

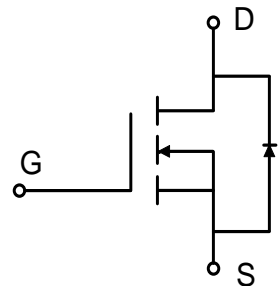
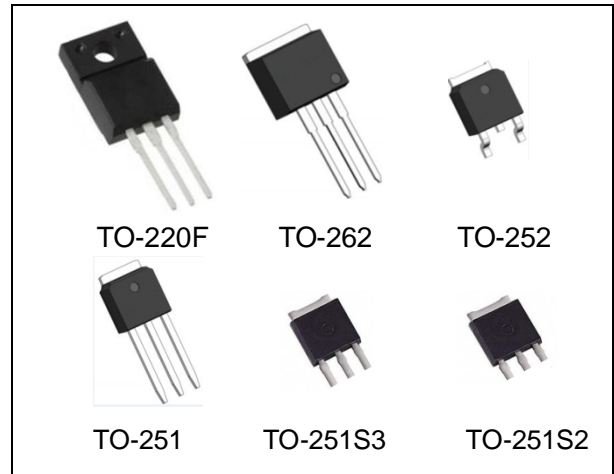
650V Silicon N-channel Power MOSFET

Description

WMOS™ DM, the silicon N-channel enhanced VDMOSFETs, is obtained by the self-aligned planar technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency.

Features

- Fast Switching
- Typ. $R_{DS(on)} = 2.3\Omega$
- Low Gate Charge (Typ. $Q_g = 12.5C$)
- Typ. $C_{rss} = 4.1pF$
- 100% UIS Tested



Applications

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

Absolute Maximum Ratings

Parameter	Symbol	WML	WMN	WMO/P/H/G	Unit
Drain-Source Voltage	V_{DS}	650			V
Continuous Drain Current ($T_C = 25^\circ C$) ($T_C = 100^\circ C$)	I_D	4 2.5			A
Pulsed Drain Current ¹⁾	I_{DM}	16			A
Gate-Source Voltage	V_{GS}	± 30			V
Avalanche Energy, Single Pulse ²⁾	E_{AS}	194			mJ
Power Dissipation ($T_C = 25^\circ C$) - Derate Above $25^\circ C$	P_D	30 0.24	90 0.72	77 0.62	W W/°C
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150			°C
Continuous Diode Forward Current	I_S	4			A
Diode Pulse Current	$I_{S,pulse}$	16			A

Thermal Characteristics

Parameter	Symbol	WML	WMN	WMO/P/H/G	Unit
Thermal Resistance, Junction-To-Case	$R_{\theta JC}$	4.17	1.39	1.62	°C/W
Thermal Resistance, Junction-To-Ambient	$R_{\theta JA}$	62.5	62.5	62.0	°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	-	4	V
Drain Cut-Off Current	I_{DSS}	V _{DS} =650 V, V _{GS} =0 V	-	-	1	μA
Gate Leakage Current, Forward	I_{GSSF}	V _{GS} =30 V, V _{DS} =0 V	-	-	100	nA
Gate Leakage Current, Reverse	I_{GSSR}	V _{GS} =-30 V, V _{DS} =0 V	-	-	-100	nA
Drain-Source On-State Resistance ³	R_{DS(on)}	V _{GS} =10 V, I _D =2 A	-	2.3	2.7	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	430	-	pF
Output Capacitance	C_{oss}		-	55	-	
Reverse Transfer Capacitance	C_{rss}		-	4.1	-	
Turn-On Delay Time	t_{d(on)}	V _{DD} = 325V, I _D = 4A R _G = 25Ω, V _{GS} =10V	-	9.93	-	ns
Rise Time	t_r		-	25.6	-	
Turn-Off Delay Time	t_{d(off)}		-	27.6	-	
Fall Time	t_f		-	25.6	-	
Gate Charge Characteristics						
Gate To Source Charge	Q_{gs}	V _{DD} =520 V, I _D =4A, V _{GS} =0 to 10 V	-	2.74	-	nC
Gate To Drain Charge	Q_{gd}		-	6.31	-	
Gate Charge Total	Q_g		-	12.5	-	
Reverse Diode Characteristics						
Diode Forward Voltage	V_{SD}	V _{GS} =0 V, I _F =4A	-	-	1.4	V
Reverse Recovery Time	t_{rr}	I _F =4A, dI _F /dt=100 A/μs	-	450	-	ns
Reverse Recovery Charge	Q_{rr}	V _{GS} =0 V	-	1.87	-	μC

Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature
2. I_{AS}=3.6A, V_{DD}=50V, R_G=25Ω, starting T_J = 25°C
3. Pulse test: pulse width≤300μs, duty cycle≤2%.

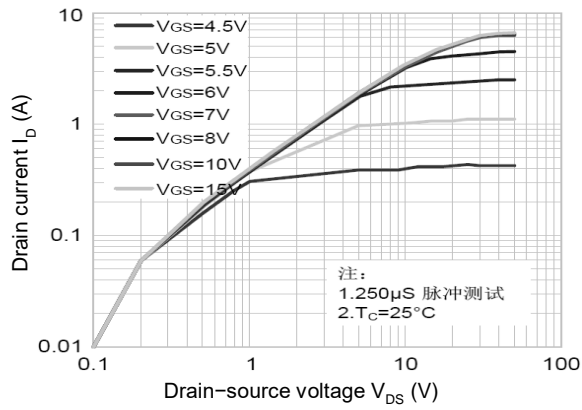


Figure 1. On-Region Characteristics

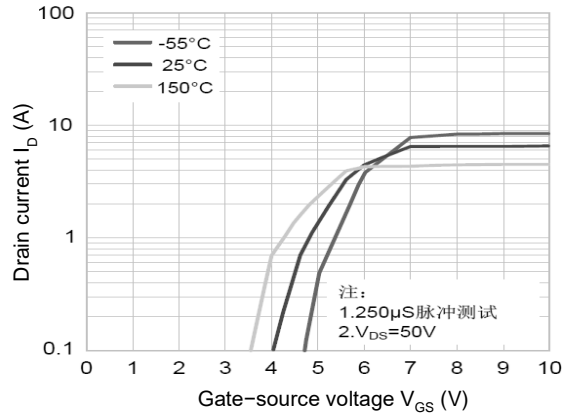


Figure 2. Transfer Characteristics

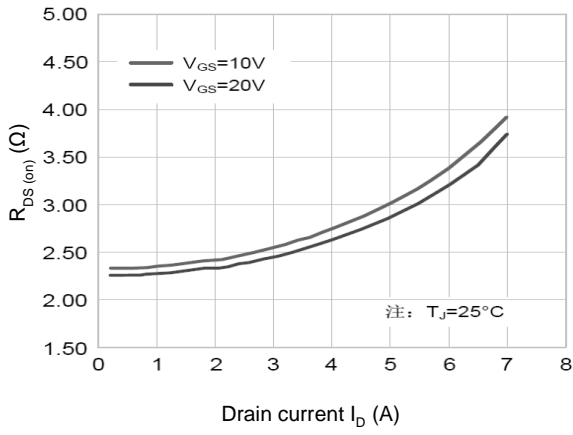


Figure 3. On-Resistance Variation vs. Drain Current

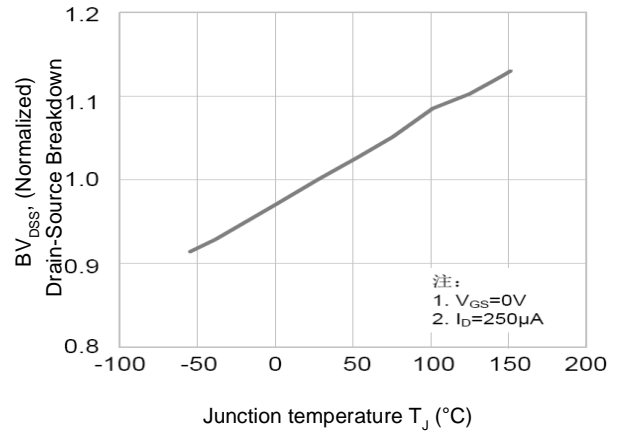


Figure 4. Breakdown Voltage vs. Temperature

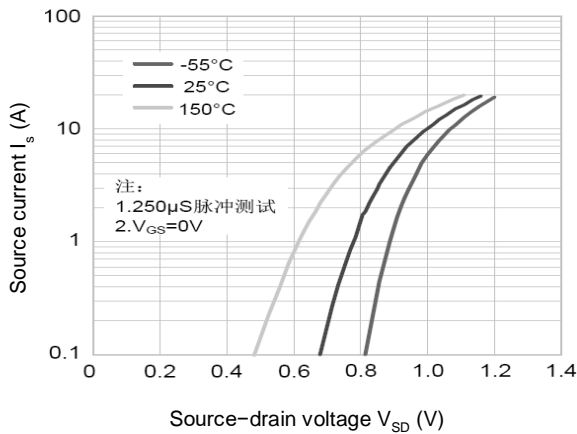


Figure 5. Source Current Variation vs. Source-drain Voltage

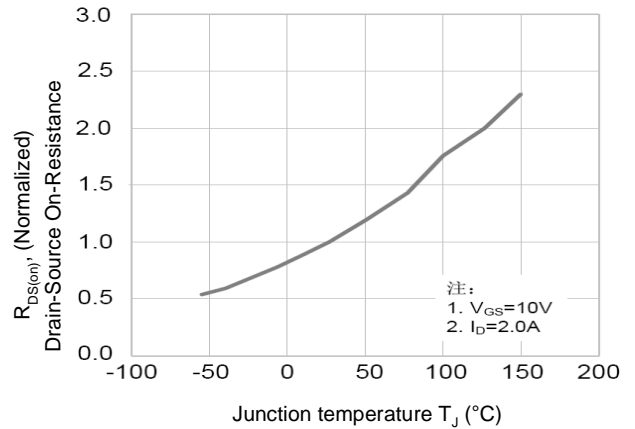


Figure 6. On-Resistance vs. Temperature

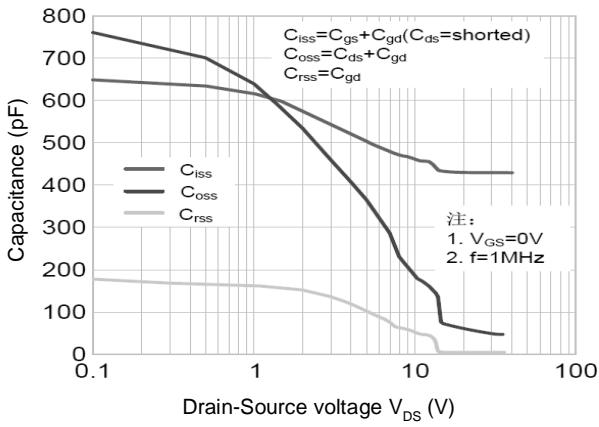


Figure 7. Capacitance Characteristics

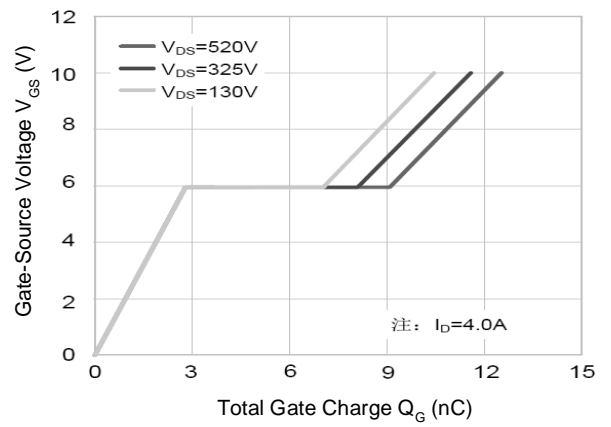


Figure 8. Gate Charge Characteristics

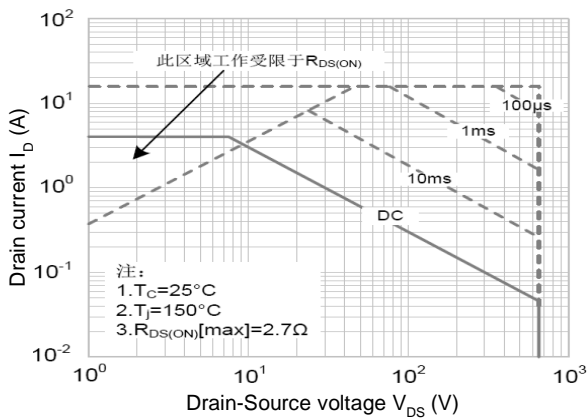


Figure 9. Maximum Safe Operating Area (WML04N65DM)

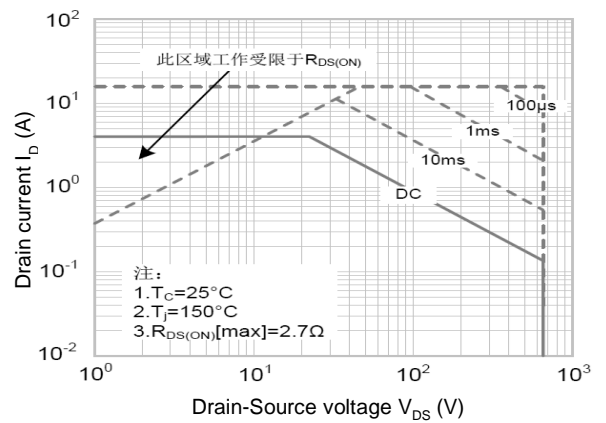


Figure 10. Maximum Safe Operating Area (WMN04N65DM)

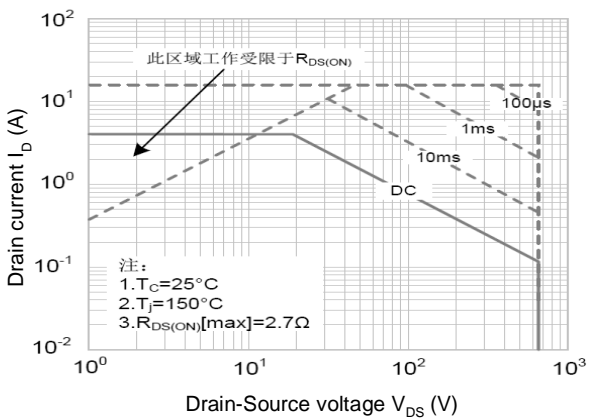


Figure 11. Maximum Safe Operating Area (WMO/P/H/G04N65DM)

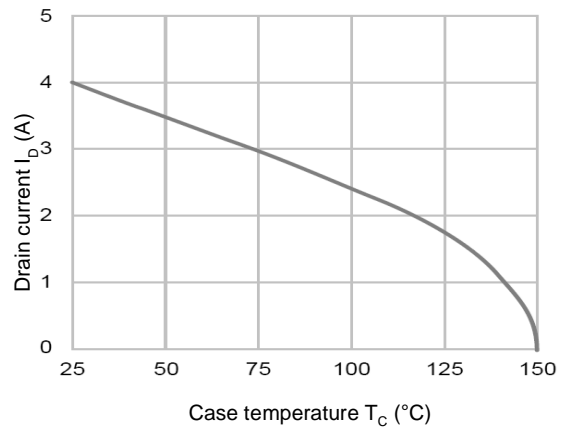
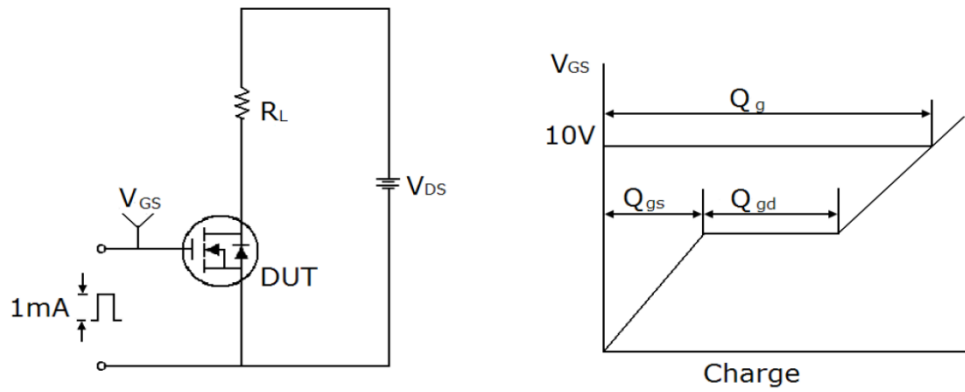
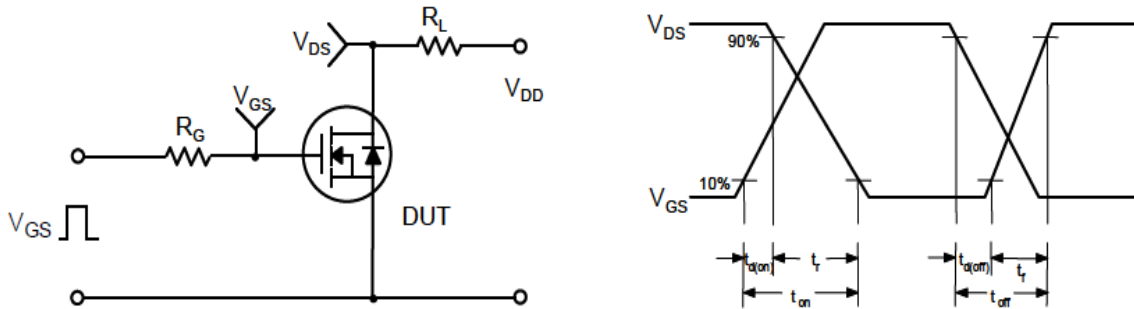


Figure 12. Drain Current vs. Case Temperature

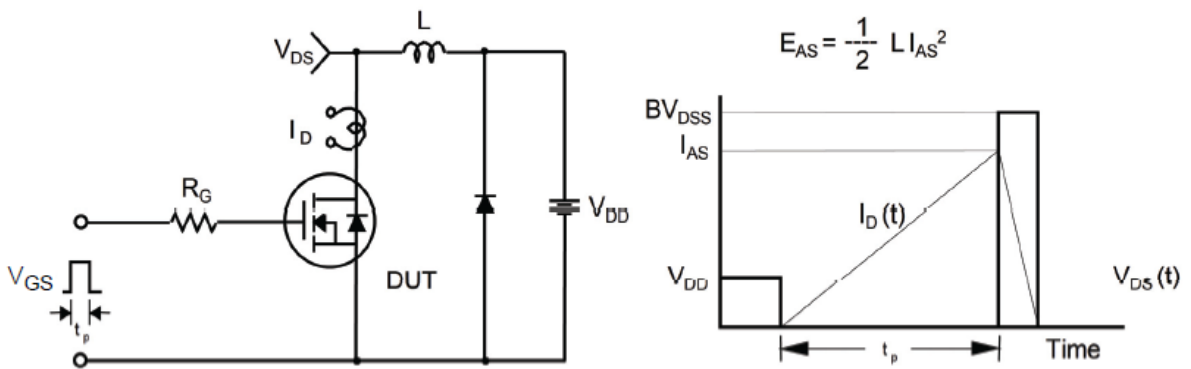
Gate Charge Test Circuit & Waveform



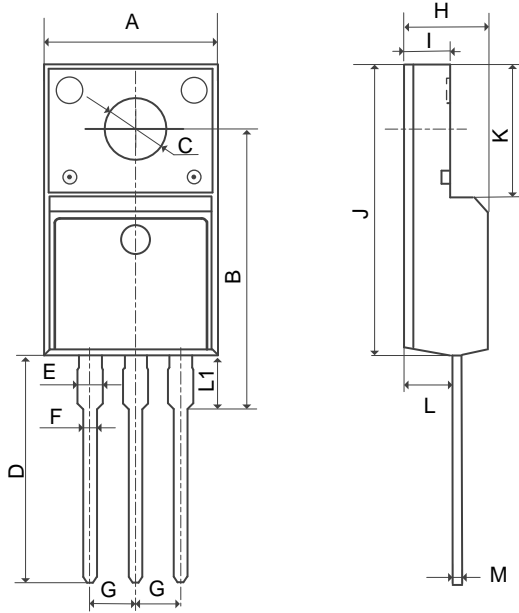
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



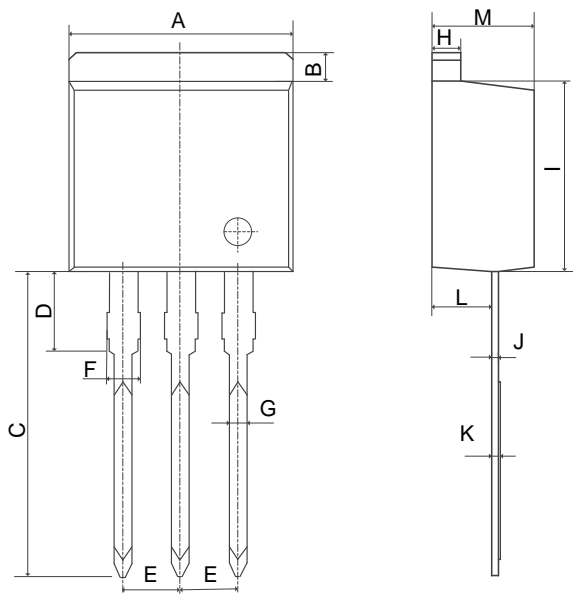
Mechanical Dimensions for TO-220F



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.96	10.38
B	15.10	16.10
C	3.03	3.38
D	12.64	13.38
E	1.17	1.58
F	0.65	0.95
G	2.54REF	
H	4.50	4.90
I	2.34	2.74
J	15.57	16.17
K	6.70REF	
L	2.50	2.96
M	0.40	0.70
L1	2.85	3.45

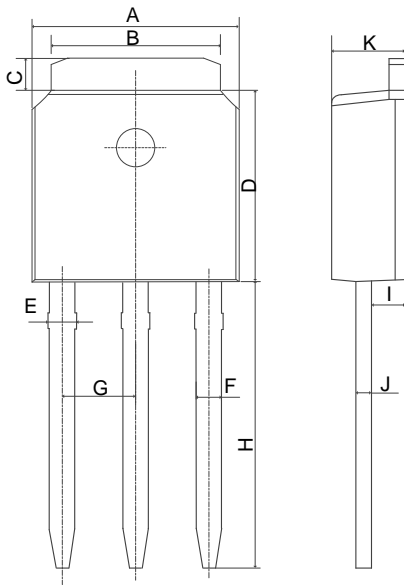
Mechanical Dimensions for TO-262



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	10.00	10.40
B	1.11	1.41
C	13.56	14.16
D	3.58	3.98
E	2.39	2.69
F	1.07	1.47
G	0.71	0.92
H	1.17	1.37
I	8.45	8.85
J	0.28	0.49
K	0.32	0.52
L	2.54	2.85
M	4.50	4.90

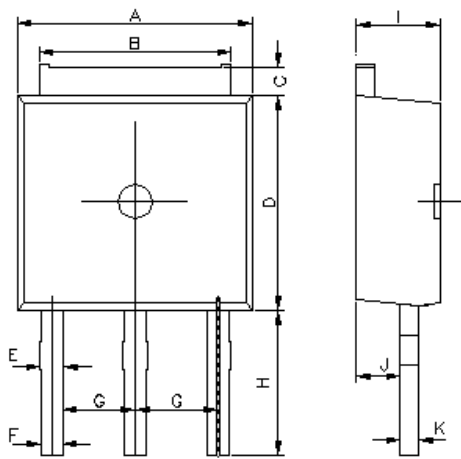
Mechanical Dimensions for TO-251



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.13	5.46
C	0.88	1.28
D	5.90	6.22
E	0.68	1.10
F	0.68	0.91
G	2.29REF	
H	9.00	9.65
I	0.90	1.17
J	0.40	0.61
K	2.10	2.50

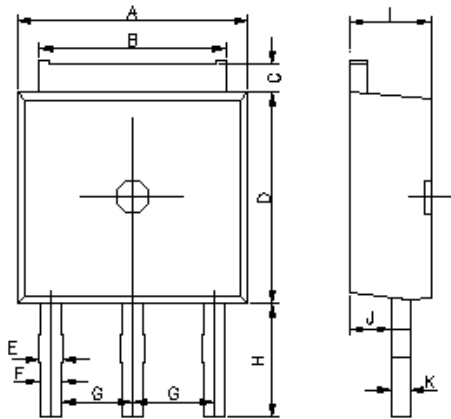
Mechanical Dimensions for TO-251S3



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.15	5.48
C	0.71	1.02
D	5.95	6.35
E	0.70	1.00
F	0.70	0.90
G	2.13	2.44
H	3.20	3.80
I	2.10	2.50
J	0.85	1.15
K	0.40	0.61

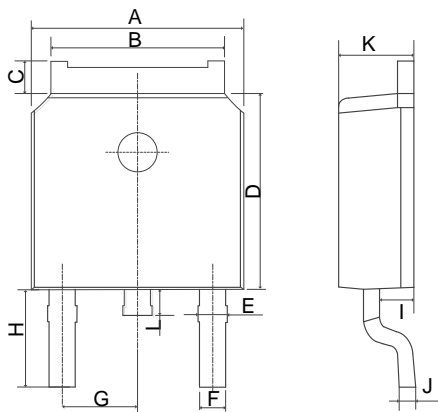
Mechanical Dimensions for TO-251S2



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.15	5.48
C	0.71	1.02
D	5.95	6.35
E	0.70	1.00
F	0.70	0.90
G	2.13	2.44
H	2.20	2.80
I	2.10	2.50
J	0.85	1.15
K	0.40	0.61

Mechanical Dimensions for TO-252



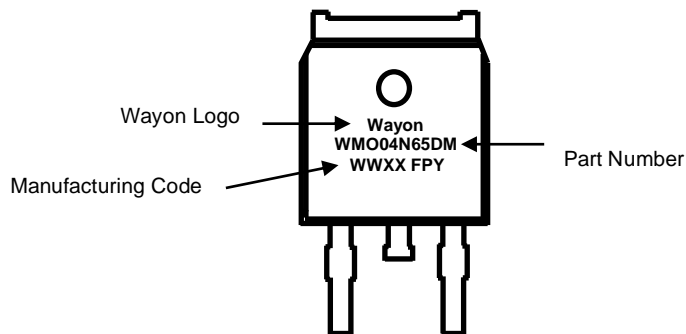
COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.13	5.50
C	0.88	1.28
D	5.90	6.22
E	0.68	1.10
F	0.68	0.91
G	2.29REF	
H	2.90REF	
I	0.85	1.17
J	0.51REF	
K	2.10	2.50
L	0.40	1.00

Ordering Information

Part	Package	Marking	Packing method
WML04N65DM	TO-220F	WML04N65DM	Tube
WMN04N65DM	TO-262	WMN04N65DM	Tube
WMO04N65DM	TO-252	WMO04N65DM	Tape and Reel
WMP04N65DM	TO-251	WMP04N65DM	Tube
WMH04N65DM	TO-251S2	WMH04N65DM	Tube
WMG04N65DM	TO-251S3	WMG04N65DM	Tube

Marking Information



Contact Information

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