WTC

Winsem Technology Corp.

WMD4N65S
POWER MOSFET

650V N-Channel Power MOSFET

Features

- High Voltage: BV_{DSS}=650V(Min.)
- I_D : 4A
- Robust high voltage termination
- Avalanche energy specified
- Fast diode recovery time

Application

- Ballast Bridge
- Switch Mode Power Supplier
- Power Factor Correction
- Lighting

Pin Definition
1. Gate
2. Drain
3. Source
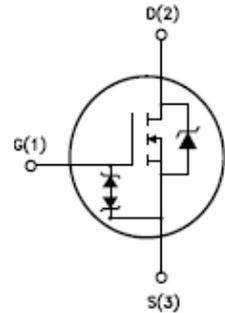
TO-252

Ordering Information

Type NO	Marking	Package Code
WMD4N65S	4N65D	TO-252

Absolute maximum ratings (T$_C$=25°C unless otherwise noted)

Characteristic	Symbol		Rating	Unit
Drain-source voltage	V_{DSS}		650	V
Gate-source voltage	V_{GSS}		±30	V
Drain current (DC) *	I_D	T_C=25°C	4.0	A
		T_C=100°C	2.53	A
Drain current (Pulsed) *	I_{DM}		16	A
Single avalanche energy ②	E_{AS}		52	mJ
Repetitive avalanche current ①	I_{AR}		2.5	A
Repetitive avalanche energy ①	E_{AR}		3.2	mJ
Power dissipation	P_D		50	W
Junction temperature	T_J		150	°C
Storage temperature range	T_{stg}		-55~150	°C

* Limited by maximum junction temperature

Characteristic		Symbol	Typ.	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	4.16	°C/W
	Junction-ambient	$R_{th(J-A)}$	62.5	

Version : A10

Electrical Characteristics (T_C=25°C unless otherwise noted)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage		BV_{DSS}	I_D=250 μA, V_{GS}=0V	650	-	-	V
Gate threshold voltage		$V_{GS(th)}$	I_D=250 μA, V_{DS}= V_{GS}	2.0	-	4.0	V
Drain-source cut-off current		I_{DSS}	V_{DS}=650V, V_{GS}=0V, T_C=25°C	-	-	1	μA
			V_{DS}=520V, V_{GS}=0V, T_C=125°C	-	-	100	μA
Gate leakage current		I_{GSS}	V_{DS}=0V, V_{GS}=±20V	-	-	±10	μA
Drain-source on-resistance		$R_{DS(on)}$	V_{GS}=10V, I_D=2A	-	2.3	2.8	Ω
Forward transfer conductance	③	g_{fs}	V_{DS}=15V, I_D=2A	-	3.5	-	S
Input capacitance		C_{iss}	V_{DS}=25V, V_{GS}=0V f=1 MHz	-	560	-	pF
Output capacitance		C_{oss}		-	51	-	
Reverse transfer capacitance		C_{rss}		-	2.2	-	
Turn-on delay time	③④	$t_{d(on)}$	V_{DD}=325V, I_D=4A R_G=10Ω	-	15	-	ns
Rise time	③④	t_r		-	23	-	
Turn-off delay time	③④	$t_{d(off)}$		-	30	-	
Fall time	③④	t_f		-	16	-	
Total gate charge	③④	Q_g	V_{DD}=520V, V_{GS}=10V I_D=4A	-	14	-	nC
Gate-source charge	③④	Q_{gs}		-	3	-	
Gate-drain charge	③④	Q_{gd}		-	6	-	

Source-Drain Diode Ratings and Characteristics (T_C=25°C unless otherwise noted)

Characteristic		Symbol	Test Condition	Min	Typ	Max	Unit
Source current (DC)		I_S	Integral reverse diode in the MOSFET	-	-	4.0	A
Source current (Pulsed)		I_{SM}		-	-	16.0	
Forward voltage		V_{SD}	V_{GS}=0V, I_{SD}=4A	-	-	1.5	V
Reverse recovery time	③④	t_{rr}	I_{SD}=4A, V_{GS}=0V dI_F/dt=100A/μs	-	315	-	ns
Reverse recovery charge	③④	Q_{rr}		-	1.2	-	μC

Note ;

1. Repetitive rating : Pulse width limited by safe operating area

2. L=10mH, I_{AS}=4A, V_{DD}=50V, R_G=25 Ω, Starting T_J=25°C

3. Pulse Test : Pulse width≤ 300 μs, Duty cycle≤ 2%

4. Essentially independent of operating temperature typical characteristics

Electrical Characteristic Curves

Fig. 1 Typical Output Characteristics
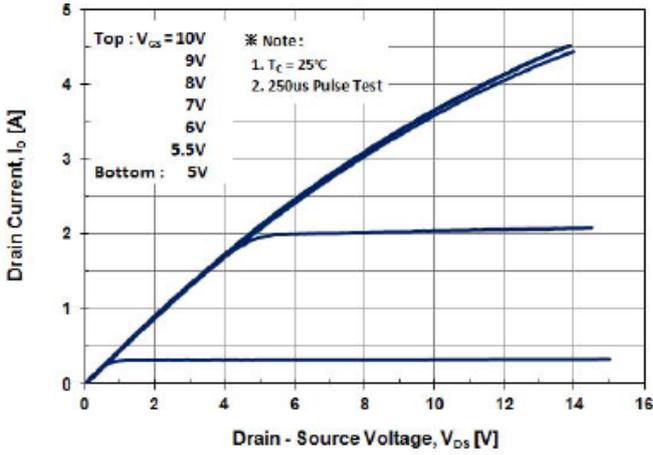
Fig. 2 Typical Output Characteristics
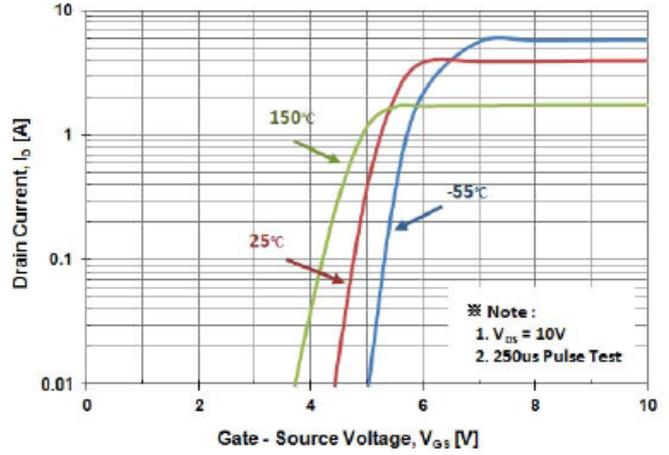

Fig. 3 On-Resistance Variation with Drain Current and Gate Voltage
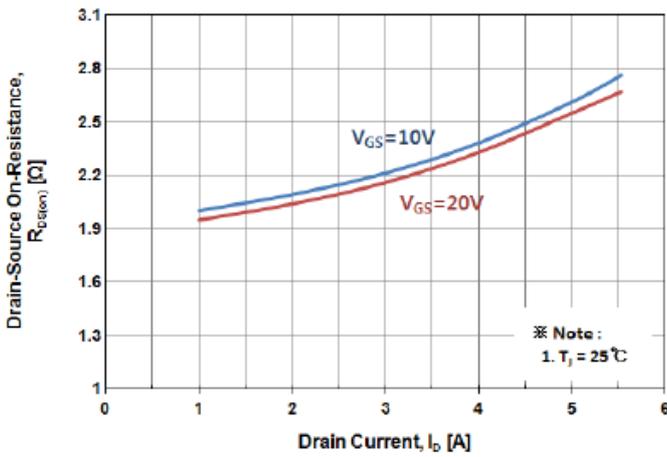

### Fig. 4 Body Diode Forward Voltage Variation with Source Current
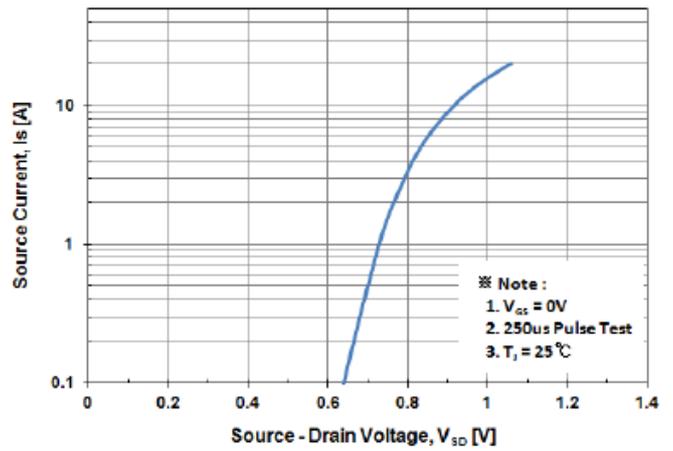

Fig. 5 Typical Capacitance Characteristics
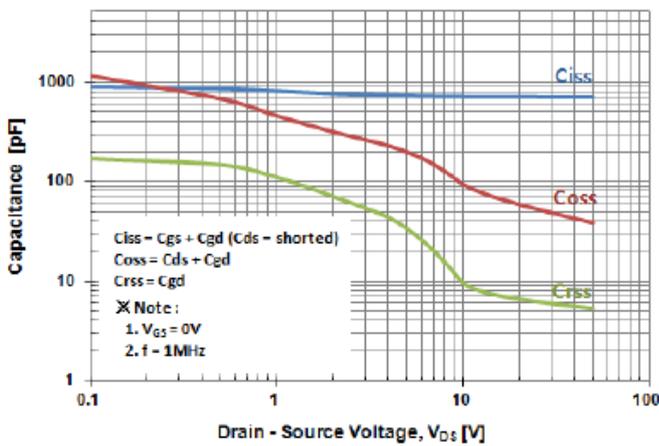
Fig. 6 Typical Total Gate Charge Characteristics

Version : A10
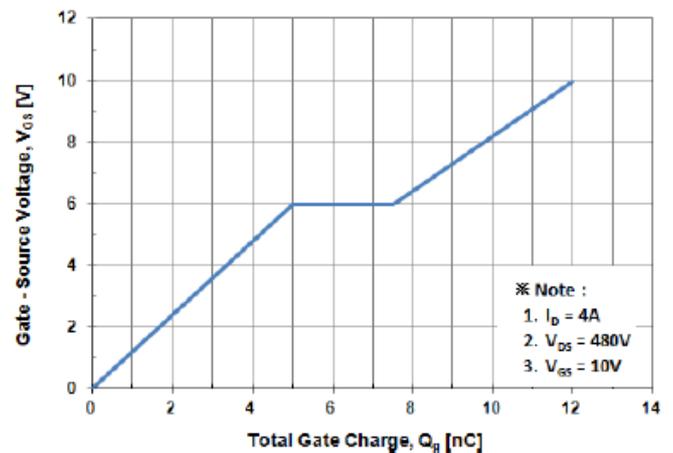
Electrical Characteristic Curves

### Fig. 7 Breakdown Voltage Variation vs. Temperature

※ Note:
1. V_{GS} = 0V
2. I_{DS} = 250uA
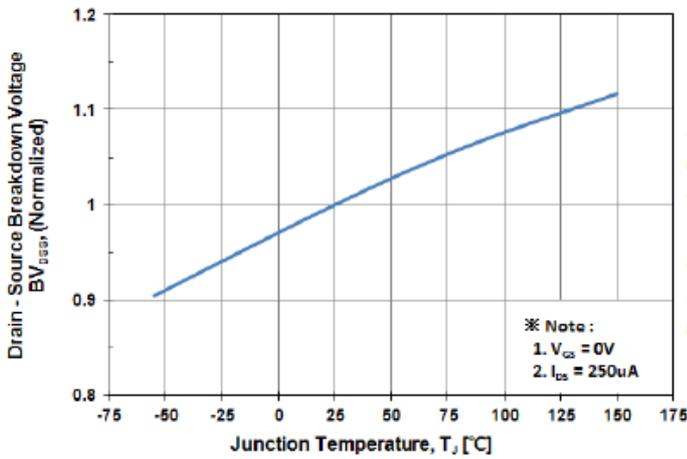
Fig. 8 On-Resistance Variation vs. Temperature

※ Note:
1. V_{GS} = 10V
2. I_D = 2A
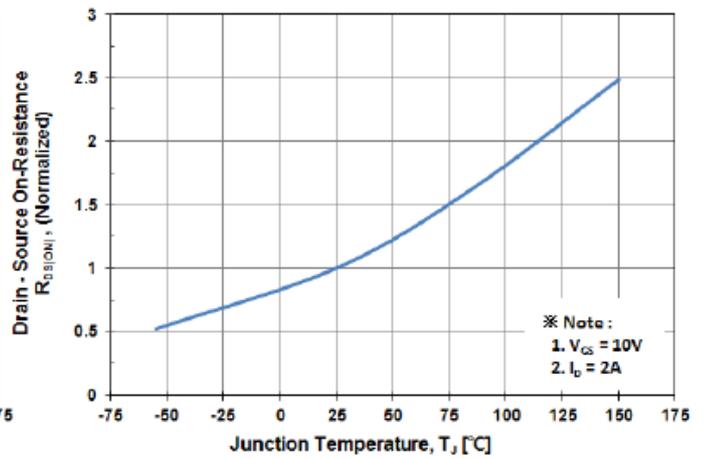
Fig. 9 Maximum Drain Current vs. Case Temperature
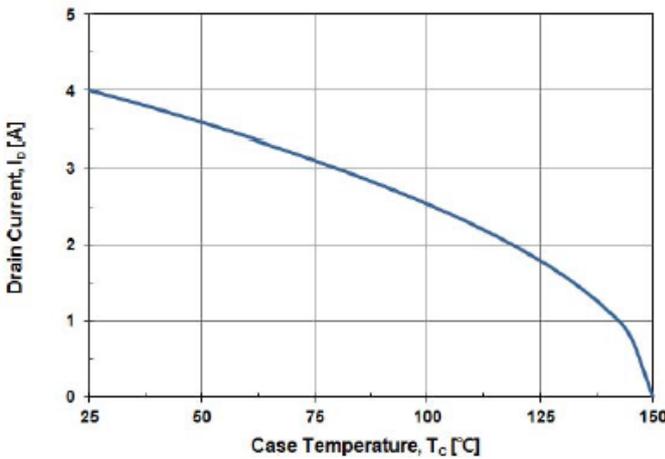
Fig. 10 Maximum Safe Operating Area

Operation in This Area is Limited by $R_{DS(on)}$

※ Note:
1. T_C = 25℃
2. T_J = 150℃
3. Single Pulse
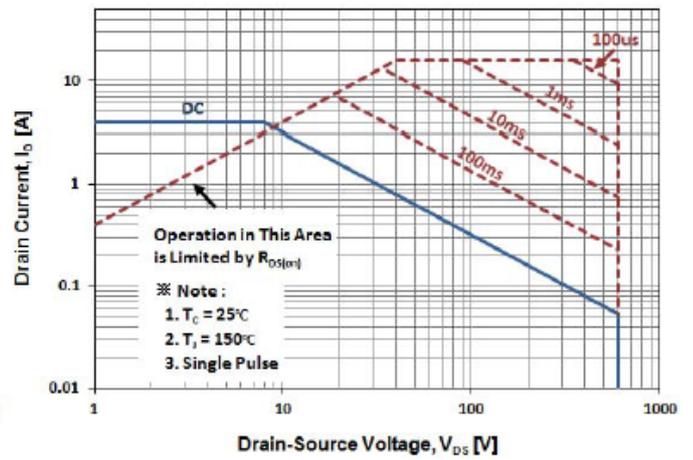
Fig. 11 Transient Thermal Impedance

Single Pulse
δ=0.01
δ=0.02
δ=0.05
δ=0.1
δ=0.2
δ=0.5

※ Note:
1. $Z_{\theta JC}(t)$ = 3.9℃/W Max.
2. Duty Factor, δ = t1 / t2
3. $T_{JM} - T_C = P_{DM} \times Z_{\theta JC}(t)$
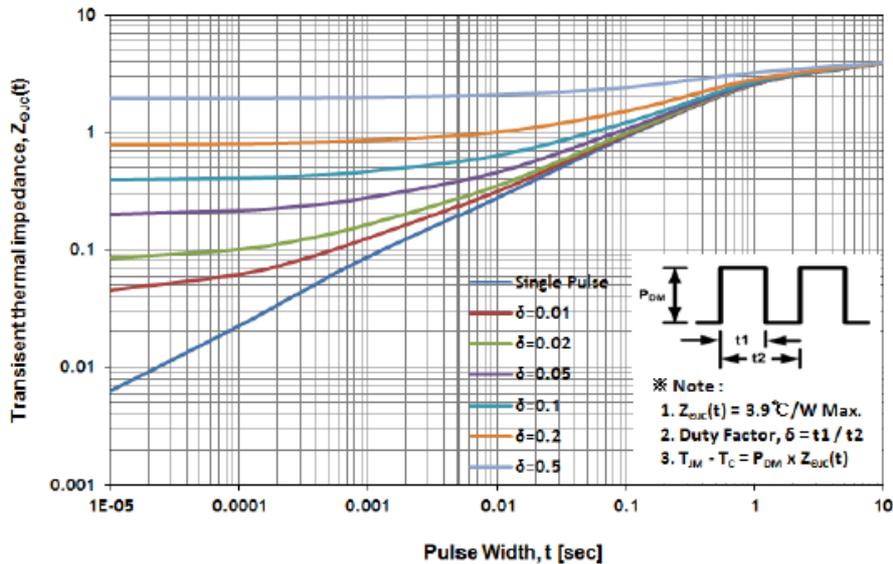
Outline Dimension : TO-252
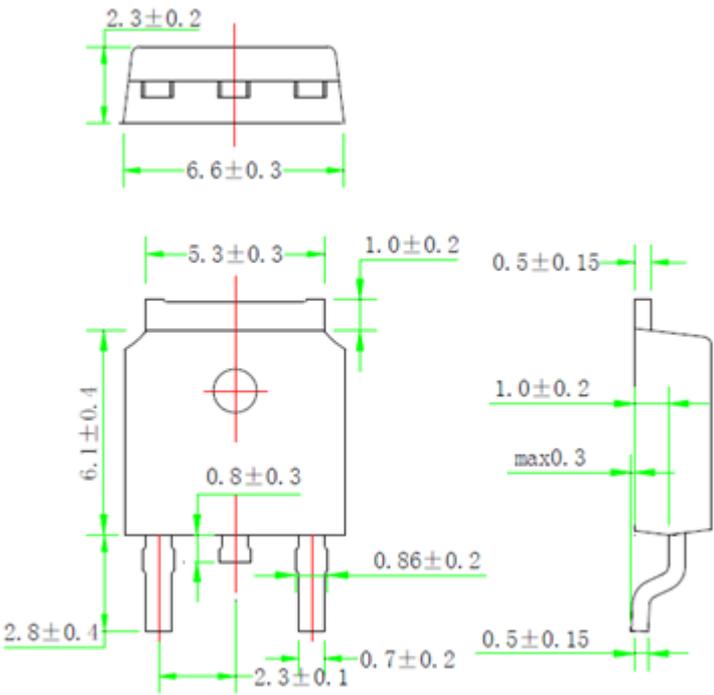
Unit : mm

Marking Diagram
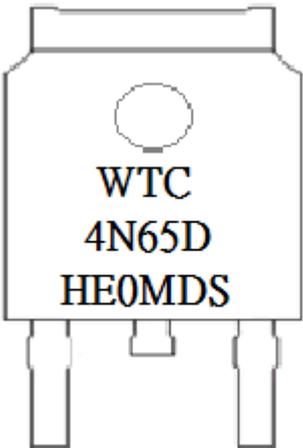
First Line	WTC	Company Name	
Second Line	4N65D	Product Code	
Third Line	HE0MDS	1st (Year Code)	A-2010　B-2011　C-2012 ···
		2nd (Month Code)	A-Jan　B-Feb　C-Mar　D-Apr　E-May　F-Jun　G-Jul　H-Aug　I-Sep　J-Oct　K-Nov　L-Dec
		3rd (Lot Code)	0-1 , A-9
		4th (Product Code)	M-MOS　,　T-Transsistor
		5th (Package Code)	I-TO-251，D-TO-252
		6th (Spec Code)	(Reserve)

Version : A10