

650V 0.17Ω Super Junction Power MOSFET

Description

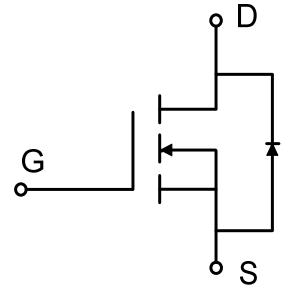
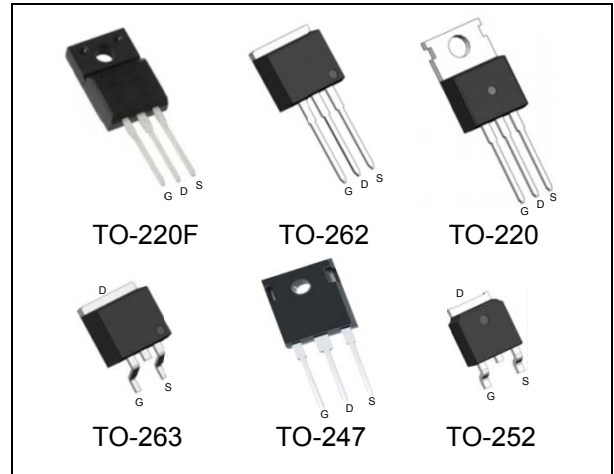
WMOS™ XJ is Wayon's new generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ XJ is suitable for applications which require superior power density and outstanding efficiency.

Features

- $V_{DS} = 700V @ T_{j,max}$
- Typ. $R_{DS(on)} = 0.17\Omega$
- 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/WMO	WML	Unit
Drain-source voltage	V_{DSS}	650		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$)	I_D	17		A
($T_C = 100^\circ C$)		10		A
Pulsed drain current ²⁾	I_{DM}	40		A
Gate-source voltage	V_{GS}	± 30		V
Avalanche energy, single pulse ³⁾	E_{AS}	210		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	0.3		mJ
Avalanche current, repetitive ²⁾	I_{AR}	2.5		A
Power dissipation ($T_C = 25^\circ C$)	P_D	135	31	W
- Derate above $25^\circ C$		1.08	0.25	W/ $^\circ C$
Operating and storage temperature range	T_j, T_{stg}	-55 to +150		$^\circ C$
Continuous diode forward current	I_S	17		A
Diode pulse current	$I_{S,pulse}$	40		A

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMN/WMJ/WMO	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.9	4	$^\circ C/W$
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 V, I _D =0.25 mA	650	-	-	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} =650 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 =4A T _j = 25°C	- -	 0.17	 0.19	 Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 100V, V _{GS} = 0V, f = 1 MHz	-	918	-	pF
Output capacitance	C _{oss}		-	38	-	
Reverse transfer capacitance	C _{rss}		-	0.8	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 10A R _G = 25Ω, V _{GS} =10V	-	26	-	ns
Rise time	t _r		-	35	-	
Turn-off delay time	t _{d(off)}		-	99	-	
Fall time	t _f		-	25	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480V, I _D =10A, V _{GS} =0 to 10V	-	4.8	-	nC
Gate to drain charge	Q _{gd}		-	5.8	-	
Gate charge total	Q _g		-	19	-	
Gate plateau voltage	V _{plateau}		-	5.0	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =4A	-	-	1.2	V
Reverse recovery time	t _{rr}	V _R =50V, I _F =10A, dI _F /dt=100A/μs	-	220	-	ns
Reverse recovery charge	Q _{rr}		-	2.5	-	μC
Peak reverse recovery current	I _{rrm}		-	17	-	A

Notes:

- Limited by $T_{j\max}$. Maximum duty cycle $D=0.5$.
- Repetitive rating: pulse width limited by maximum junction temperature.
- $I_{AS}=2.5\text{ A}$, $V_{DD}=50\text{ V}$, $R_G=25\Omega$, starting $T_j=25^\circ\text{C}$.

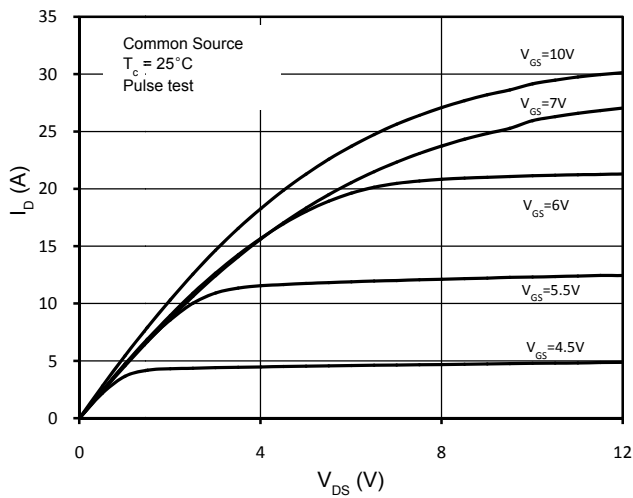


Figure 1. On-Region Characteristics

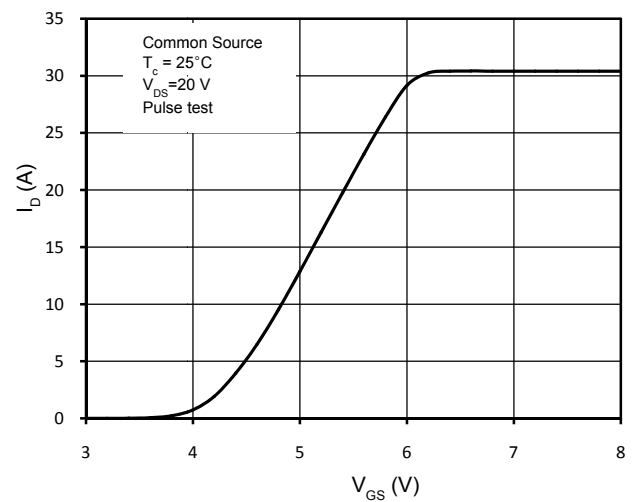


Figure 2. Transfer Characteristics

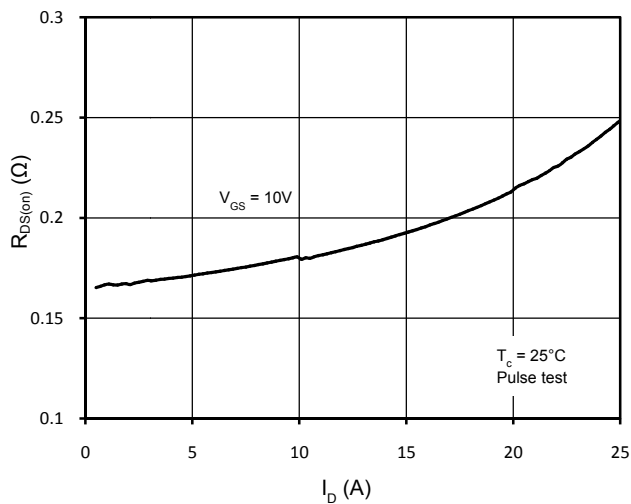


Figure 3. Static Drain-Source On Resistance

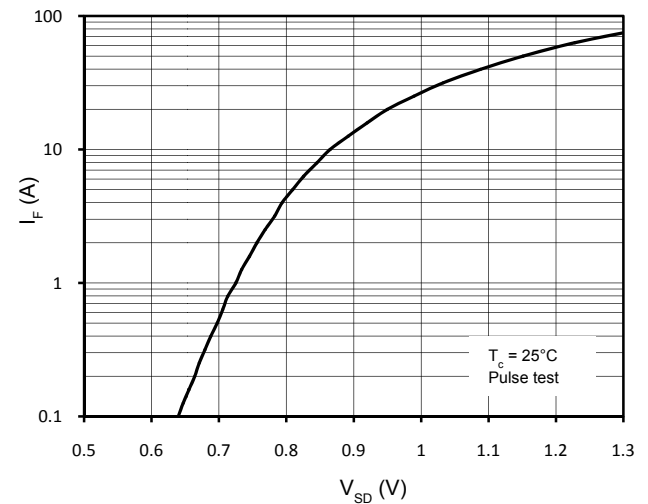
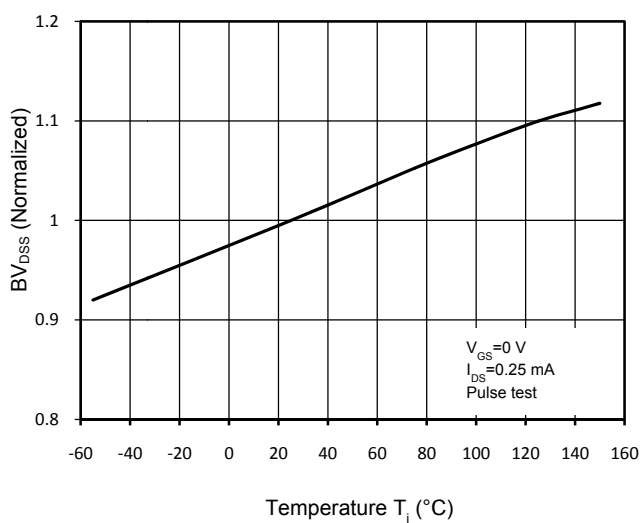
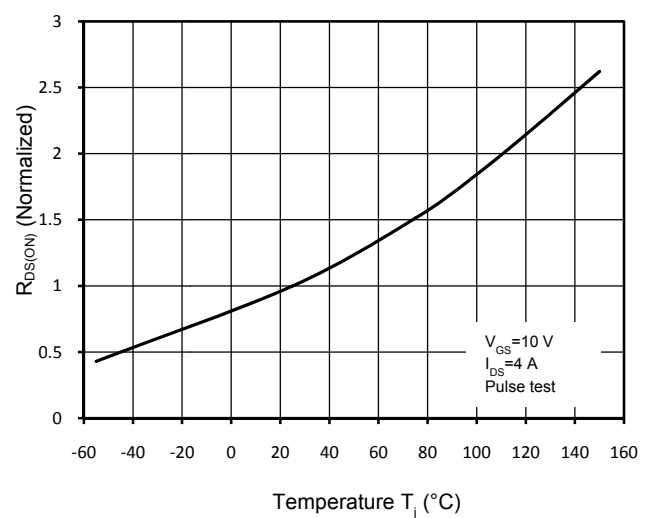


Figure 4. Body-Diode Forward Characteristics

Figure 5. Normalized BV_{DS} vs. TemperatureFigure 6. Normalized $R_{DS(on)}$ vs. Temperature

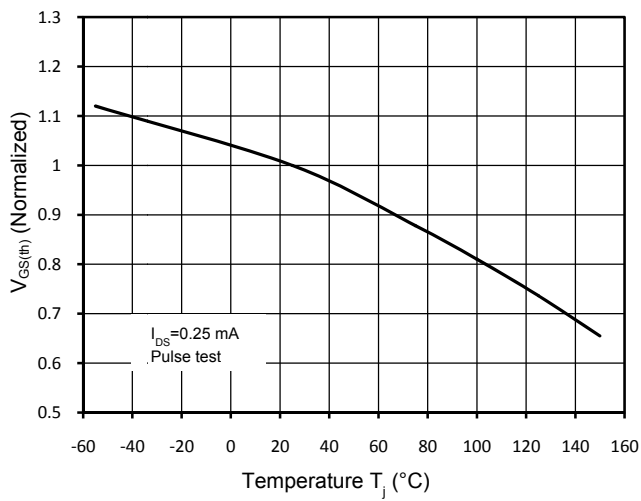


Figure 7. Threshold Voltage vs. Temperature

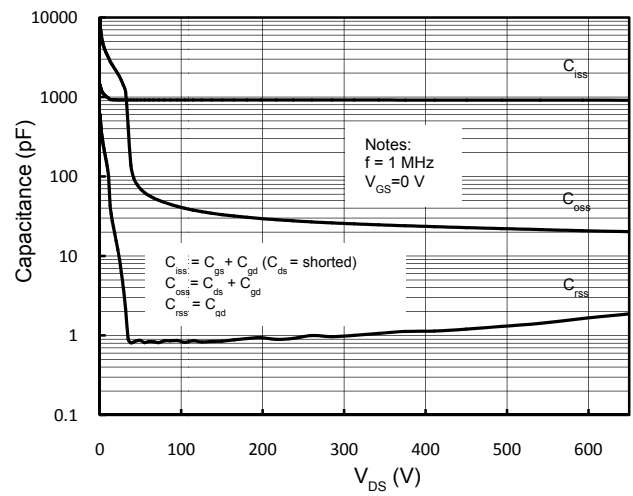


Figure 8. Capacitance Characteristics

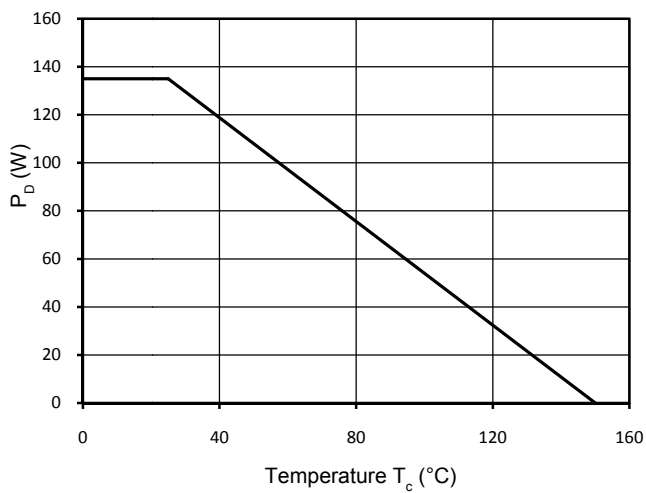


Figure 9. Power Dissipation

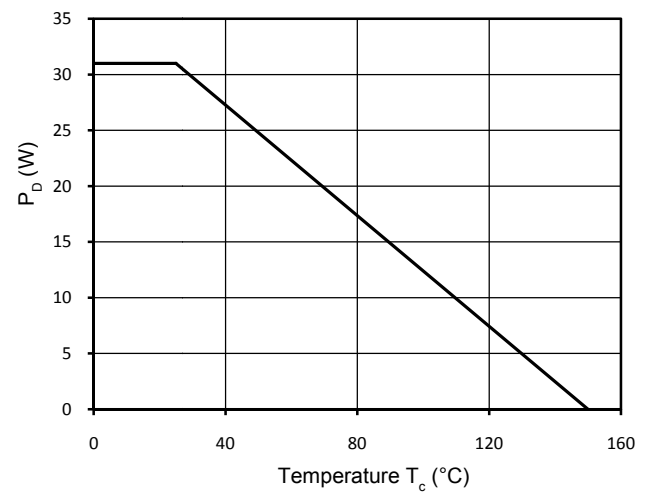


Figure 10. Power Dissipation (TO-220F)

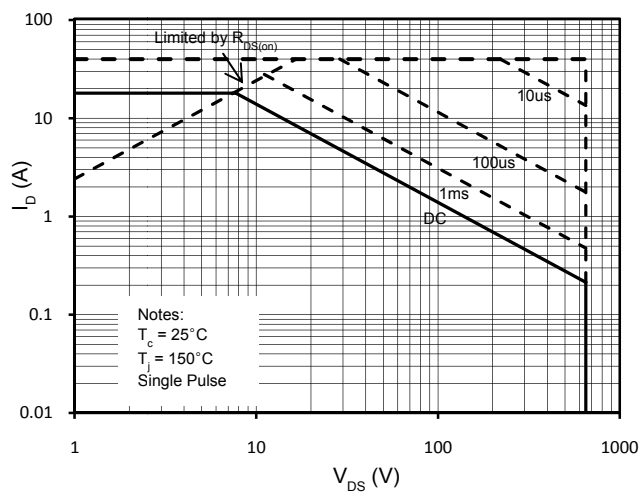


Figure 11. Maximum Safe Operating Area

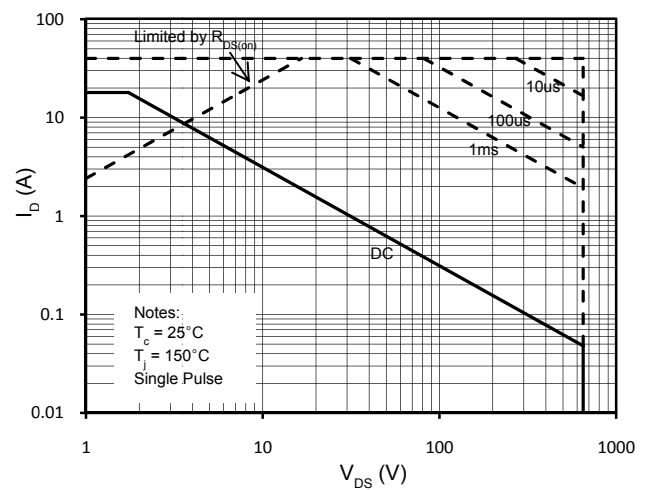


Figure 12. Maximum Safe Operating Area (TO-220F)

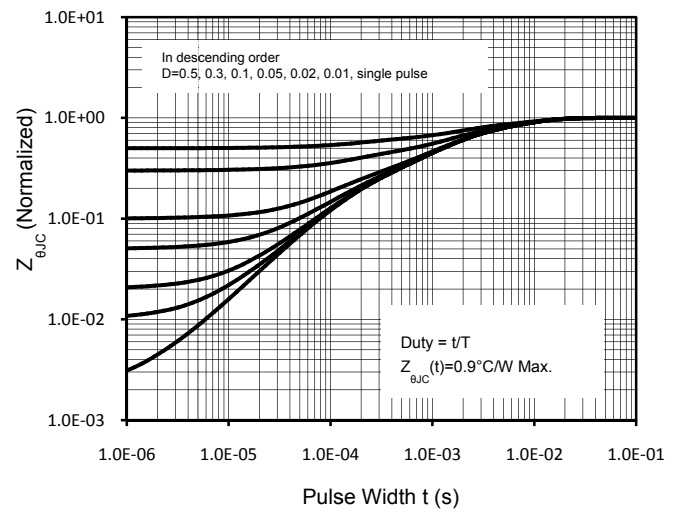
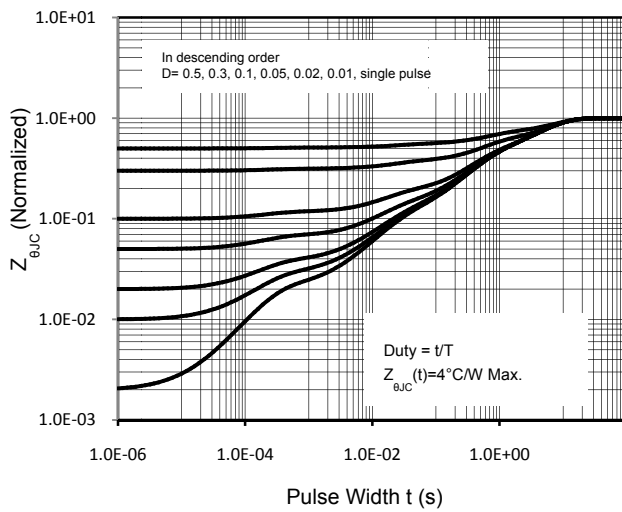


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Transient Thermal Response Curve

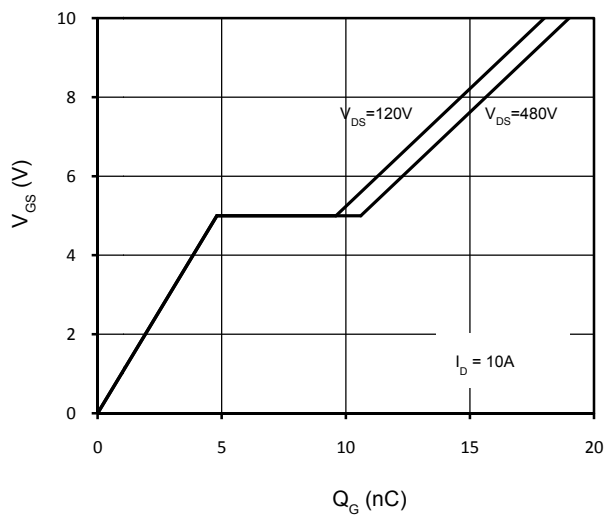
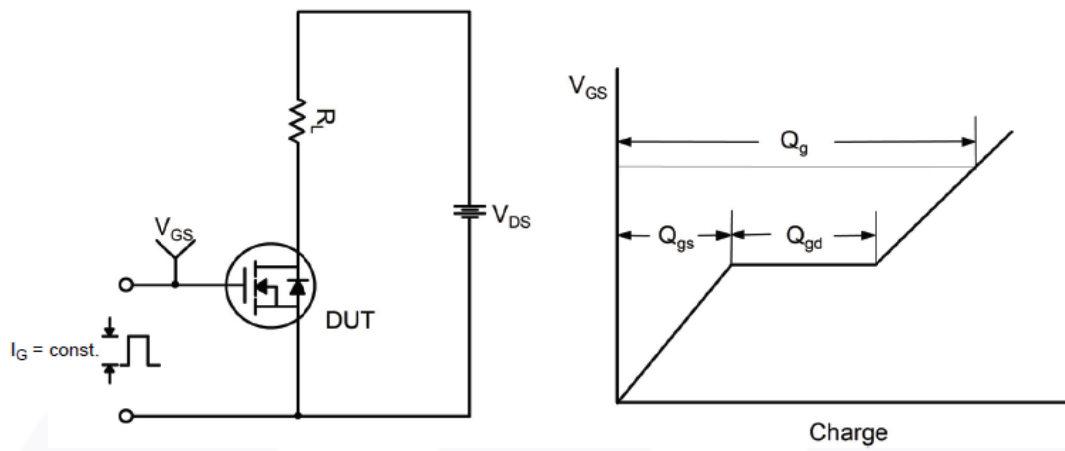
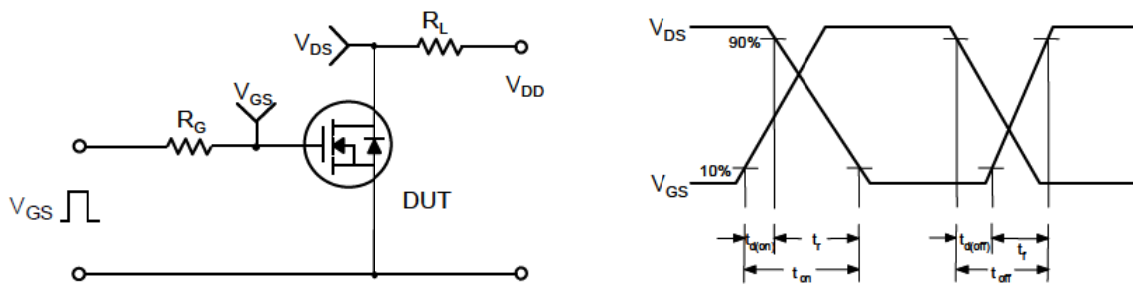


Figure 15. Gate Charge Characteristics

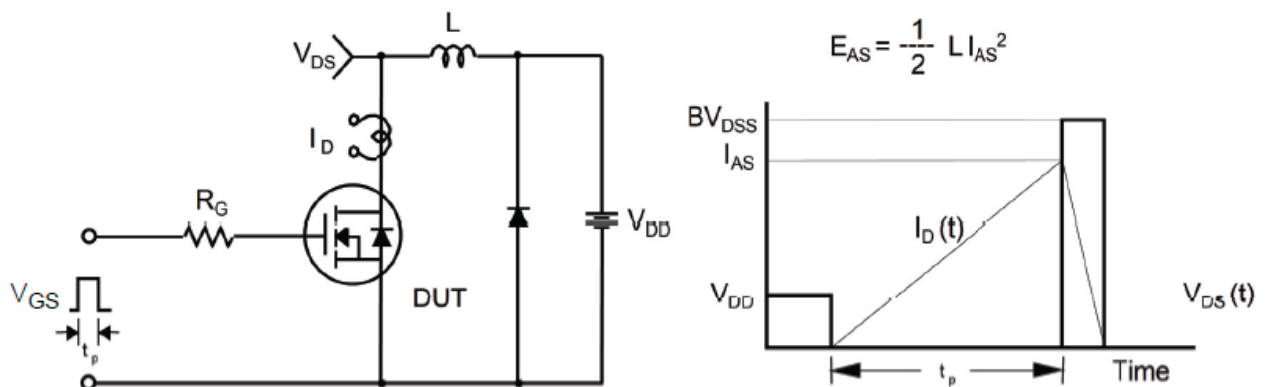
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms

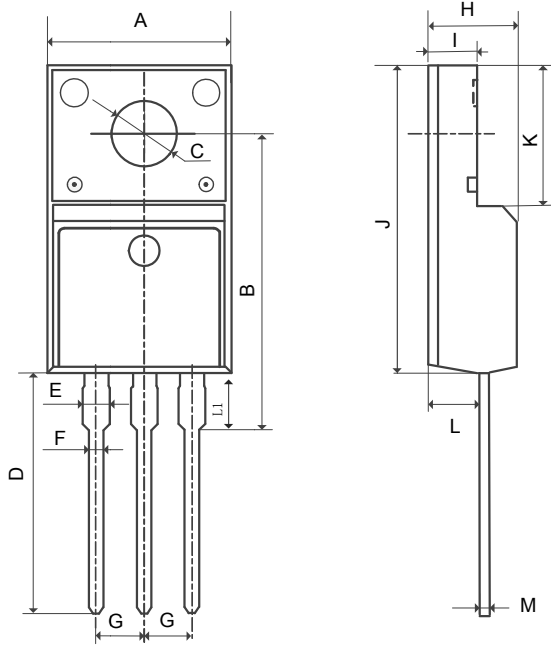


Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F

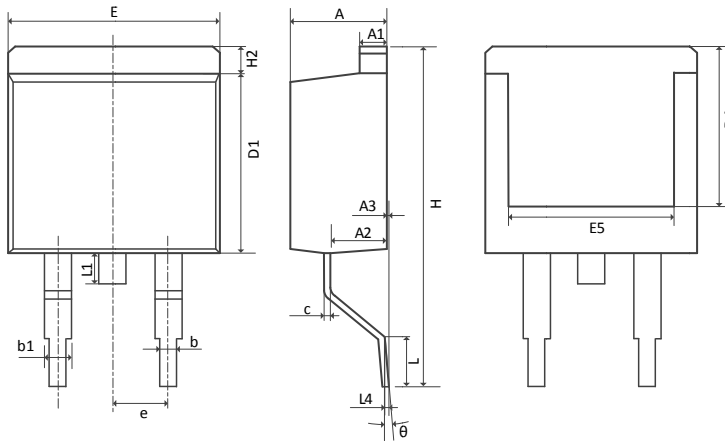
COMMON DIMENSIONS



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

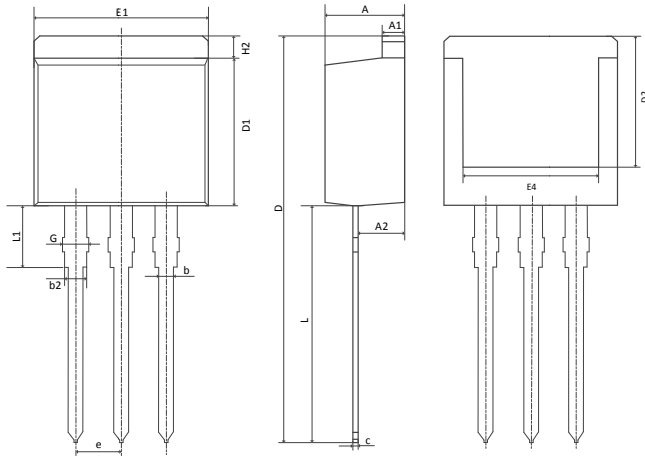
COMMON DIMENSIONS



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°

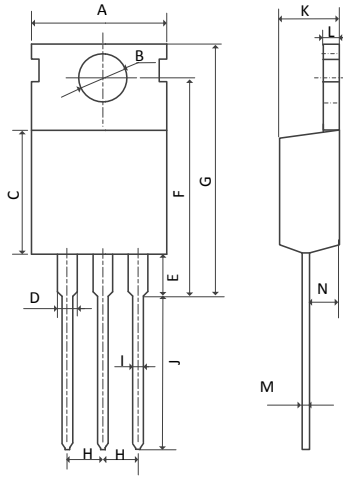
Mechanical Dimensions for TO-262

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

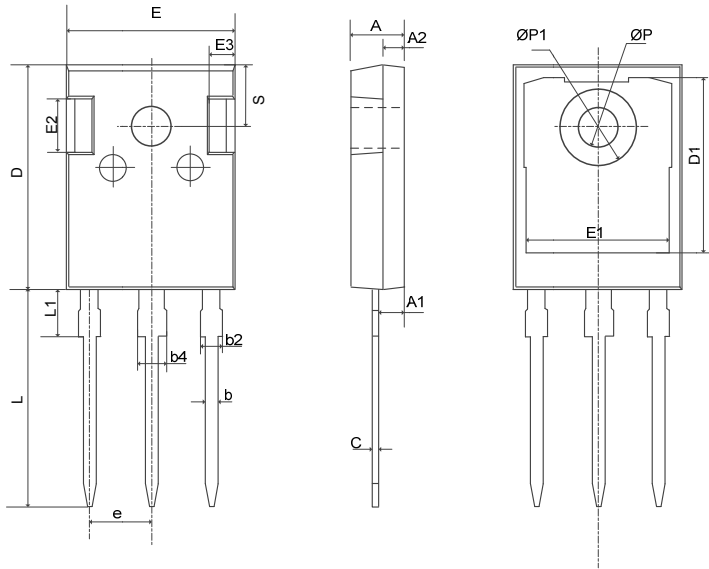


COMMON DIMENSIONS

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

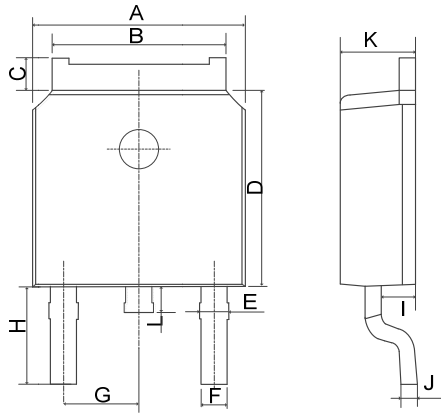
Mechanical Dimensions for TO-247

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	

Mechanical Dimensions for TO-252



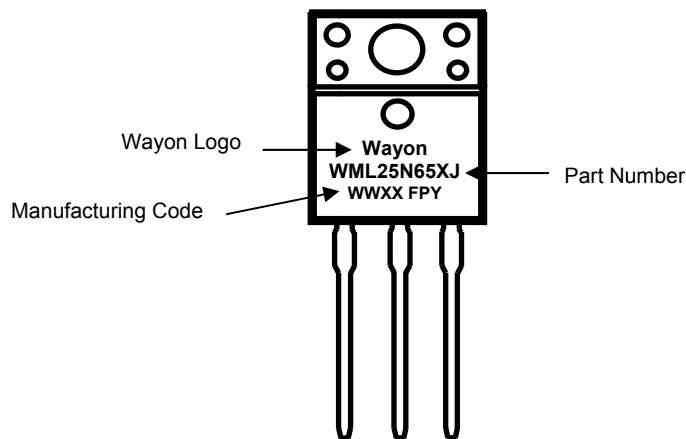
COMMON DIMENSIONS

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
WML25N65XJ	TO-220F	WML25N65XJ	Tube
WMK25N65XJ	TO-220	WMK25N65XJ	Tube
WMN25N65XJ	TO-262	WMN25N65XJ	Tube
WMM25N65XJ	TO-263	WMM25N65XJ	Tape and Reel
WMO25N65XJ	TO-252	WMO25N65XJ	Tape and Reel
WMJ25N65XJ	TO-247	WMJ25N65XJ	Tube

Marking Information



Contact Information

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

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