

600V 0.061Ω Super Junction Power MOSFET

Description

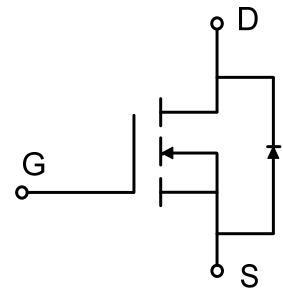
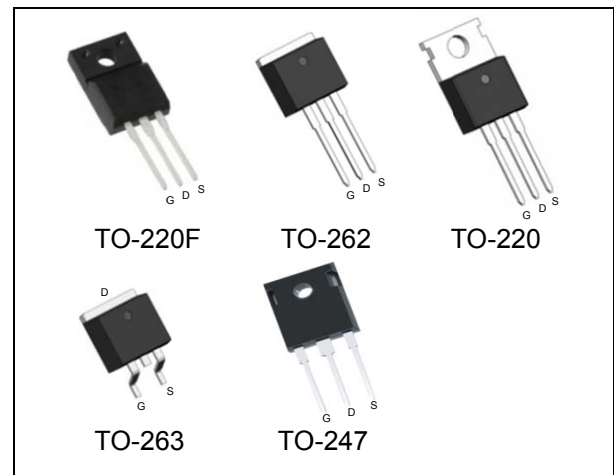
WMOS™ XJ is Wayon's new generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ XJ is suitable for applications which require superior power density and outstanding efficiency.

Features

- $V_{DS} = 650V @ T_{j,max}$
- Typ. $R_{DS(on)} = 0.061\Omega$
- 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}	710		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	1.1		mJ
Avalanche current, repetitive ²⁾	I_{AR}	4.5		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	$R_{\theta JC}$	0.37	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	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.25\text{mA}$	2.5	3.5	4.5	V
Drain cut-off current	I_{DSS}	$V_{DS}=600\text{ V}, V_{GS}=0\text{V},$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	-	-	3	μA
Gate leakage current, forward	I_{GSSF}	$V_{GS}=20\text{V}, V_{DS}=0\text{V}$	-	-	200	nA
Gate leakage current, reverse	I_{GSSR}	$V_{GS}=-20\text{V}, V_{DS}=0\text{V}$	-	-	-200	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=10\text{A}$ $T_j = 25^\circ\text{C}$	-	0.061	0.07	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}= 100\text{V}, V_{GS}= 0\text{V},$	-	2557	-	pF
Output capacitance	C_{oss}	$f = 1\text{ MHz}$	-	91	-	
Reverse transfer capacitance	C_{rss}		-	2.3	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 300\text{V}, I_D = 15\text{A}$	-	56	-	ns
Rise time	t_r	$R_G = 25\Omega, V_{GS}=10\text{V}$	-	50	-	
Turn-off delay time	$t_{d(off)}$		-	207	-	
Fall time	t_f		-	33	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=480\text{V}, I_D=15\text{A},$	-	16.5	-	nC
Gate to drain charge	Q_{gd}	$V_{GS}=0\text{ to }10\text{V}$	-	16.9	-	
Gate charge total	Q_g		-	53.8	-	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	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}	$V_R=50\text{V}, I_F=15\text{A},$	-	289	-	ns
Reverse recovery charge	Q_{rr}	$di/dt=100\text{A}/\mu\text{s}$	-	4.1	-	μC
Peak reverse recovery current	I_{rrm}		-	27	-	A

Notes:

- Limited by $T_{j\text{max}}$. Maximum duty cycle $D=0.5$.
- Pulse width limited by maximum junction temperature.
- $I_{AS} = 4.5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, starting $T_j = 25^\circ\text{C}$.

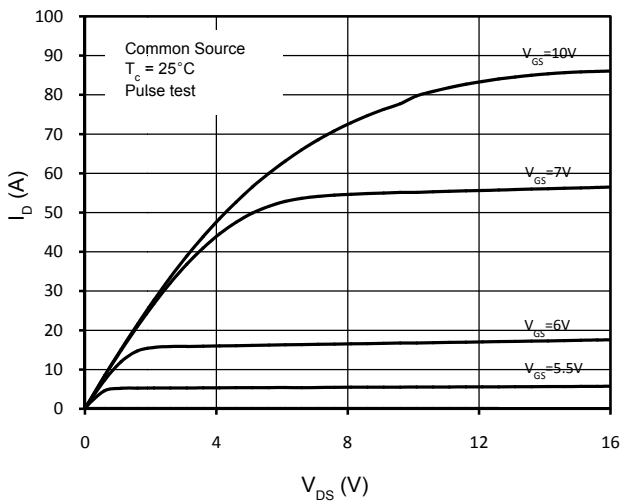


Figure 1. On-Region Characteristics

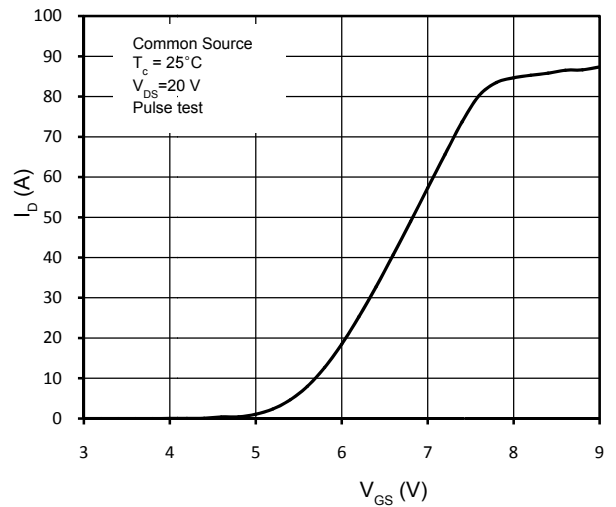


Figure 2. Transfer Characteristics

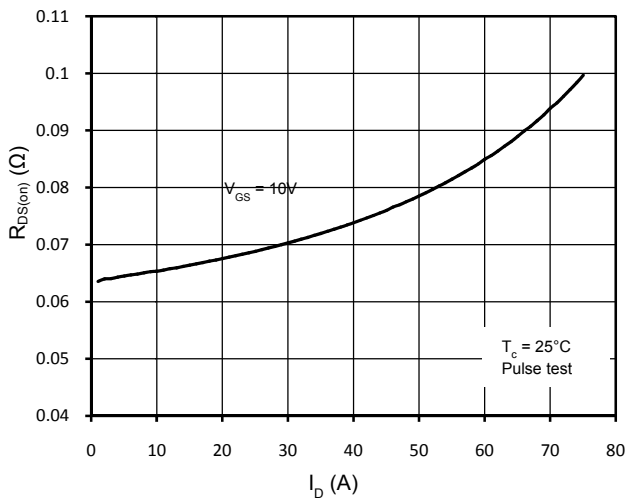


Figure 3. Static Drain-Source On Resistance

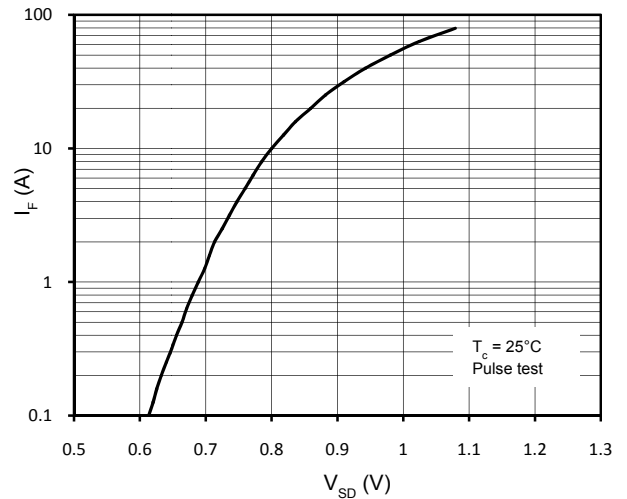


Figure 4. Body-Diode Forward Characteristics

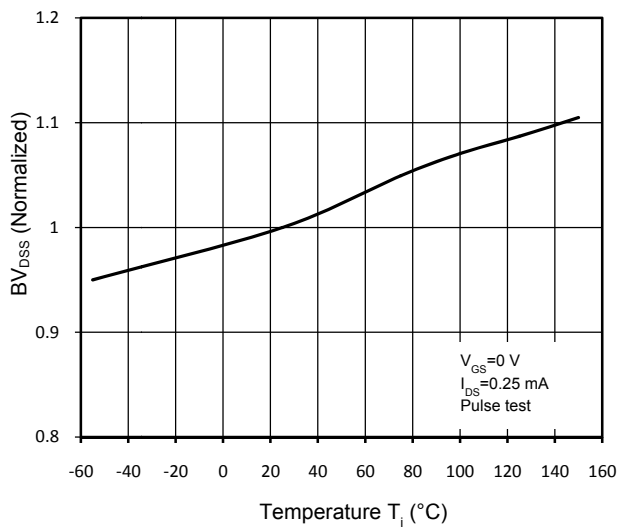


Figure 5. Normalized $BV_{DS(s)}$ vs. Temperature

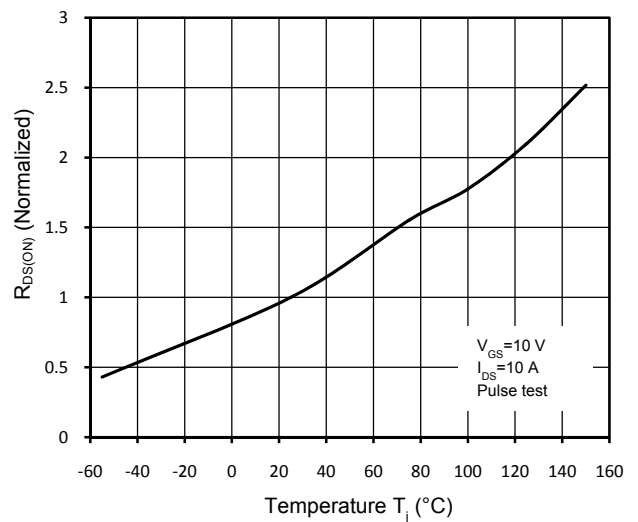


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

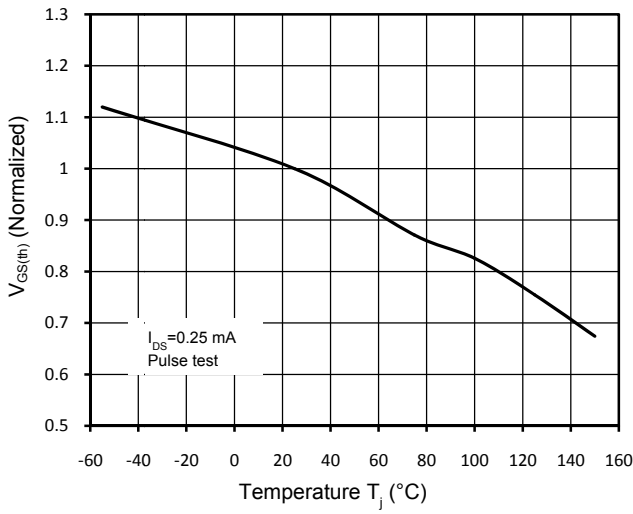


Figure 7. Threshold Voltage vs. Temperature

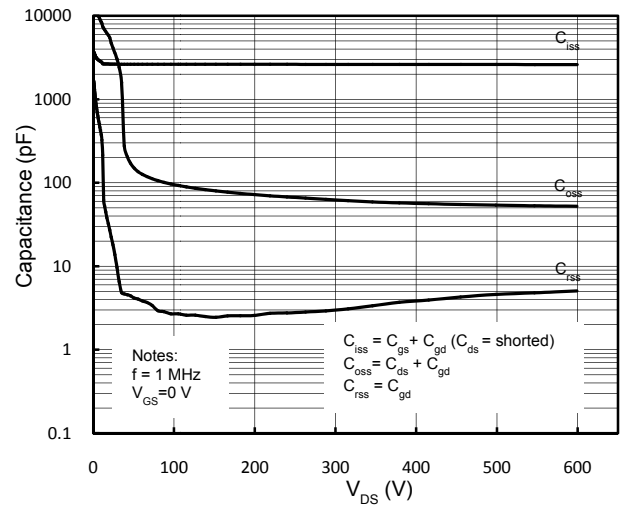


Figure 8. Capacitance Characteristics

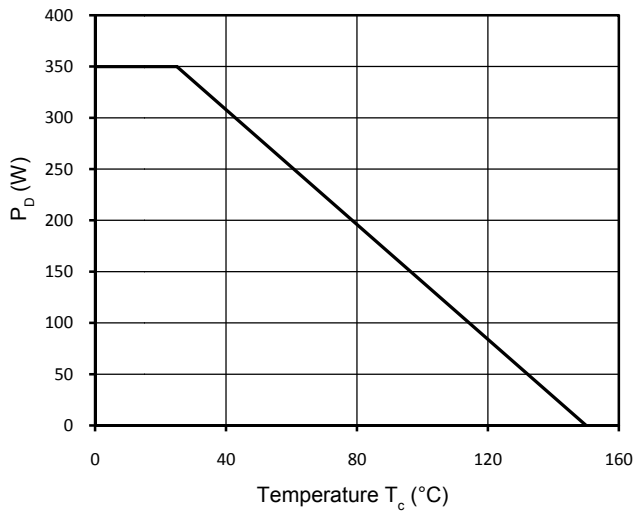


Figure 9. Power Dissipation

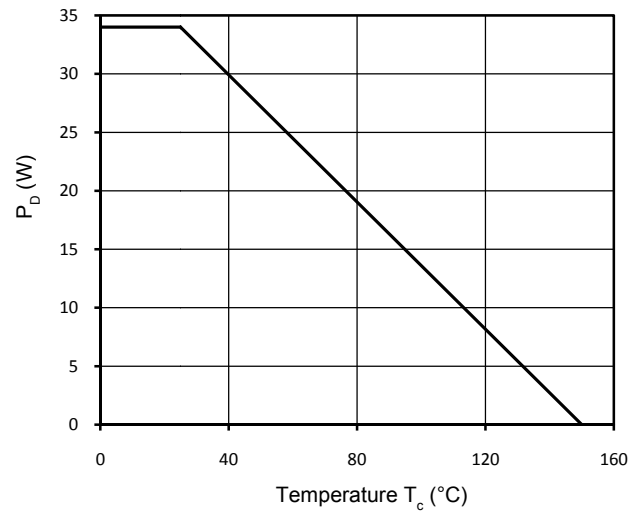


Figure 10. Power Dissipation (TO-220F)

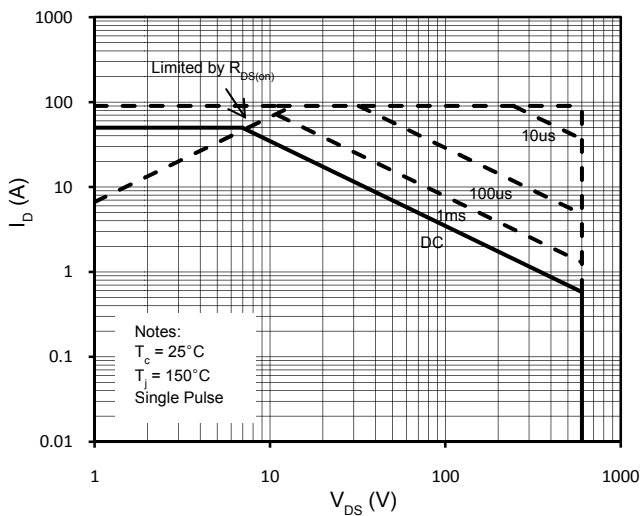


Figure 11. Maximum Safe Operating Area

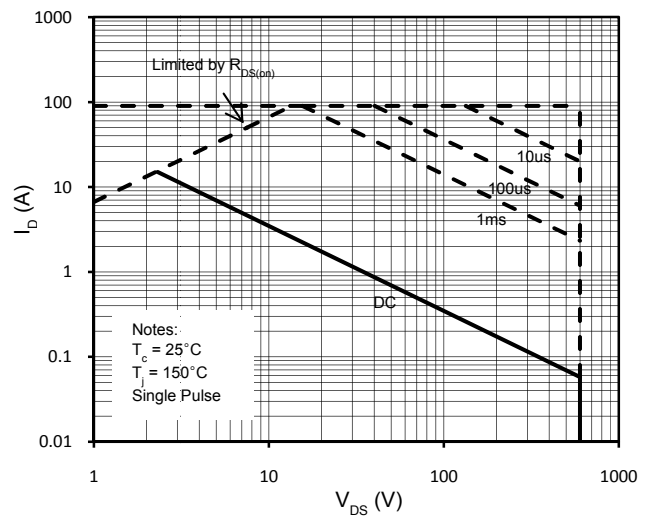


Figure 12. Maximum Safe Operating Area (TO-220F)

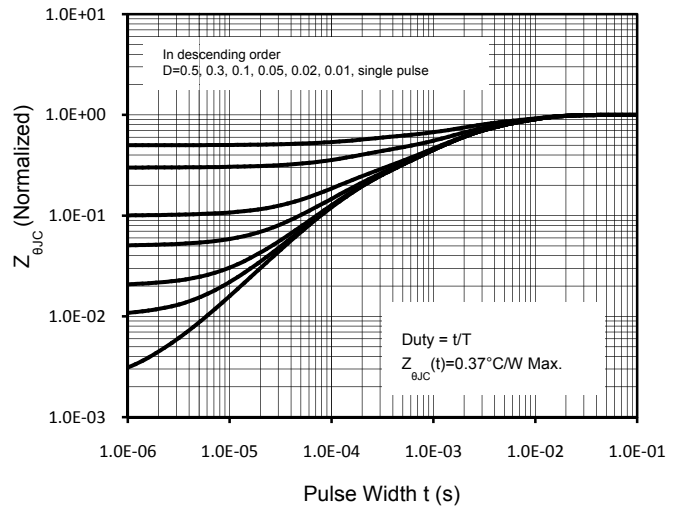
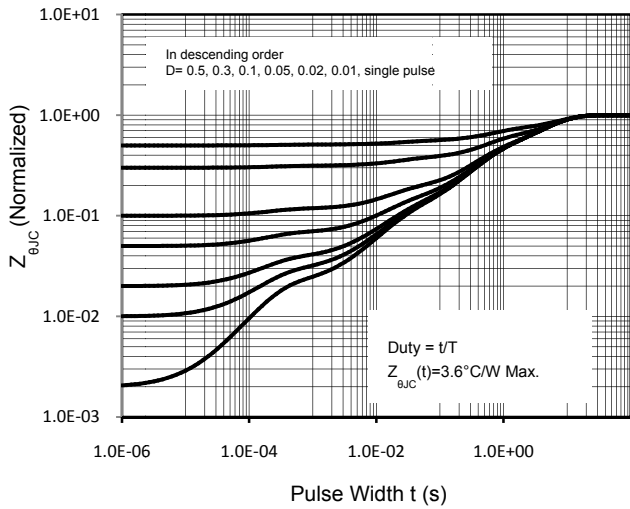


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Transient Thermal Response Curve

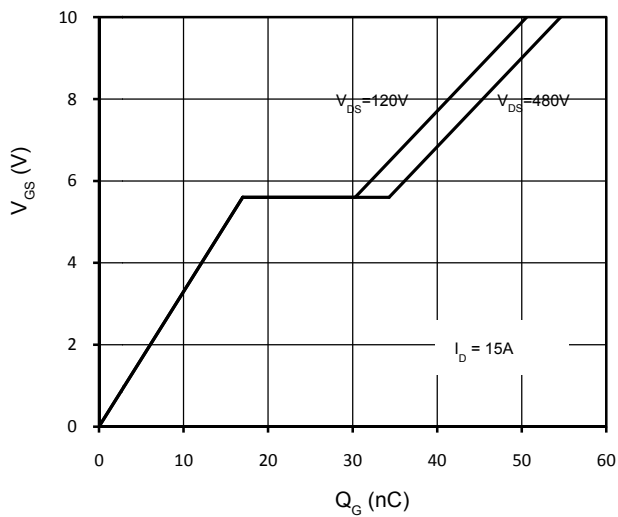
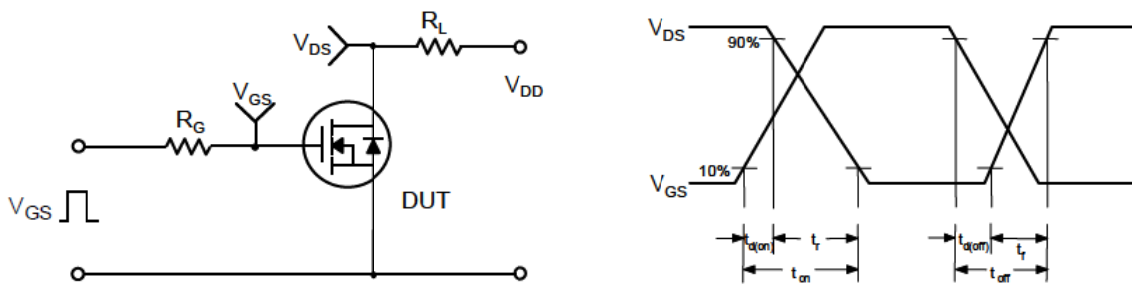


Figure 15. Gate Charge Characteristics

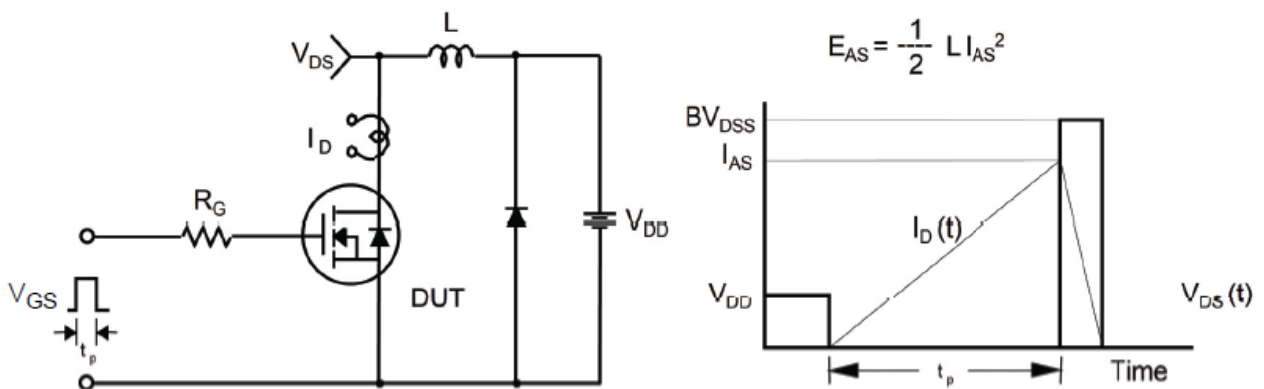
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms

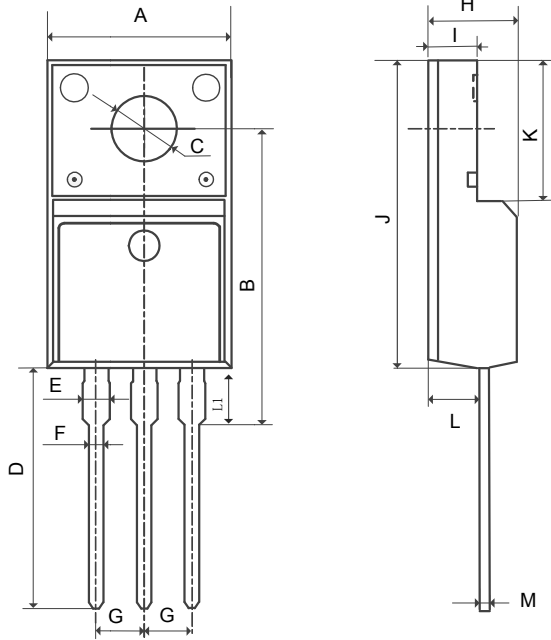


Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F

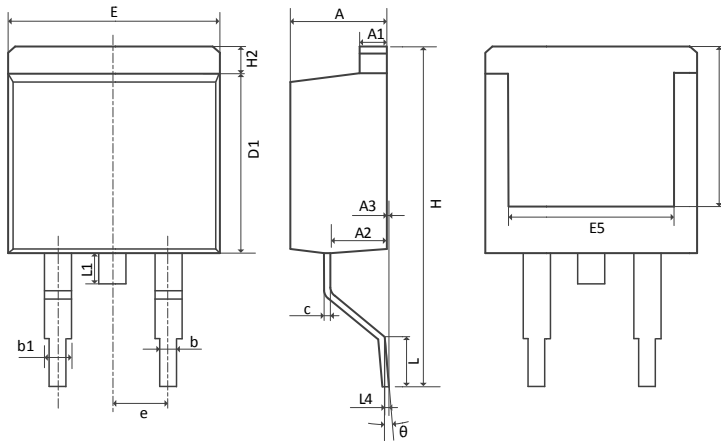
COMMON DIMENSIONS



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

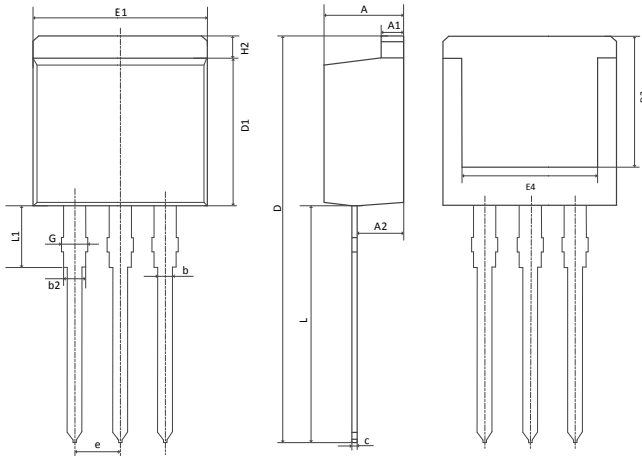
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.37	4.89
A1	1.17	1.42
A2	2.19	2.89
A3	0.00	0.25
b	0.70	0.96
b1	1.17	1.47
c	0.30	0.60
D1	8.45	9.35
D4	6.60	—
E	9.80	10.40
E5	7.06	—
e	2.54BSC	
H	14.70	16.00
H2	1.07	1.47
L	2.00	2.70
L1	1.15	1.75
L4	0.25BSC	
θ	0°	9°

Mechanical Dimensions for TO-262

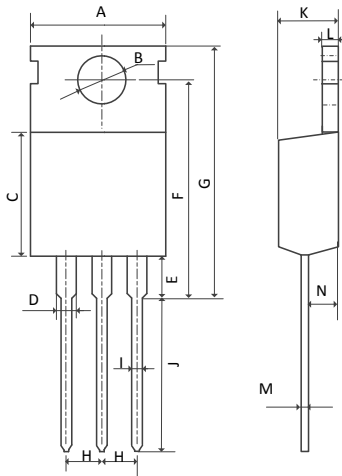
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.37	4.90
A1	1.17	1.42
A2	2.20	2.89
b	0.71	0.96
b2	1.07	1.47
c	0.28	0.60
D	22.00	24.02
D1	8.45	9.30
D2	6.00	—
E1	9.80	10.40
E4	7.06	—
e	2.54BSC	
G	1.23	1.50
H2	—	1.50
L	12.90	14.16
L1	2.80	4.00

Mechanical Dimensions for TO-220

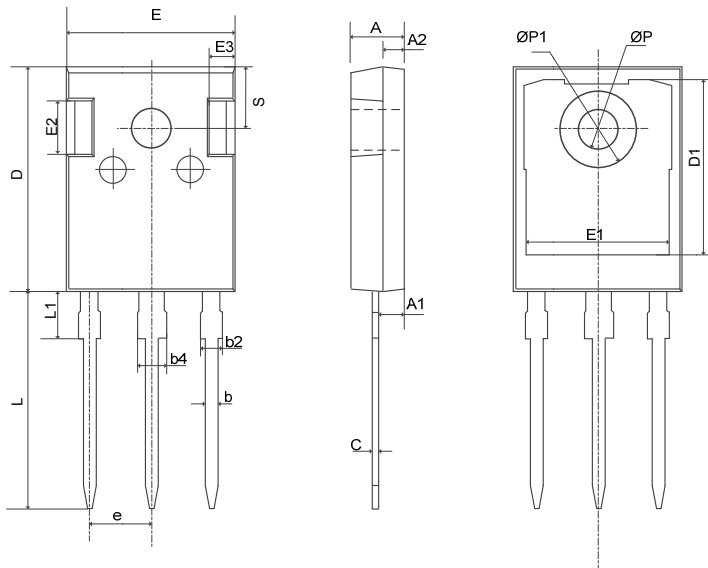
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	9.70	10.30
B	3.40	3.80
C	8.80	9.40
D	1.17	1.47
E	2.60	3.50
F	15.10	16.90
G	19.60MAX	
H	2.54REF	
I	0.70	0.95
J	9.25	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-247

COMMON DIMENSIONS

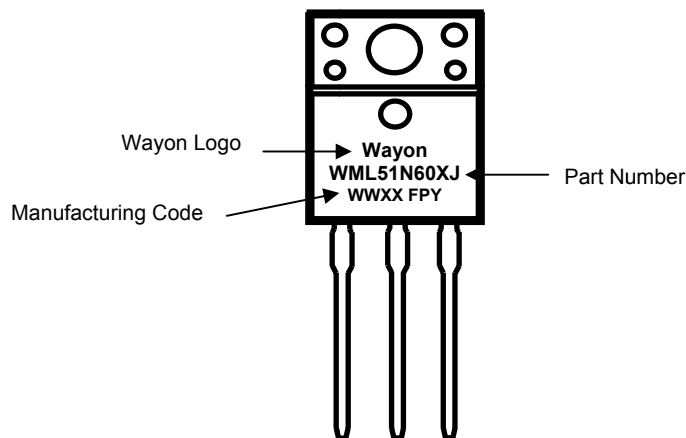


SYMBOL	MM	
	MIN	MAX
A	4.80	5.21
A1	2.21	2.61
A2	1.85	2.16
b	1.07	1.36
b2	1.91	2.41
b4	2.87	3.38
c	0.51	0.75
D	20.70	21.30
D1	16.25	17.65
E	15.50	16.13
E1	12.38	13.60
E2	3.68	5.20
E3	1.00	2.70
e	5.44BSC	
L	19.62	20.32
L1	—	4.40
ØP	3.40	3.80
ØP1	—	7.40
S	6.15BSC	

Ordering Information

Part	Package	Marking	Packing method
WML51N60XJ	TO-220F	WML51N60XJ	Tube
WMK51N60XJ	TO-220	WMK51N60XJ	Tube
WMN51N60XJ	TO-262	WMN51N60XJ	Tube
WMM51N60XJ	TO-263	WMM51N60XJ	Tape and Reel
WMJ51N60XJ	TO-247	WMJ51N60XJ	Tube

Marking Information



Contact Information

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Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com

WAYON website: <http://www.way-on.com>

For additional information, please contact your local Sales Representative.

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