

600V 0.06Ω Super Junction Power MOSFET

Description

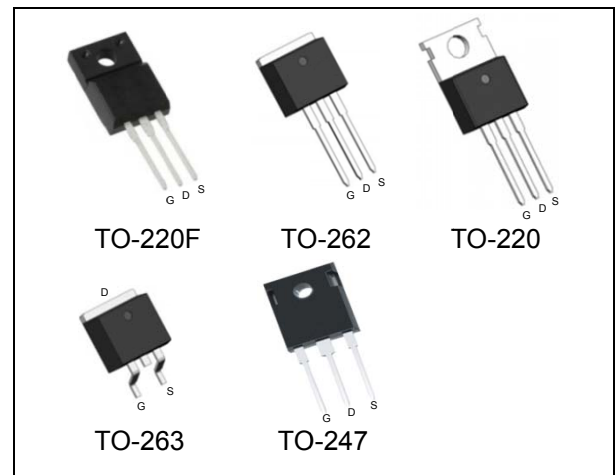
WMOS™ C4 is Wayon's 4th generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ C4 is suitable for applications which require superior power density and outstanding efficiency.

Features

- $V_{DS} = 650V @ T_{j,max}$
- Typ. $R_{DS(on)} = 0.06\Omega$
- 100% UIS tested
- Pb-free plating, Halogen free

Applications

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



Absolute Maximum Ratings

Parameter	Symbol	WMK/WMM/WMN/WMJ	WML	Unit
Drain-source voltage	V_{DSS}	600		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$)	I_D	50		A
		26		A
Pulsed drain current ²⁾	I_{DM}	90		A
Gate-source voltage	V_{GS}	± 30		V
Avalanche energy, single pulse ³⁾	E_{AS}	940		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	1.3		mJ
Avalanche current, repetitive ²⁾	I_{AR}	5		A
Power dissipation ($T_C = 25^\circ C$) - Derate above $25^\circ C$	P_D	350	34	W
		2.8	0.27	W/ $^\circ C$
Operating and storage temperature range	T_{j}, T_{stg}	-55 to +150		$^\circ C$
Continuous diode forward current ¹⁾	I_S	50		A
Diode pulse current ²⁾	$I_{S,pulse}$	90		A

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMN/WMJ	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.36	3.6	$^\circ C/W$
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	80	$^\circ C/W$

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
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	3	4	V
Drain cut-off current	I_{DSS}	$V_{DS}=600\text{ V}, V_{GS}=0\text{V},$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	-	-	1	μA
Gate leakage current, forward	I_{GSSF}	$V_{GS}=20\text{V}, V_{DS}=0\text{V}$	-	-	100	nA
Gate leakage current, reverse	I_{GSSR}	$V_{GS}=-20\text{V}, V_{DS}=0\text{V}$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=15\text{A}$ $T_j = 25^\circ\text{C}$	-	0.06	0.07	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}= 100\text{V}, V_{GS}= 0\text{V},$ $f = 1\text{ MHz}$	-	3400	-	pF
Output capacitance	C_{oss}		-	115	-	
Reverse transfer capacitance	C_{rss}		-	2.7	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 300\text{V}, I_D = 15\text{A}$ $R_G = 25\Omega, V_{GS}=10\text{V}$	-	53	-	ns
Rise time	t_r		-	40	-	
Turn-off delay time	$t_{d(off)}$		-	214	-	
Fall time	t_f		-	28	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=480\text{V}, I_D=15\text{A},$ $V_{GS}=0\text{ to }10\text{V}$	-	15.0	-	nC
Gate to drain charge	Q_{gd}		-	15.6	-	
Gate charge total	Q_g		-	58.0	-	
Gate plateau voltage	$V_{plateau}$		-	5.0	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=15\text{A}$	-	-	1.2	V
Reverse recovery time	t_{rr}	$V_R=50\text{V}, I_F=15\text{A},$ $di_F/dt=100\text{A}/\mu\text{s}$	-	280	-	ns
Reverse recovery charge	Q_{rr}		-	4.3	-	μC
Peak reverse recovery current	I_{rrm}		-	30	-	A

Notes:

- Limited by $T_{j\text{max}}$. Maximum duty cycle $D=0.5$.
- Pulse width limited by maximum junction temperature.
- $I_{AS} = 5\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, starting $T_j = 25^\circ\text{C}$.

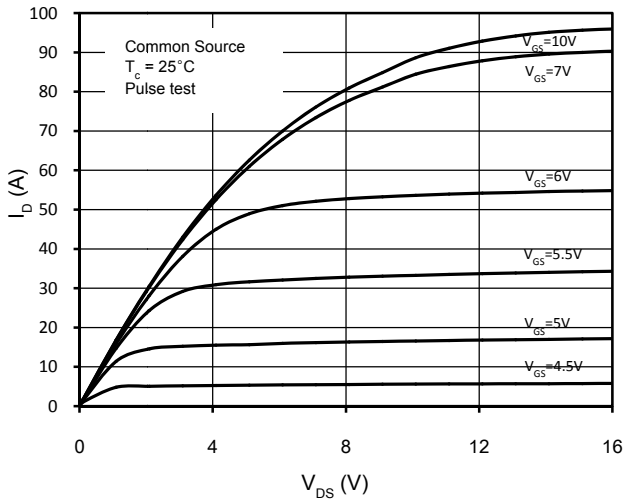


Figure 1. On-Region Characteristics

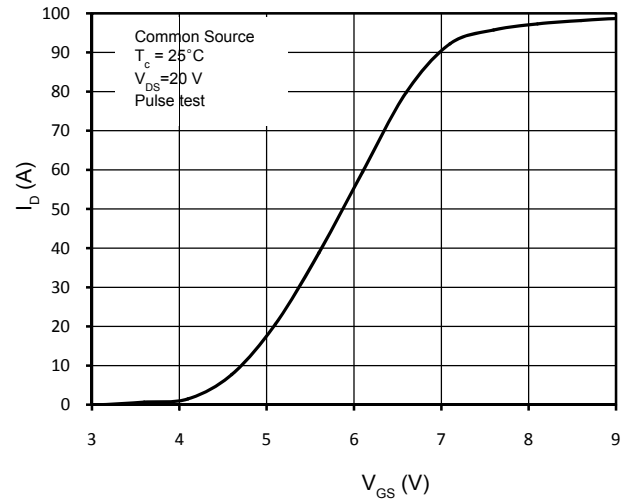


Figure 2. Transfer Characteristics

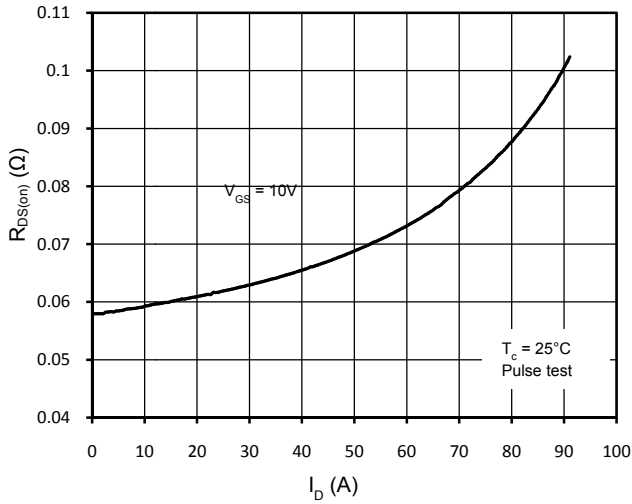


Figure 3. Static Drain-Source On Resistance

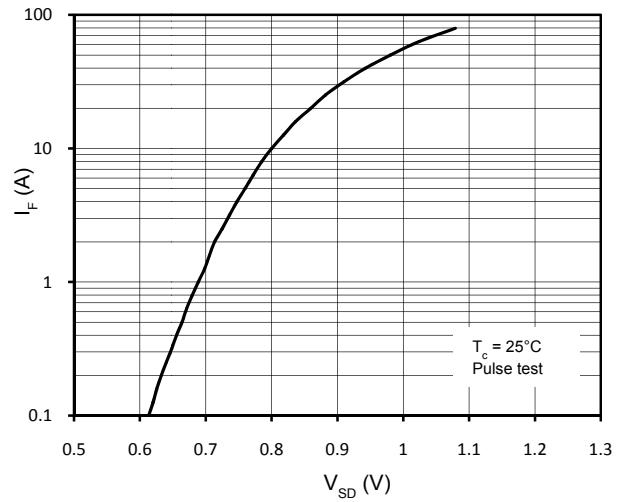


Figure 4. Body-Diode Forward Characteristics

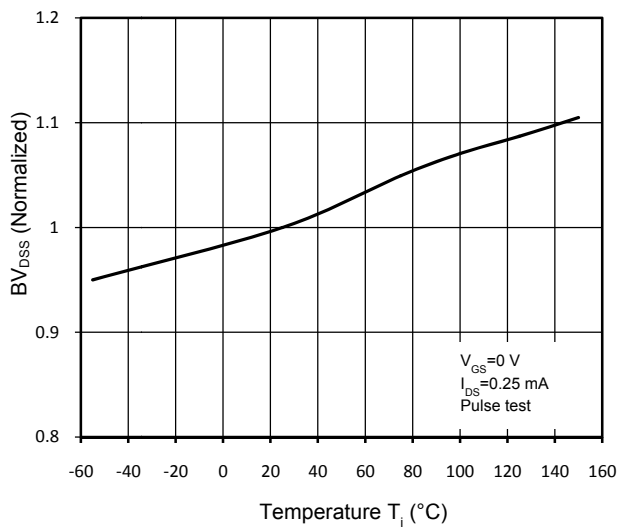


Figure 5. Normalized $BV_{DS(s)}$ vs. Temperature

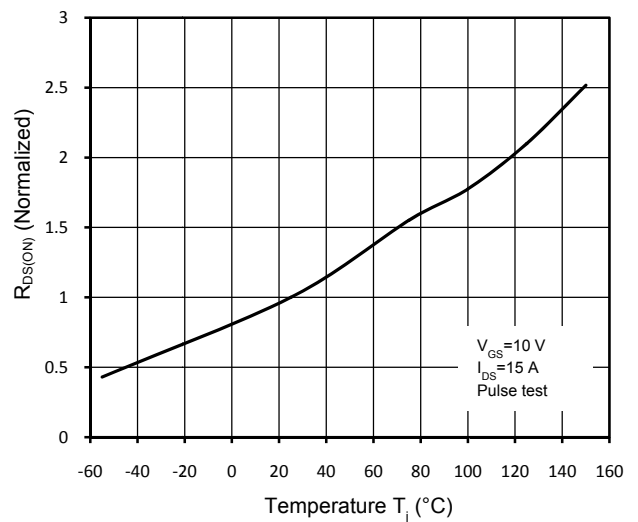


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

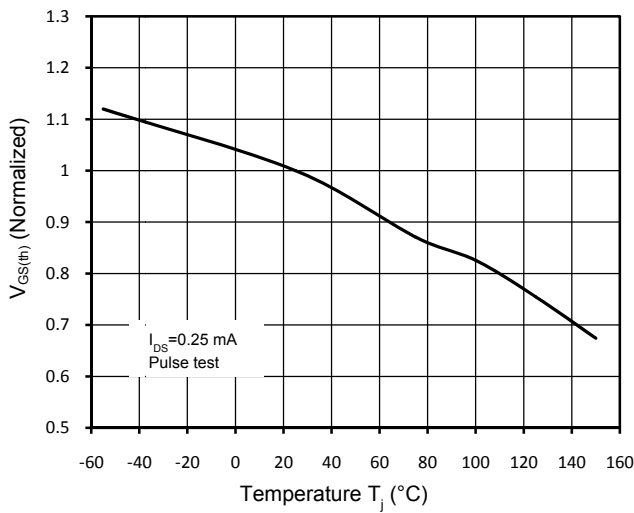


Figure 7. Threshold Voltage vs. Temperature

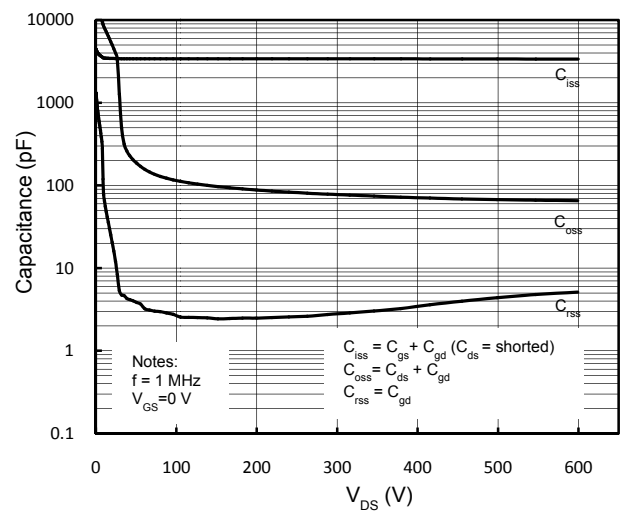


Figure 8. Capacitance Characteristics

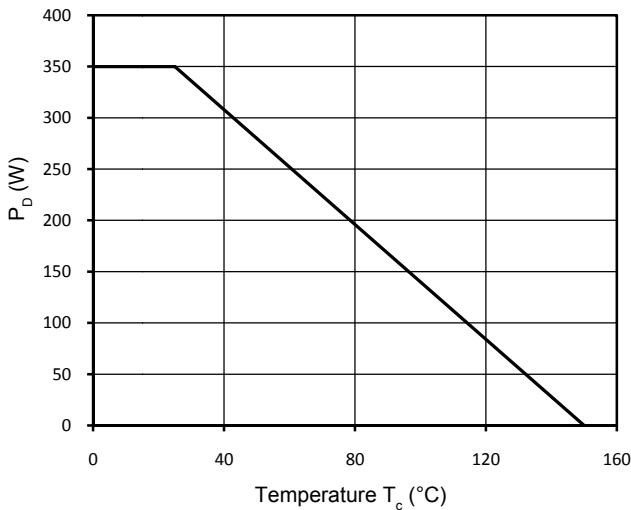


Figure 9. Power Dissipation

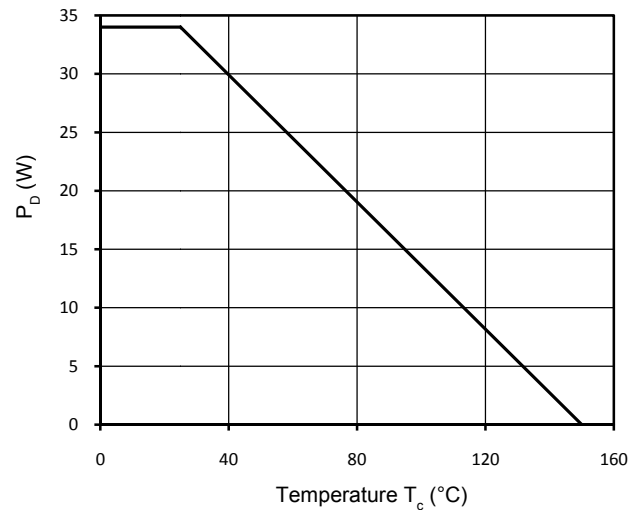


Figure 10. Power Dissipation (TO-220F)

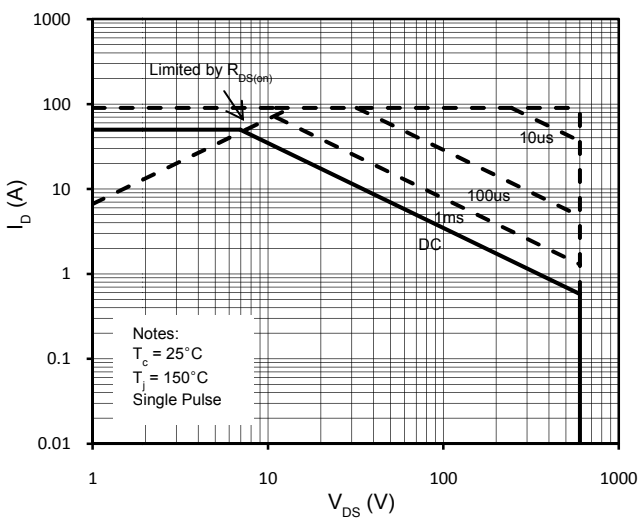


Figure 11. Maximum Safe Operating Area

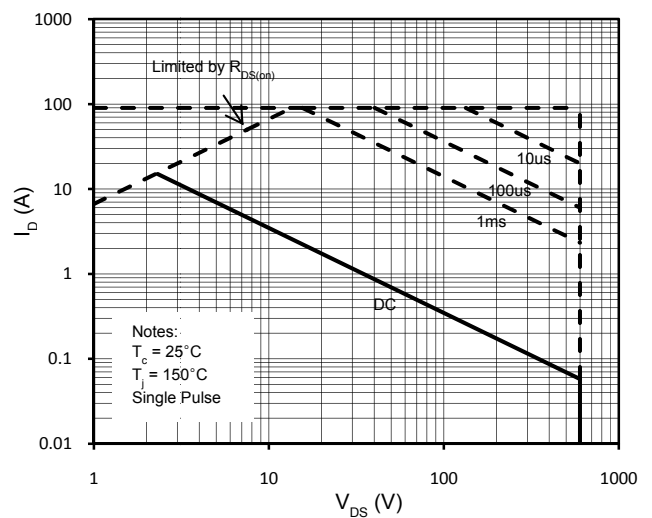


Figure 12. Maximum Safe Operating Area (TO-220F)

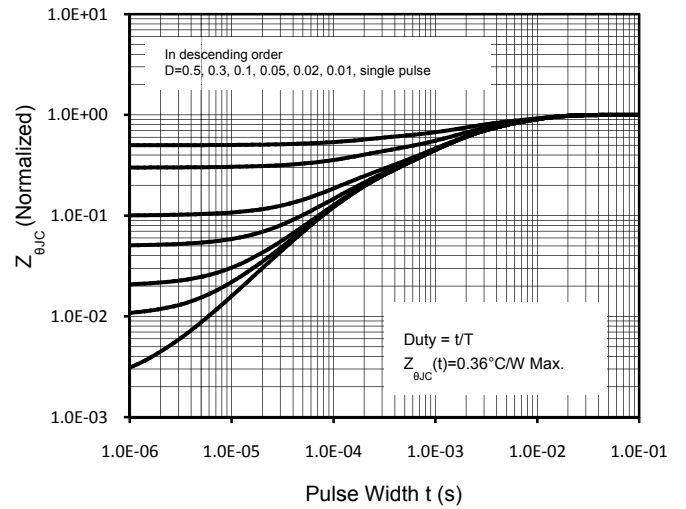
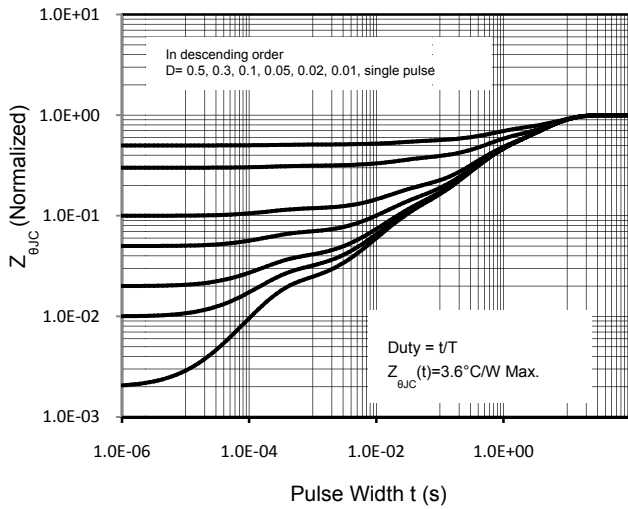


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Transient Thermal Response Curve

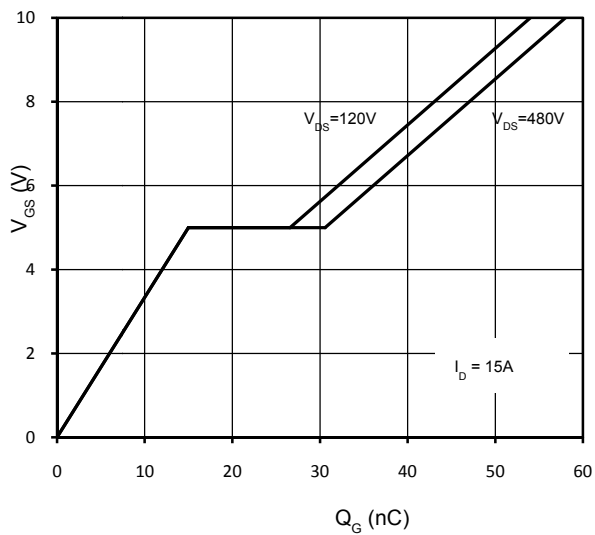


Figure 15. Gate Charge Characteristics

Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F

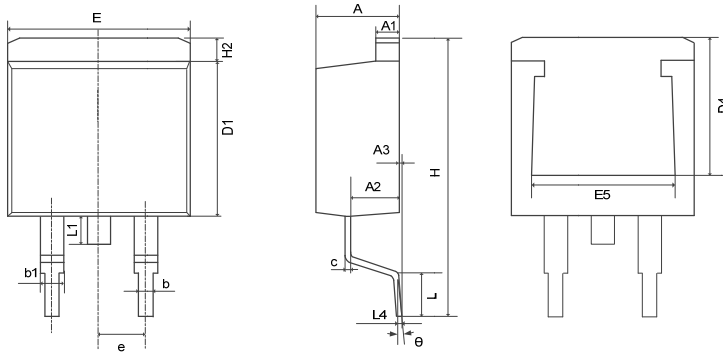


COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.96	10.36
B	15.10	16.10
C	3.03	3.38
D	12.64	13.28
E	1.18	1.58
F	0.70	0.95
G	2.54REF	
H	4.50	4.90
I	2.34	2.74
J	15.57	16.17
K	6.70REF	
L	2.56	2.96
M	0.40	0.65
L1	2.85	3.45

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

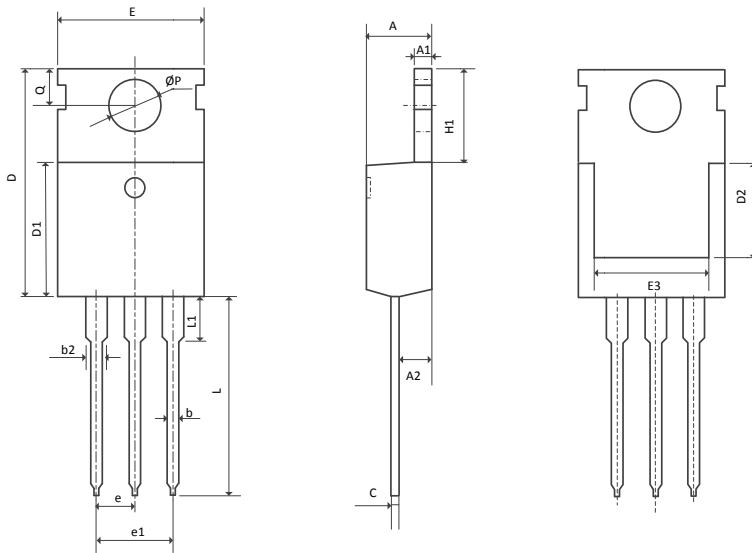
COMMON DIMENSIONS



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

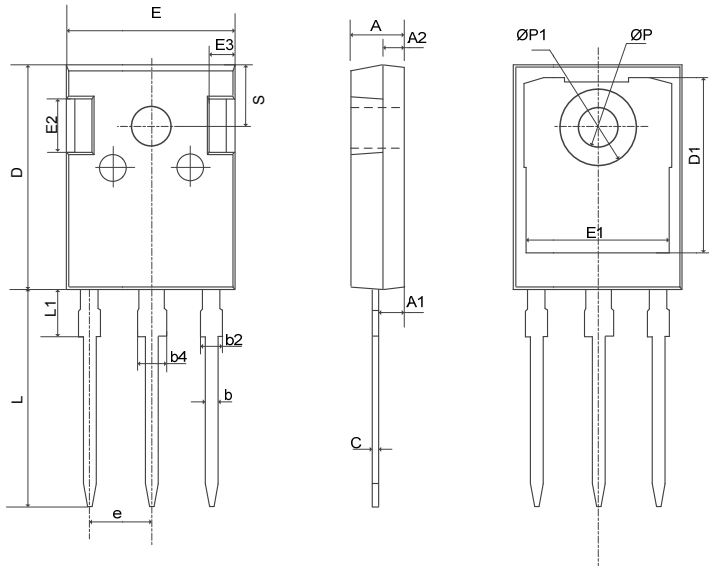
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.37	4.70
A1	1.25	1.40
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.45	0.60
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–
E	9.70	10.30
E3	7.00	–
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	–	3.40
ØP	3.40	3.80
Q	2.60	3.00

Mechanical Dimensions for TO-247

COMMON DIMENSIONS

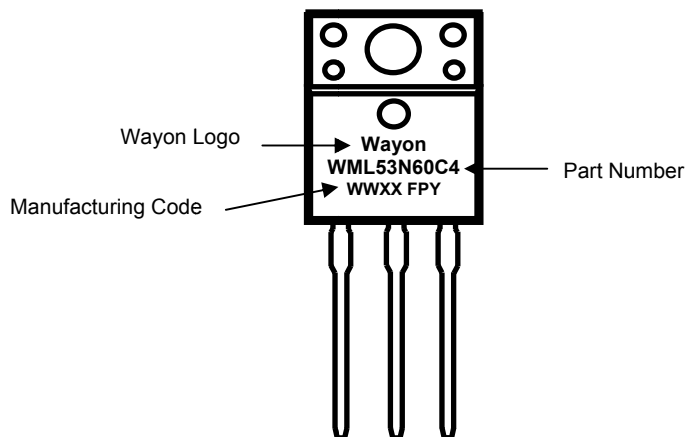


SYMBOL	MM	
	MIN	MAX
A	4.80	5.21
A1	2.21	2.61
A2	1.85	2.16
b	1.07	1.36
b2	1.91	2.41
b4	2.87	3.38
c	0.51	0.75
D	20.70	21.30
D1	16.25	17.65
E	15.50	16.13
E1	12.38	13.60
E2	3.68	5.20
E3	1.00	2.70
e	5.44BSC	
L	19.62	20.32
L1	—	4.40
ØP	3.40	3.80
ØP1	—	7.30
S	6.15BSC	

Ordering Information

Part	Package	Marking	Packing method
WML53N60C4	TO-220F	WML53N60C4	Tube
WMK53N60C4	TO-220	WMK53N60C4	Tube
WMN53N60C4	TO-262	WMN53N60C4	Tube
WMM53N60C4	TO-263	WMM53N60C4	Tape and Reel
WMJ53N60C4	TO-247	WMJ53N60C4	Tube

Marking Information



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