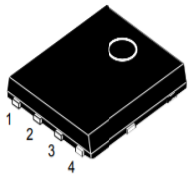
650V 0.35Ω Super Junction Power MOSFET

Description

WMOS™ EM is Wayon's 3rd generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ EM is suitable for applications which require superior power density and outstanding efficiency.

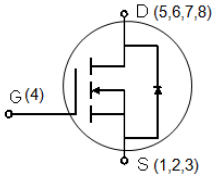


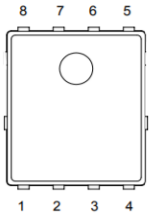
PDFN 5x6

Features

- V_{DS} =700V @ $T_{j,max}$
- Typ. $R_{DS(on)}$ =0.35Ω
- 100% UIS tested
- Pb-free plating, Halogen free

RoHS compliant





Applications

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

Absolute Maximum Ratings

Parameter	Symbol	WMB13N65EM	Unit
Drain-source voltage	V_{DSS}	650	V
Continuous drain current[1] (T_C = 25°C)	I_D	11	A
(T_C = 100°C)		6.5	A
Pulsed drain current[2]	I_{DM}	35	A
Gate-source voltage	V_{GS}	±30	V
Avalanche energy, single pulse[3]	E_{AS}	145	mJ
Avalanche energy, repetitive[2]	E_{AR}	0.21	mJ
Avalanche current, repetitive[2]	I_{AR}	2	A
Power dissipation (T_C = 25°C)	P_D	85	W
- Derate above 25°C		0.68	W/°C
Operating and storage temperature range	T_j, T_{stg}	-55 to +150	°C
Continuous diode forward current	I_S	11	A
Diode pulse current	$I_{S,pulse}$	35	A
MOSFET dv/dt ruggedness	dv/dt	50	V/ns
Peak diode recovery voltage slope	dv/dt	15	V/ns

Thermal Characteristics

Parameter	Symbol	WMB13N65EM	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	1.47	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	°C/W

Electrical Characteristics T_c = 25°C, unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=0.25 mA	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.25mA	2	3	4	V
Drain cut-off current	I_{DSS}	V_{DS}=650 V, V_{GS}=0 V,				μA
		T_j = 25°C	-	-	1	
		T_j = 125°C	-	50	-	
Gate leakage current, forward	I_{GSSF}	V_{GS}=20 V, V_{DS}=0 V	-	-	100	nA
Gate leakage current, reverse	I_{GSSR}	V_{GS}=-20 V, V_{DS}=0 V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=2 A	--	0.35	0.39	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS}= 100 V, V_{GS}= 0 V,	-	710	-	pF
Output capacitance	C_{oss}	f = 1 MHz	-	25	-	
Reverse transfer capacitance	C_{rss}		-	2	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 300V, I_D = 5A	-	20	-	ns
Rise time	t_r	R_G = 25Ω, V_{GS}=10V	-	16	-	
Turn-off delay time	$t_{d(off)}$		-	61	-	
Fall time	t_f		-	17	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=480 V, I_D=5A,	-	3.4	-	nC
Gate to drain charge	Q_{gd}	V_{GS}=0 to 10 V	-	10.1	-	
Gate charge total	Q_g		-	20.3	-	
Gate plateau voltage	$V_{plateau}$		-	4.7	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=2A	-	-	1.2	V
Reverse recovery time	t_{rr}	V_R=50 V, I_F=5A,	-	213	-	ns
Reverse recovery charge	Q_{rr}	dI_F/dt=100 A/μs	-	2.1	-	μC
Peak reverse recovery current	I_{rrm}		-	20	-	A

Notes:

1. Limited by $T_{j\,max}$. Maximum duty cycle D=0.5.

2. Repetitive rating: pulse width limited by maximum junction temperature.

3. I_{AS} = 2 A, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C.

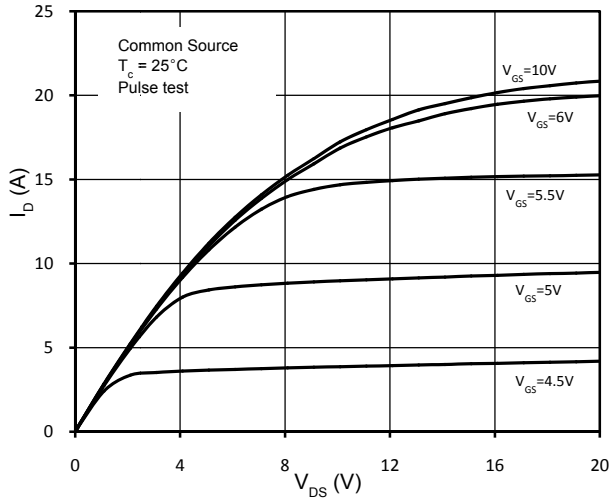


Figure 1.On-Region Characteristics

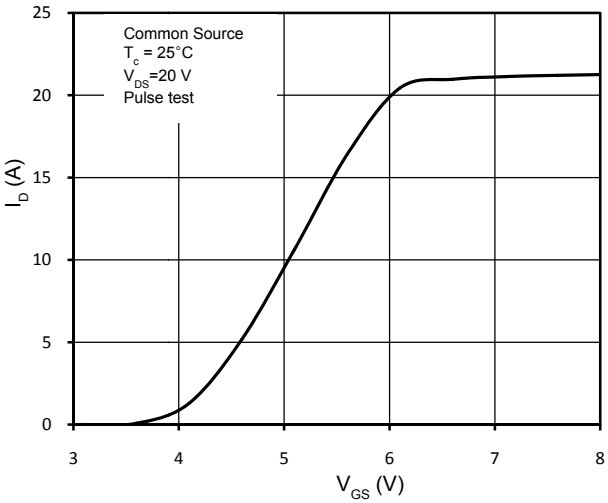


Figure 2. Transfer Characteristics

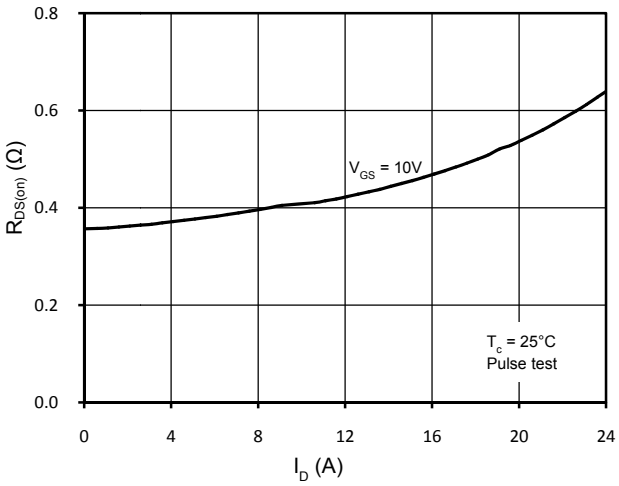


Figure 3. Static Drain-Source On Resistance

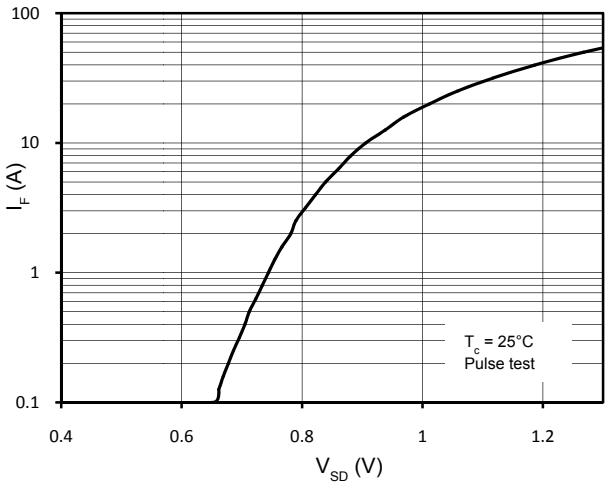


Figure 4. Body- Diode Forward Characteristics

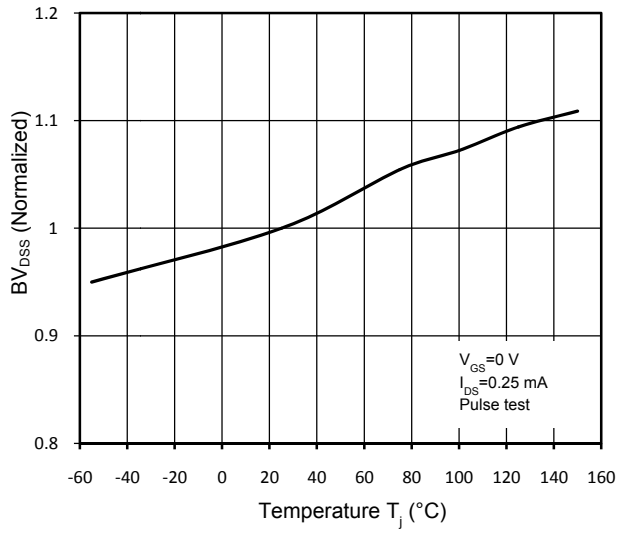


Figure 5. Normalized BV_{DSS} vs. Temperature

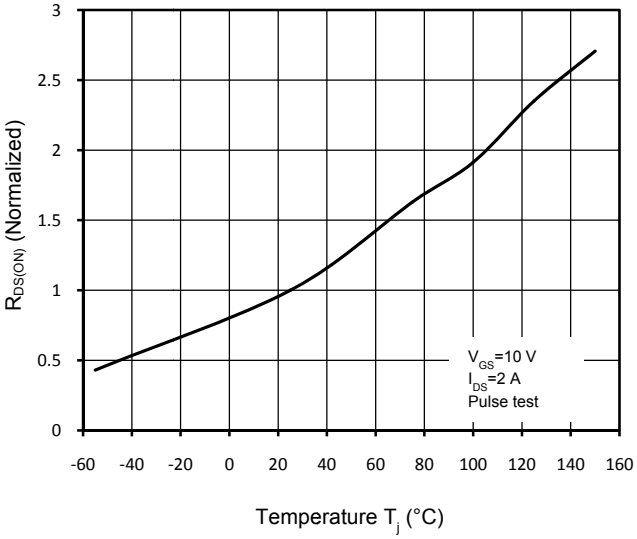


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

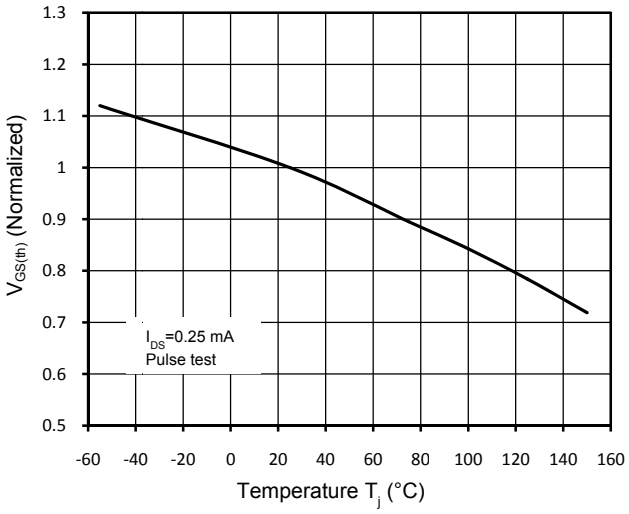


Figure 7. Threshold Voltage vs. Temperature

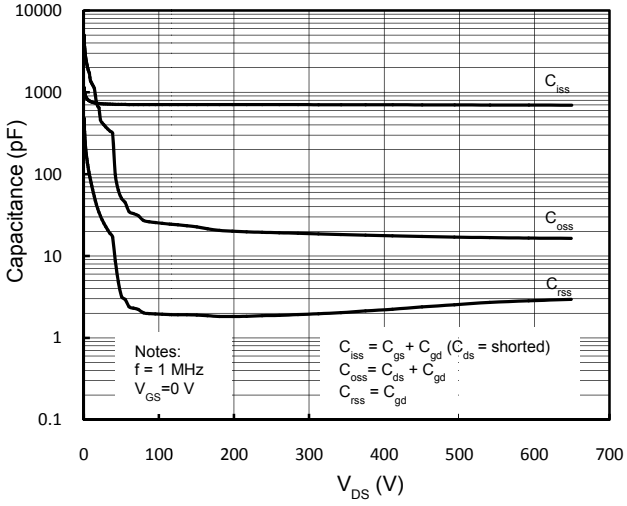


Figure 8. Capacitance Characteristics

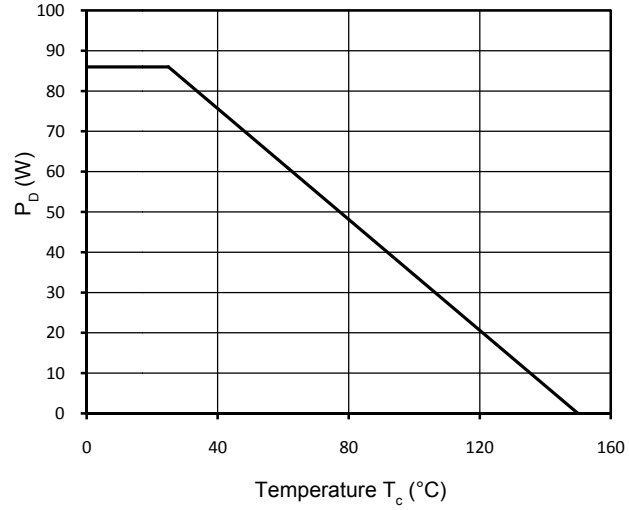


Figure 9. Power Dissipation

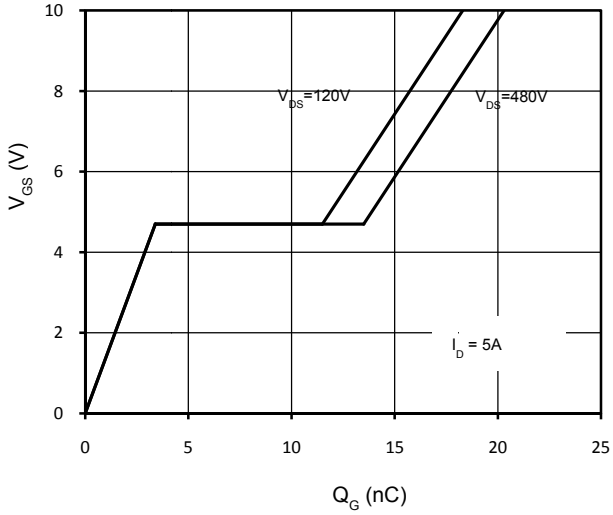


Figure 10. Gate Charge Characteristics

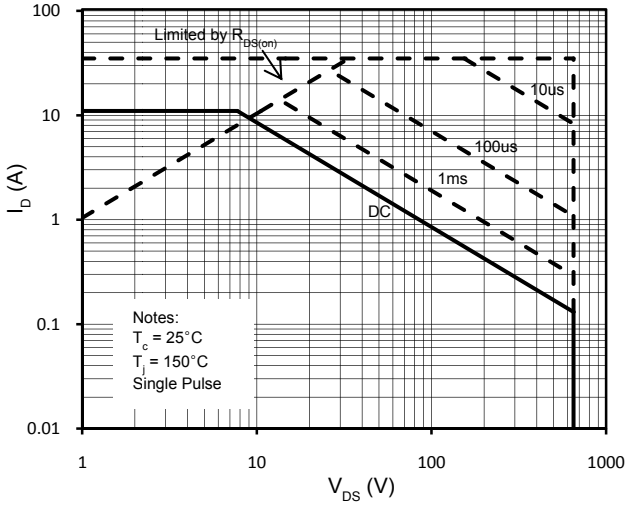


Figure 11. Maximum Safe Operating Area

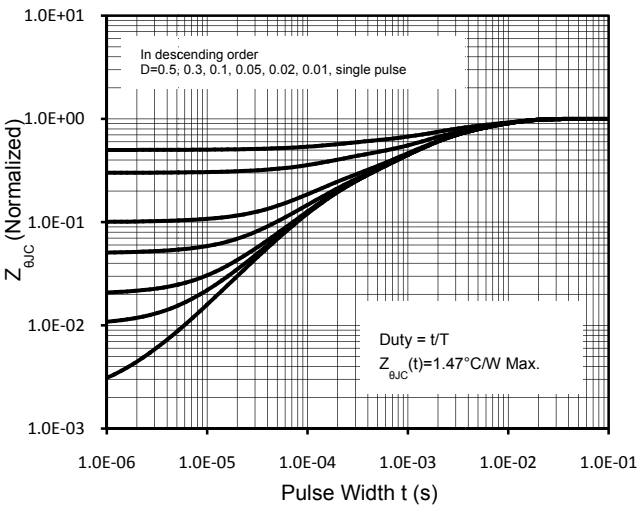
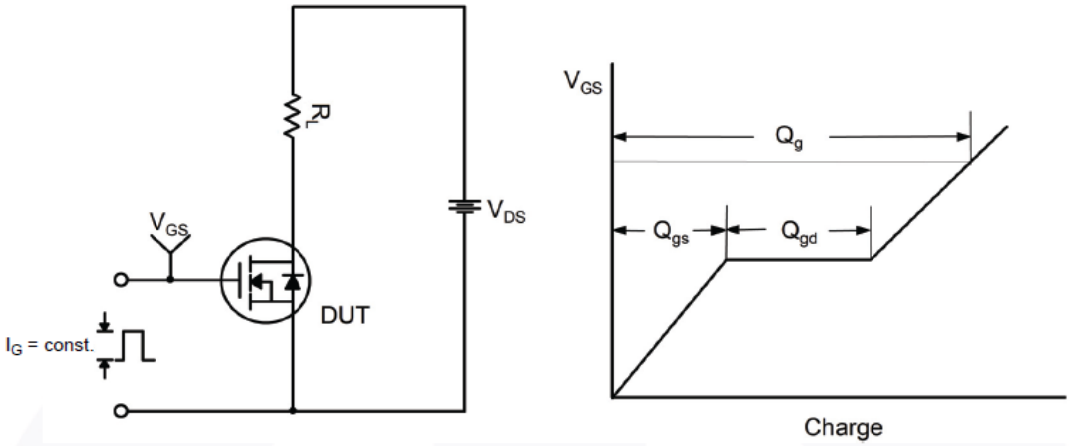
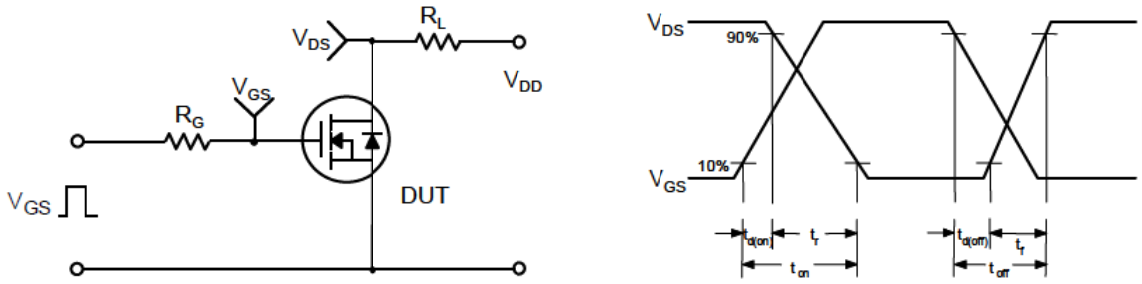


Figure 12. Transient Thermal Response Curve

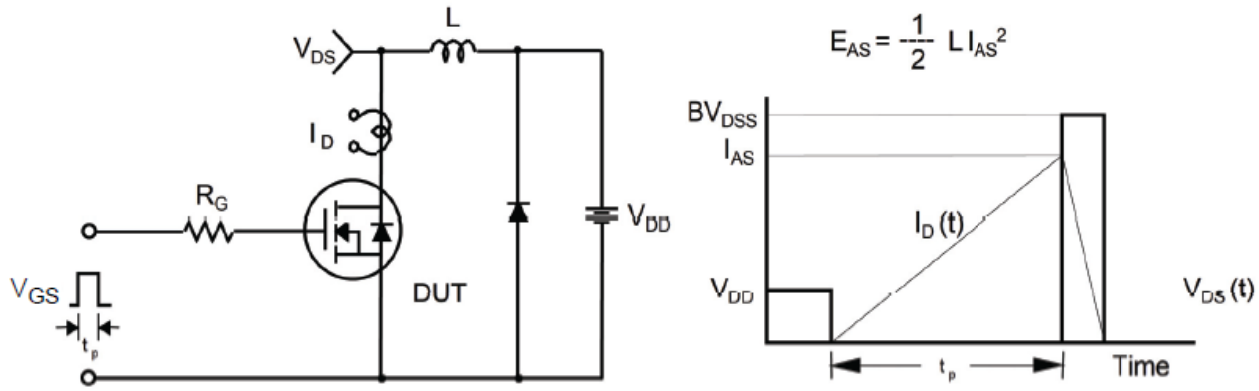
Gate Charge Test Circuit & Waveform



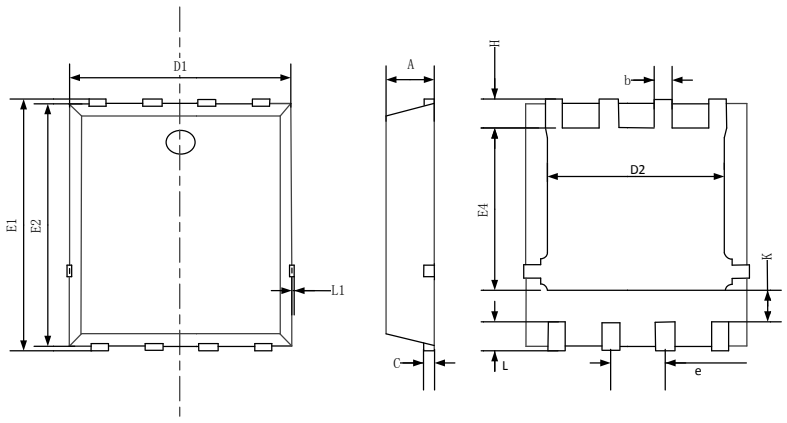
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for PDFN 5x6



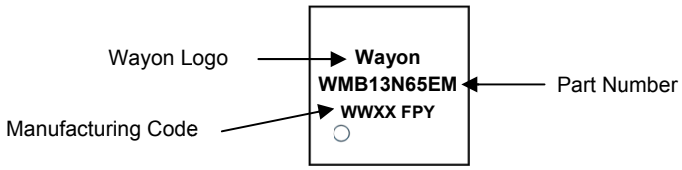
COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	1.0	1.2
b	0.3	0.5
C	0.15	0.35
D1	5.0	5.4
D2	3.8	4.3
E1	5.95	6.35
E2	5.66	6.06
E4	3.52	3.92
e	1.17	1.37
H	0.4	0.6
K	1.15	1.6
L	0.3	0.7
L1		0.12

Ordering Information

Part	Package	Marking	Packing method
WMB13N65EM	PDFN 5x6	WMB13N65EM	Tape and Reel

Marking Information



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