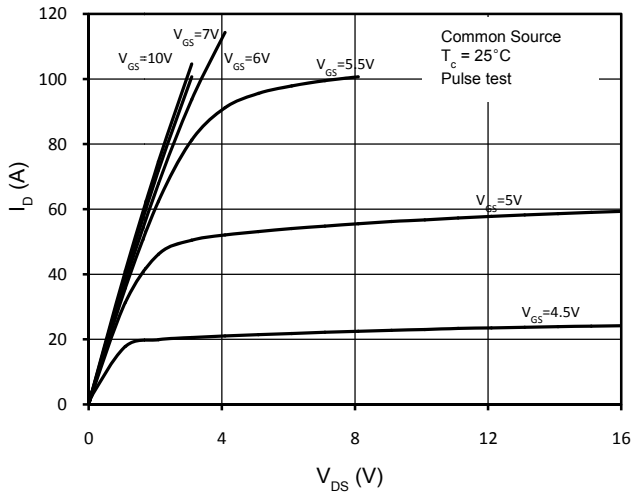


Figure 1. On-Region Characteristics

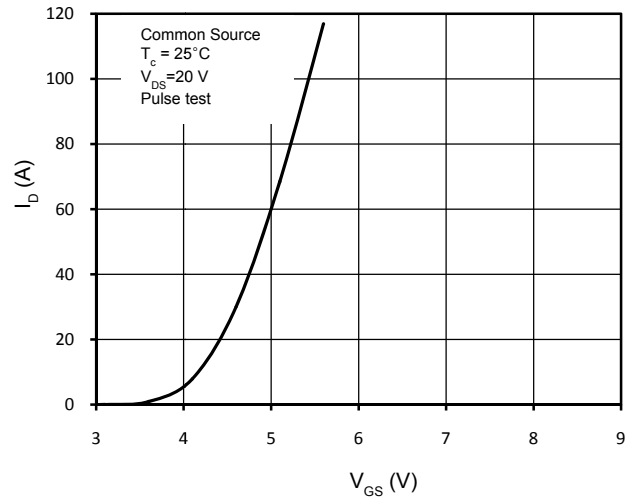


Figure 2. Transfer Characteristics

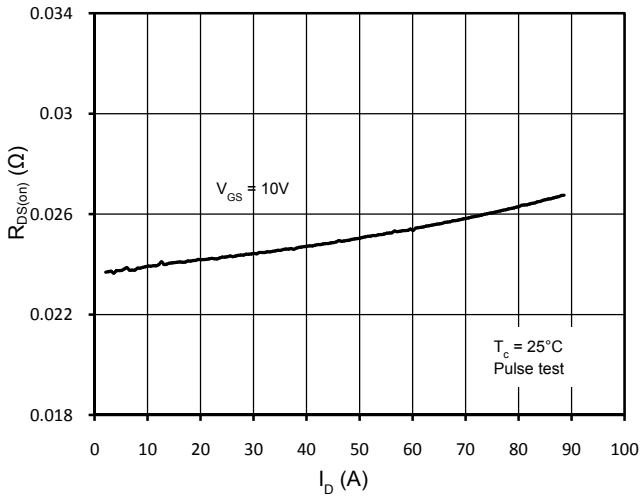


Figure 3. Static Drain-Source On Resistance

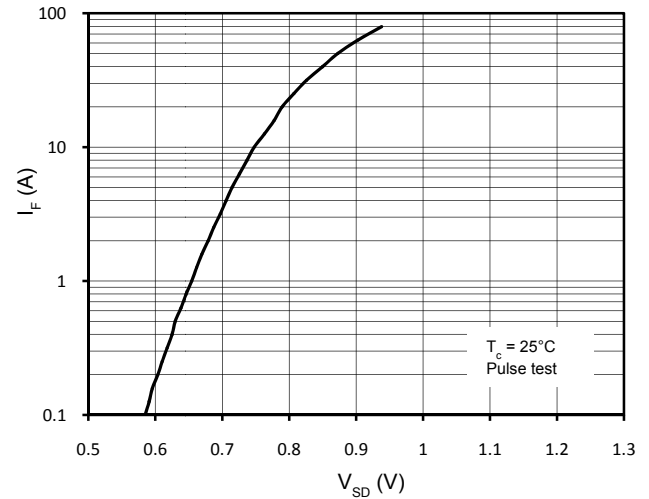


Figure 4. Body-Diode Forward Characteristics



Figure 5. Normalized  $BV_{DS}$  vs. Temperature

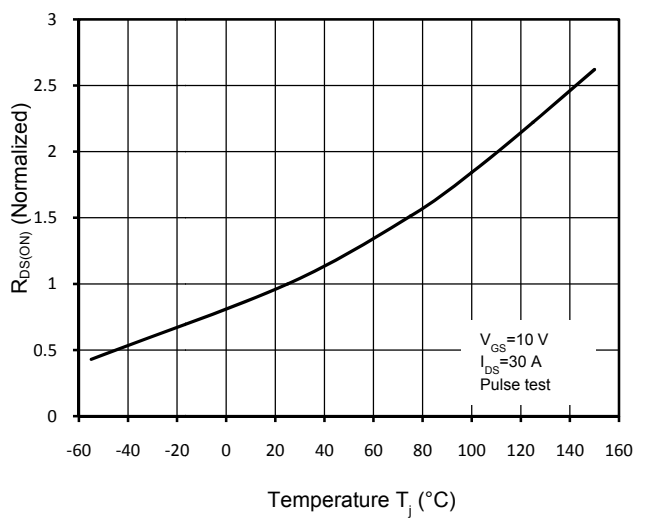


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

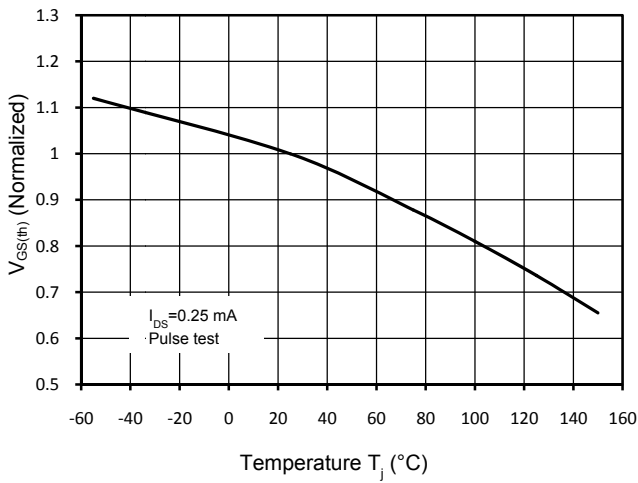


Figure 7. Threshold Voltage vs. Temperature

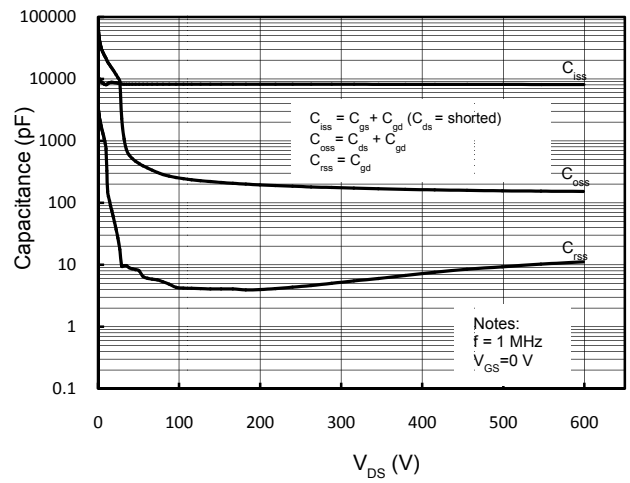


Figure 8. Capacitance Characteristics

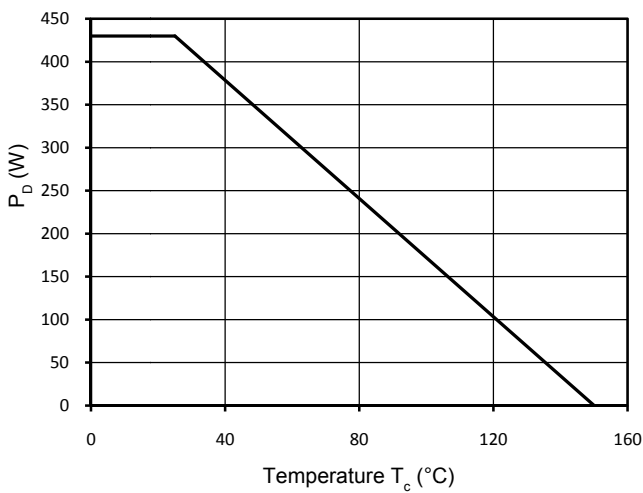


Figure 9. Power Dissipation

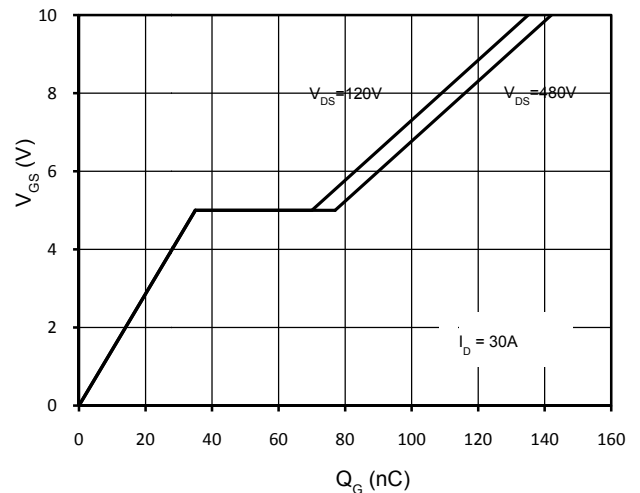


Figure 10. Gate Charge Characteristics

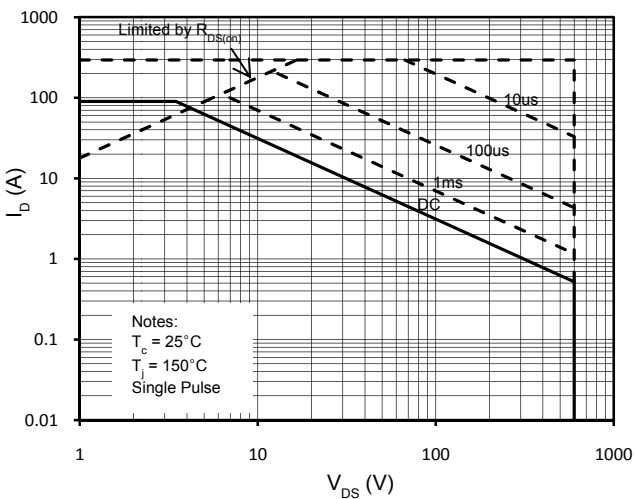


Figure 11. Maximum Safe Operating Area

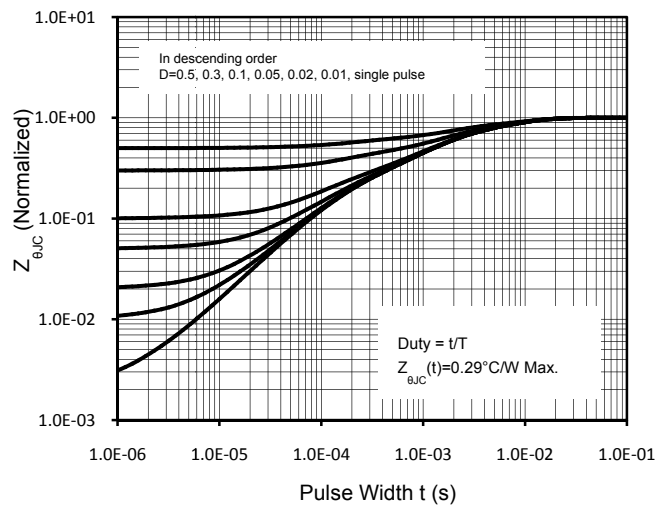


Figure 12. Transient Thermal Response Curve

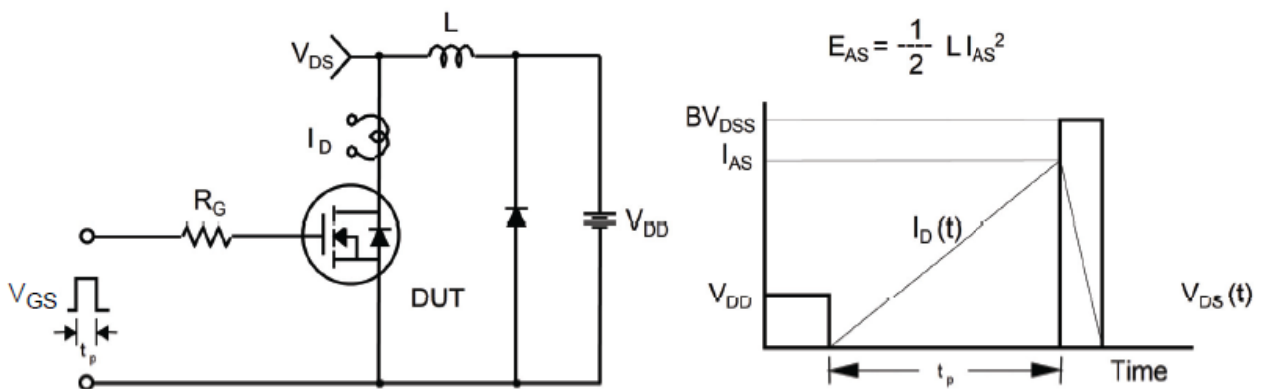
### Gate Charge Test Circuit & Waveform



### Switching Test Circuit & Waveforms

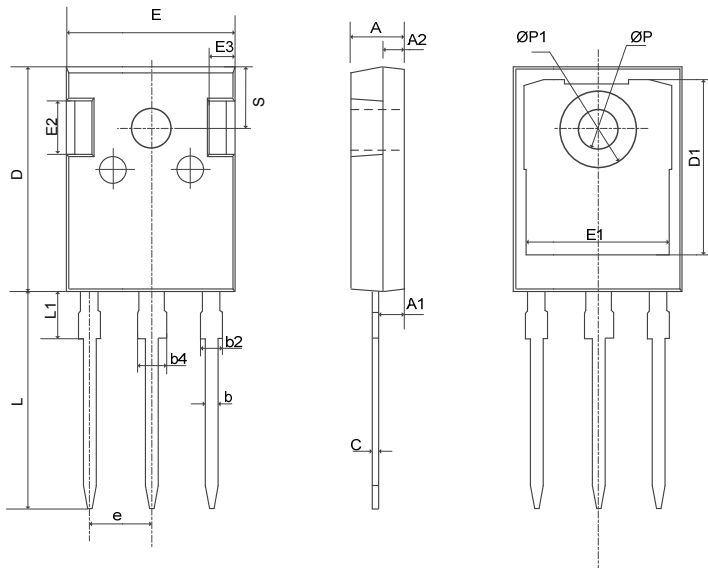


### Unclamped Inductive Switching Test Circuit & Waveforms



## Mechanical Dimensions for TO-247

## COMMON DIMENSIONS

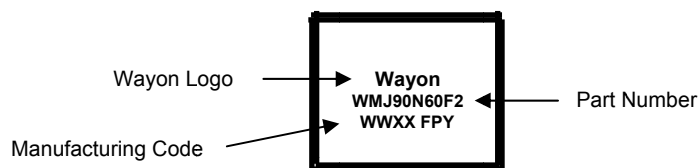


SYMBOL	MM	
	MIN	MAX
A	4.80	5.21
A1	2.21	2.61
A2	1.85	2.16
b	1.07	1.36
b2	1.91	2.41
b4	2.87	3.38
c	0.51	0.75
D	20.70	21.30
D1	16.25	17.65
E	15.50	16.13
E1	12.38	13.60
E2	3.68	5.20
E3	1.00	2.70
e	5.44BSC	
L	19.62	20.32
L1	—	4.40
ØP	3.40	3.80
ØP1	—	7.30
S	6.15BSC	

## Ordering Information

Part	Package	Marking	Packing method
WMJ90N60F2	TO-247	WMJ90N60F2	Tube

## Marking Information




## Contact Information

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