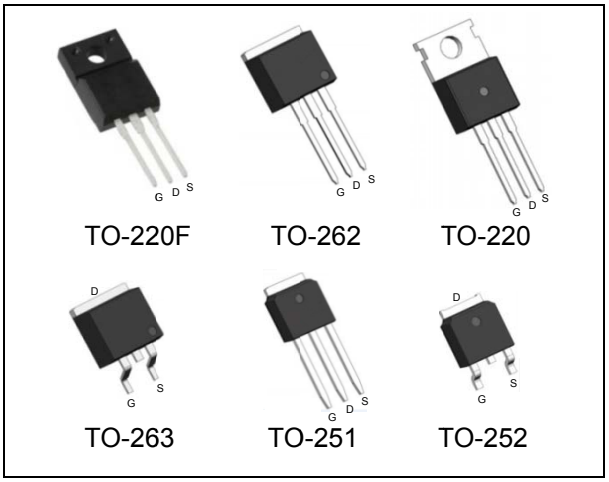
500V 0.4Ω Super Junction Power MOSFET

Description

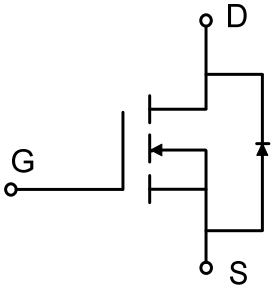
WMOS™ C4 is Wayon's 4th generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ C4 is suitable for applications which require superior power density and outstanding efficiency.



Features

- V_{DS} =550V @ $T_{j,max}$
- Typ. $R_{DS(on)}$ =0.4Ω
- 100% UIS tested
- Pb-free plating, Halogen free

RoHS compliant



Applications

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

Absolute Maximum Ratings

Parameter	Symbol	WMK/WMM/WMN/WMP/WMO	WML	Unit
Drain-source voltage	V_{DSS}	500		V
Continuous drain current[1] (T_C = 25°C)	I_D	10		A
(T_C = 100°C)		6		A
Pulsed drain current[2]	I_{DM}	25		A
Gate-source voltage	V_{GS}	±30		V
Avalanche energy, single pulse[3]	E_{AS}	45		mJ
Avalanche energy, repetitive[2]	E_{AR}	0.15		mJ
Avalanche current, repetitive[2]	I_{AR}	1.0		A
Power dissipation (T_C = 25°C)	P_D	57	27	W
- Derate above 25°C		0.46	0.22	W/°C
Operating and storage temperature range	T_j, T_{stg}	-55 to +150		°C
Continuous diode forward current	I_S	10		A
Diode pulse current	$I_{S,pulse}$	25		A

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMN/WMP/WMO	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	2.2	4.6	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	80	°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	500	-	-	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}=500 V, V_{GS}=0V, T_j = 25°C T_j = 125°C	 - -	 - 30	 1 -	μA
Gate leakage current, forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V	-	-	100	nA
Gate leakage current, reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=2 A T_j = 25°C	- -	 0.4	 0.48	 Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS}= 100V, V_{GS}= 0V,	-	415	-	pF
Output capacitance	C_{oss}	f = 1 MHz	-	19	-	
Reverse transfer capacitance	C_{rss}		-	0.95	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 300V, I_D = 2A	-	12	-	ns
Rise time	t_r	R_G = 25Ω, V_{GS}=10V	-	10	-	
Turn-off delay time	$t_{d(off)}$		-	62	-	
Fall time	t_f		-	13	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=480V, I_D=2A,	-	1.7	-	nC
Gate to drain charge	Q_{gd}	V_{GS}=0 to 10V	-	3.5	-	
Gate charge total	Q_g		-	9.6	-	
Gate plateau voltage	$V_{plateau}$		-	5.2	-	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=50V, I_F=2A,	-	105	-	ns
Reverse recovery charge	Q_{rr}	dI_F/dt=100A/μs	-	0.6	-	μC
Peak reverse recovery current	I_{rrm}		-	11.3	-	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} = 1.0 A, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C.

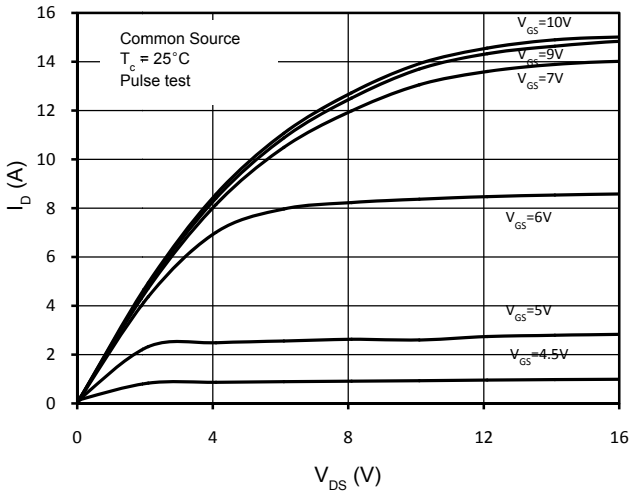


Figure 1.On-Region Characteristics

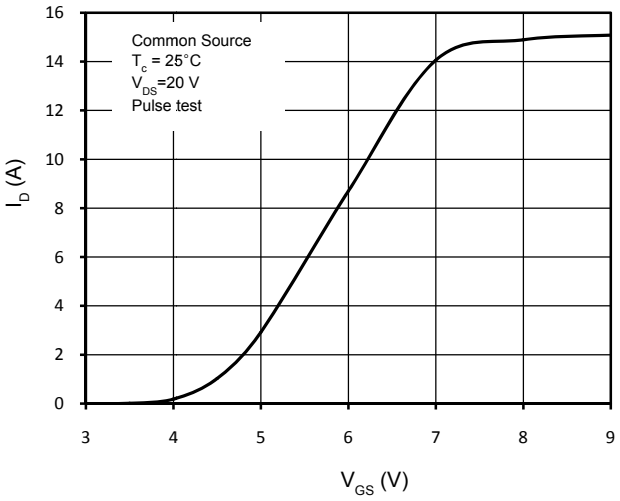


Figure 2. Transfer Characteristics

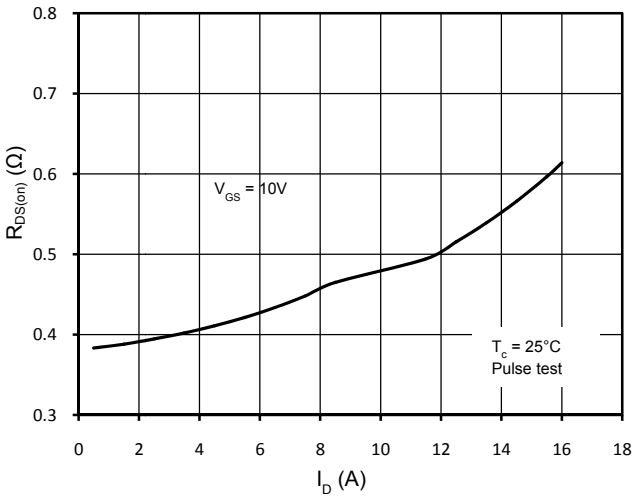


Figure 3. Static Drain-Source On Resistance

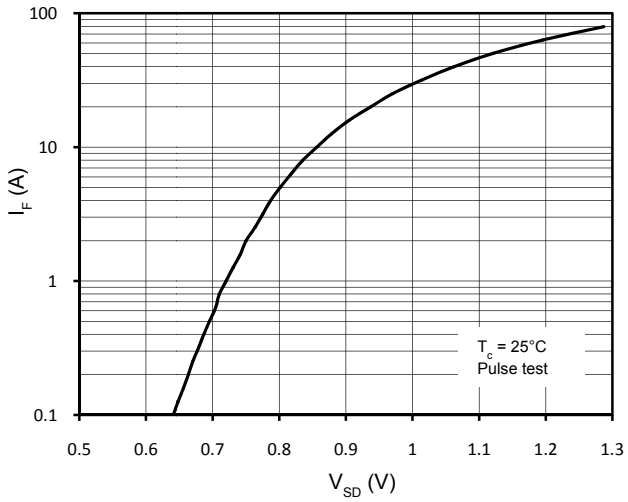


Figure 4. Body- Diode Forward Characteristics

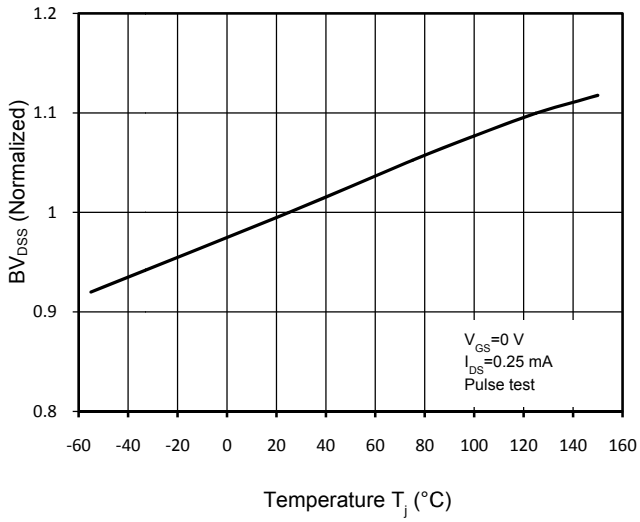


Figure 5. Normalized BV_{DSS} vs. Temperature

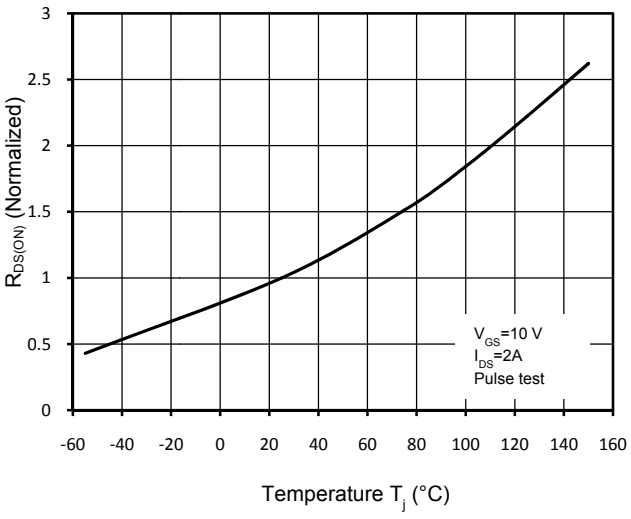


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

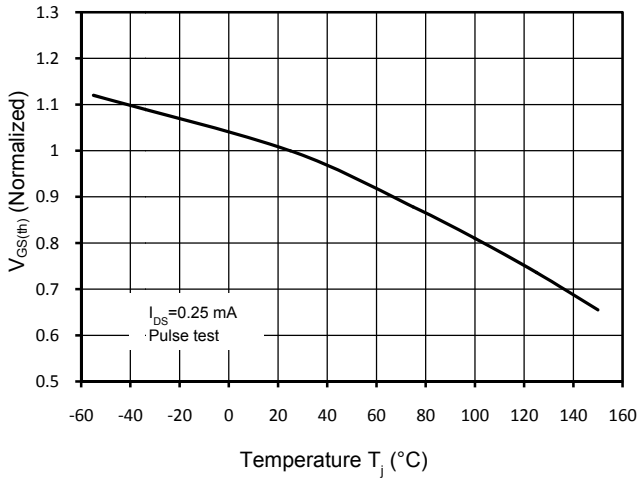


Figure 7. Threshold Voltage vs. Temperature

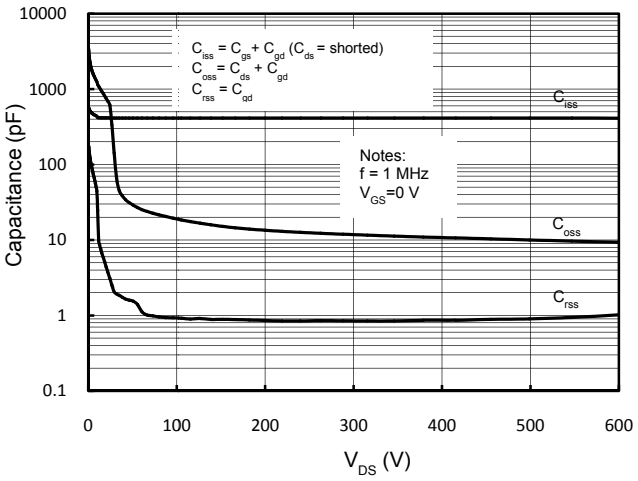


Figure 8. Capacitance Characteristics

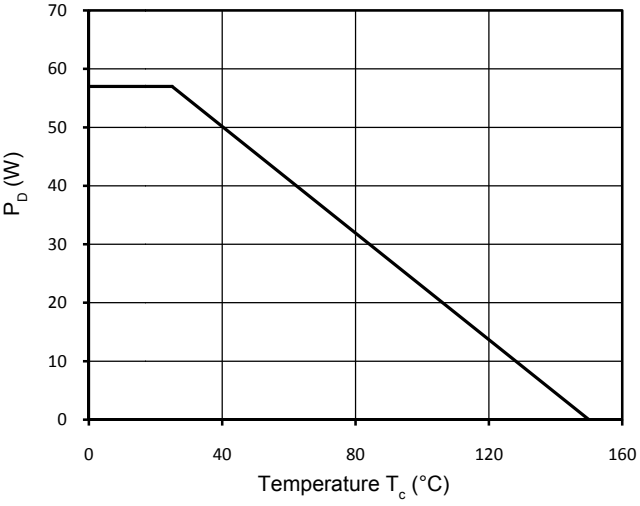


Figure 9. Power Dissipation

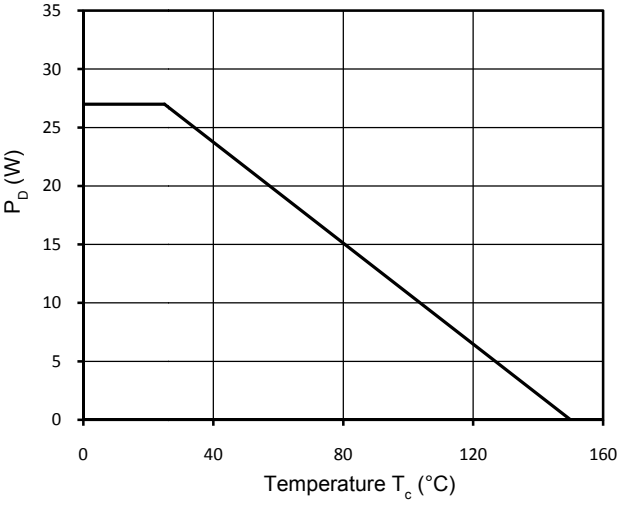


Figure 10. Power Dissipation (TO-220F)

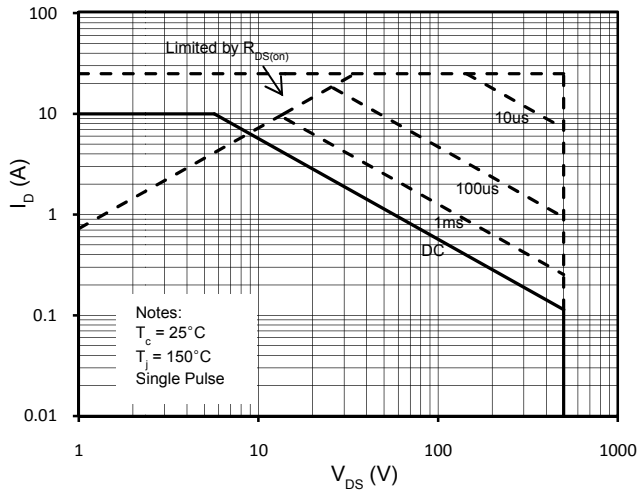


Figure 11. Maximum Safe Operating Area

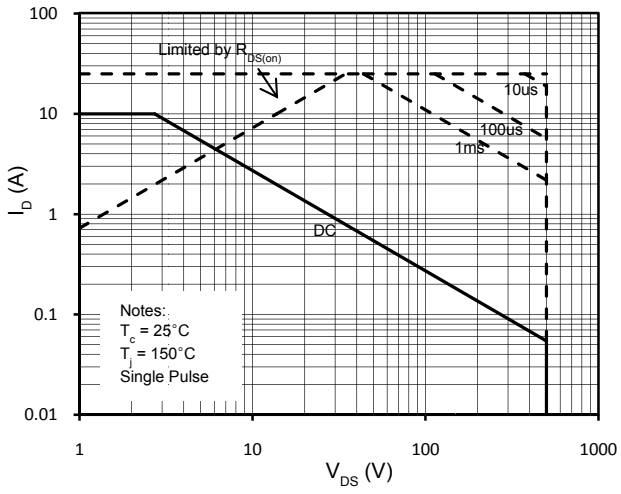


Figure 12. Maximum Safe Operating Area(TO-220F)

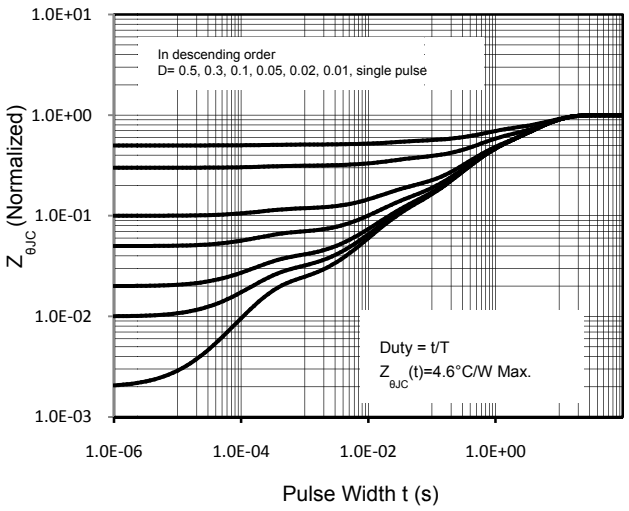


Figure 13. Transient Thermal Response Curve (TO-220F)

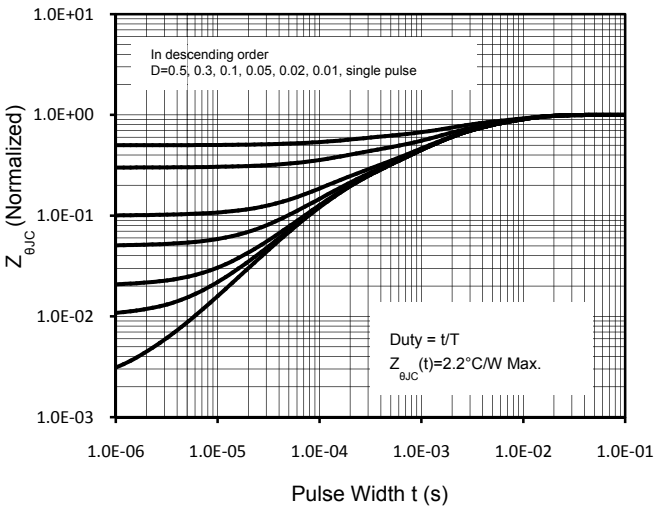


Figure 14. Transient Thermal Response Curve

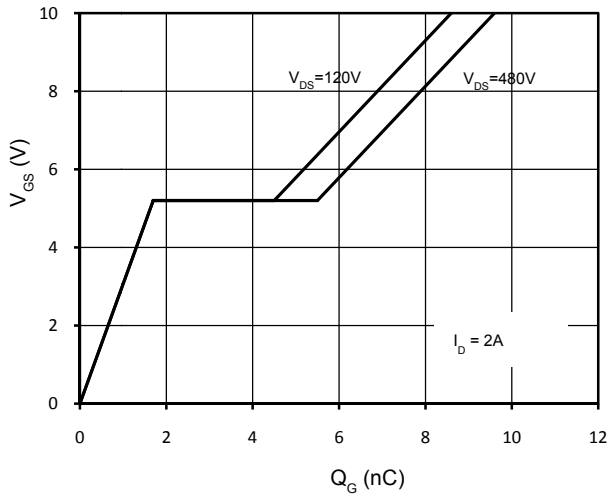
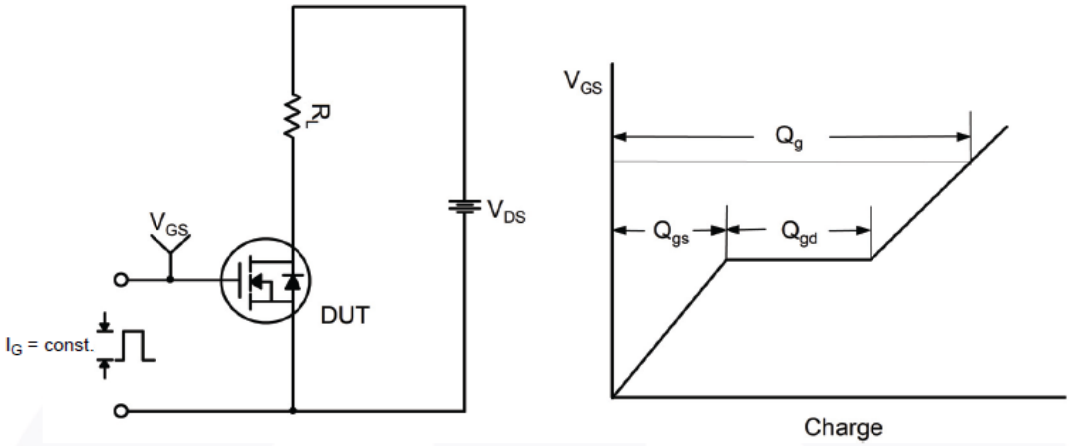
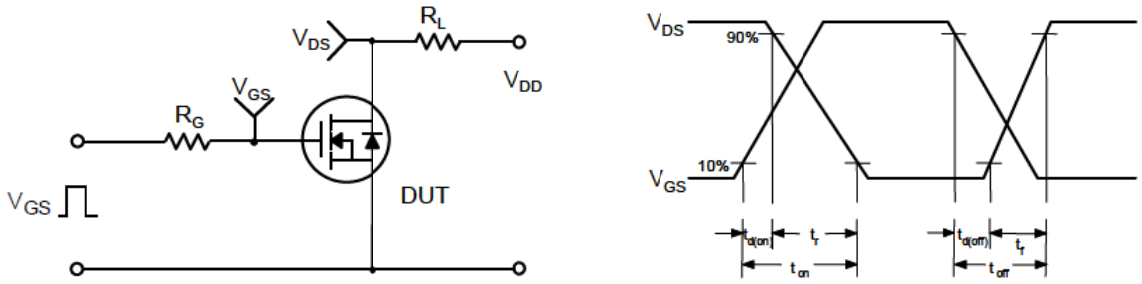


Figure 15. Gate Charge Characteristics

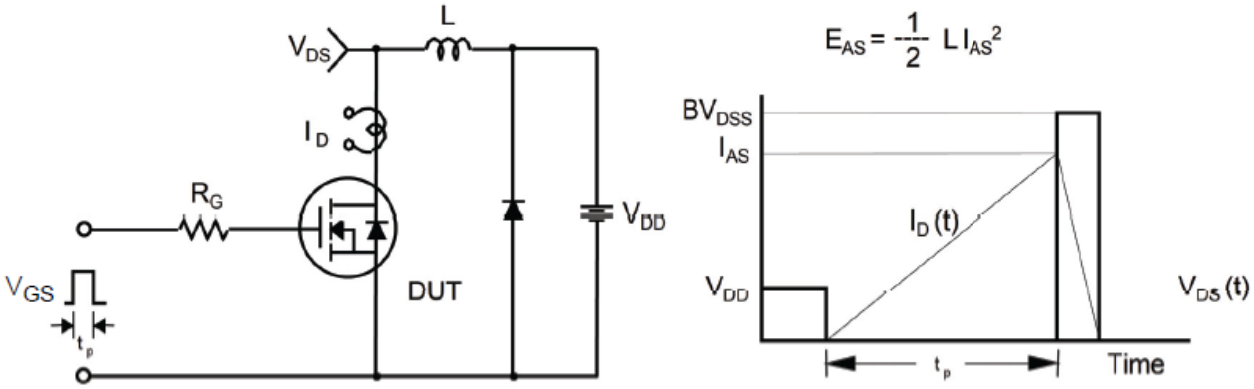
Gate Charge Test Circuit & Waveform



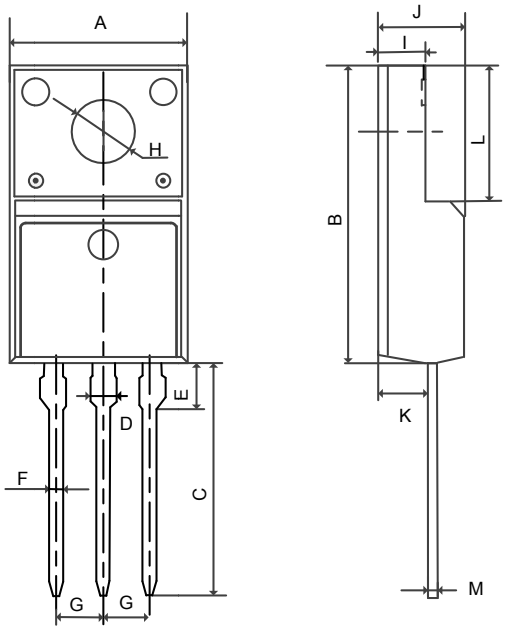
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



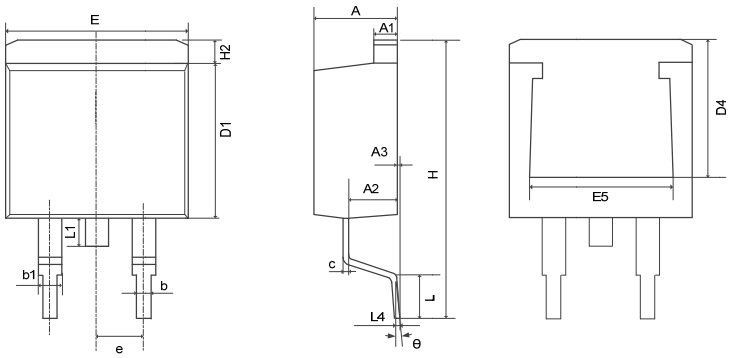
Mechanical Dimensions for TO-220FT



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.96	10.36
B	15.67	16.07
C	12.70	13.30
D	1.12	1.32
E	1.85	2.15
F	0.59	0.79
G	2.39	2.69
H	3.08	3.29
I	2.34	2.74
J	4.50	4.90
K	2.61	2.91
L	6.50	6.90
M	0.40	0.60

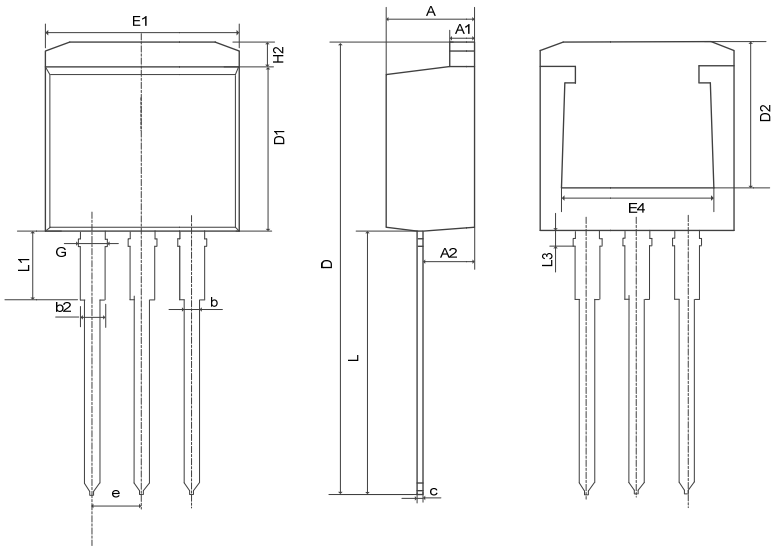
Mechanical Dimensions for TO-263



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.37	4.89
A1	1.17	1.42
A2	2.49	2.89
b	0.70	0.96
b1	1.17	1.47
c	0.30	0.53
D1	8.45	8.90
D4	6.60	—
E	9.86	10.40
E5	7.06	—
e	2.54BSC	
H	14.70	15.50
H2	1.07	1.47
L	2.00	2.70
L1	1.40	1.70
L4	0.25BSC	
θ	0°	9°

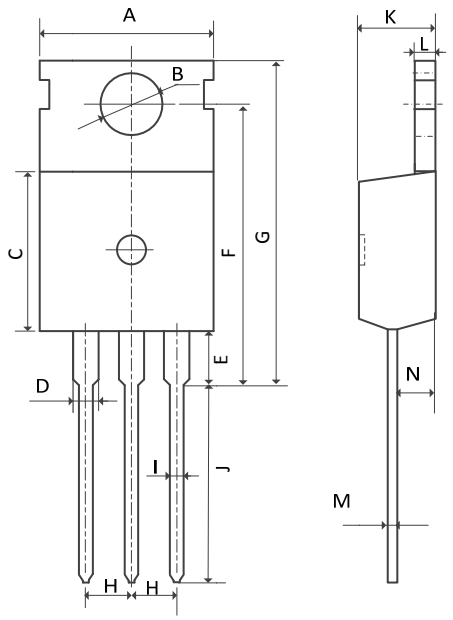
Mechanical Dimensions for TO-262



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.37	4.90
A1	1.17	1.42
A2	2.49	2.89
b	0.71	0.96
b2	1.07	1.47
c	0.28	0.53
D	23.20	24.02
D1	8.45	8.90
D2	6.00	—
E1	9.86	10.40
E4	7.06	—
e	2.54BSC	
G	1.25	1.50
H2	—	1.50
L	13.33	14.16
L1	3.50	4.00
L3	1.28	1.58

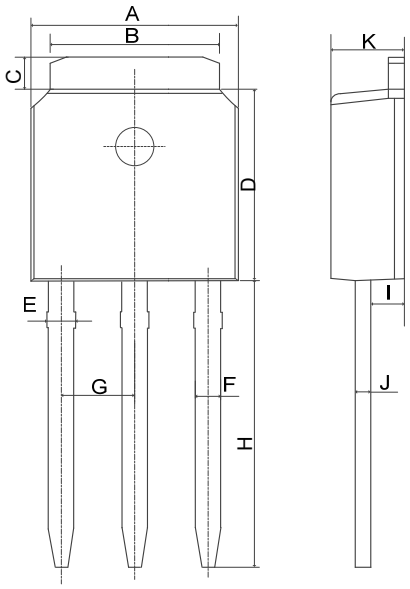
Mechanical Dimensions for TO-220



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

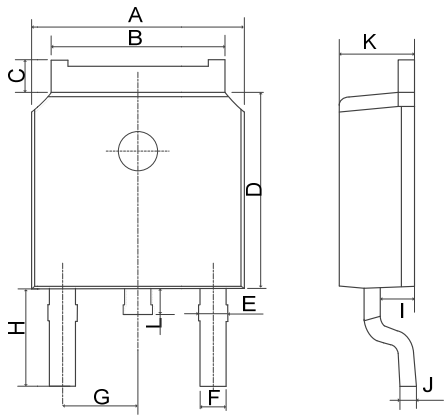
Mechanical Dimensions for TO-251



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	9.00	9.65
I	0.85	1.17
J	0.40	0.61
K	2.10	2.50

Mechanical Dimensions for TO-252



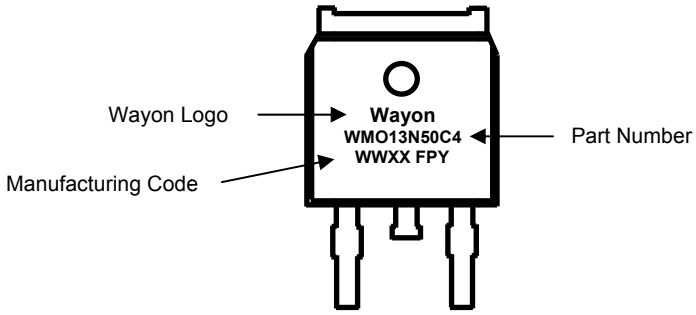
COMMON DIMENSIONS

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
WML13N50C4	TO-220FT	WML13N50C4	Tube
WMK13N50C4	TO-220	WMK13N50C4	Tube
WMN13N50C4	TO-262	WMN13N50C4	Tube
WMM13N50C4	TO-263	WMM13N50C4	Tape and Reel
WMO13N50C4	TO-252	WMO13N50C4	Tape and Reel
WMP13N50C4	TO-251	WMP13N50C4	Tube

Marking Information



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