

650V 0.089Ω Super Junction Power MOSFET

Description

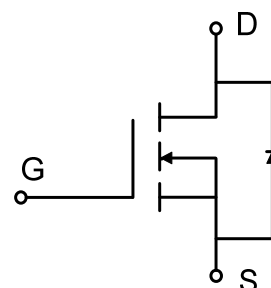
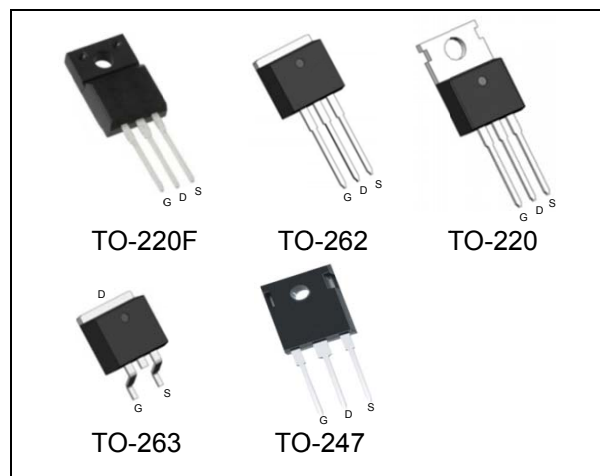
WMOS™ C2 is Wayon's 2nd generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ C2 is suitable for applications which require superior power density and outstanding efficiency.

Features

- $V_{DS} = 700V @ T_{j,max}$
- Typ. $R_{DS(on)} = 0.089\Omega$
- 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}	650		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$)	I_D	38		A
($T_C = 100^\circ C$)		21		A
Pulsed drain current ²⁾	I_{DM}	100		A
Gate-source voltage	V_{GS}	± 30		V
Avalanche energy, single pulse ³⁾	E_{AS}	740		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	1.0		mJ
Avalanche current, repetitive ²⁾	I_{AR}	4.5		A
Power dissipation ($T_C = 25^\circ C$)	P_D	277	34	W
- Derate above $25^\circ C$		2.22	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	33		A
Diode pulse current ²⁾	$I_{S,pulse}$	100		A

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMN/WMJ	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.45	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 V, I _D =0.25 mA	650	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =0.25mA	2.2	3	4.2	V
Drain cut-off current	I _{DSS}	V _{DS} =650 V, V _{GS} =0V, T _J = 25°C T _J = 125°C	- -	- 10	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 =15A T _J = 25°C	- -	 0.089	 0.099	 Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 100V, V _{GS} = 0V, f = 1 MHz	-	2940	-	pF
Output capacitance	C _{Oss}		-	100	-	
Reverse transfer capacitance	C _{rss}		-	1.8	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 15A R _G = 25Ω, V _{GS} =10V	-	53	-	ns
Rise time	t _r		-	71	-	
Turn-off delay time	t _{d(off)}		-	193	-	
Fall time	t _f		-	46	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480V, I _D =15A, V _{GS} =0 to 10V	-	14.5	-	nC
Gate to drain charge	Q _{gd}		-	23.5	-	
Gate charge total	Q _g		-	60	-	
Gate plateau voltage	V _{plateau}		-	5.5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =15A	-	-	1.2	V
Reverse recovery time	t _{rr}	V _R =50V, I _F =15A, dI _F /dt=100A/μs	-	297	-	ns
Reverse recovery charge	Q _{rr}		-	4.5	-	μC
Peak reverse recovery current	I _{rrm}		-	35.5	-	A

Notes:

- Limited by $T_{j\max}$. 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 $T_j = 25^\circ\text{C}$.

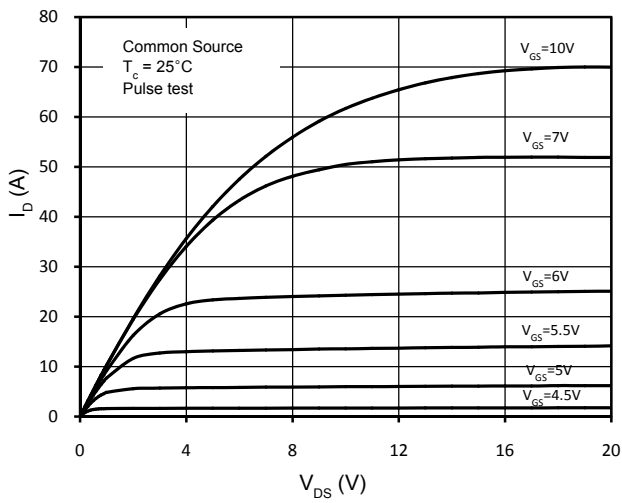


Figure 1. On-Region Characteristics

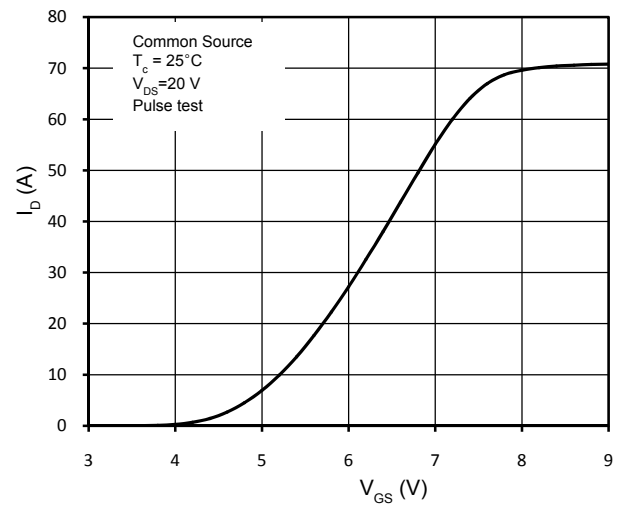


Figure 2. Transfer Characteristics

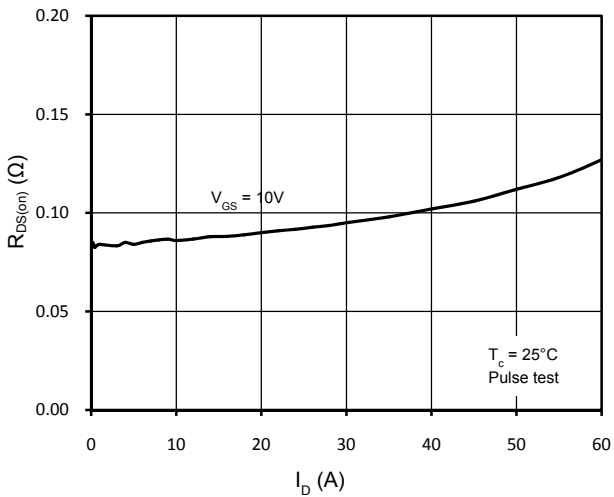


Figure 3. Static Drain-Source On Resistance

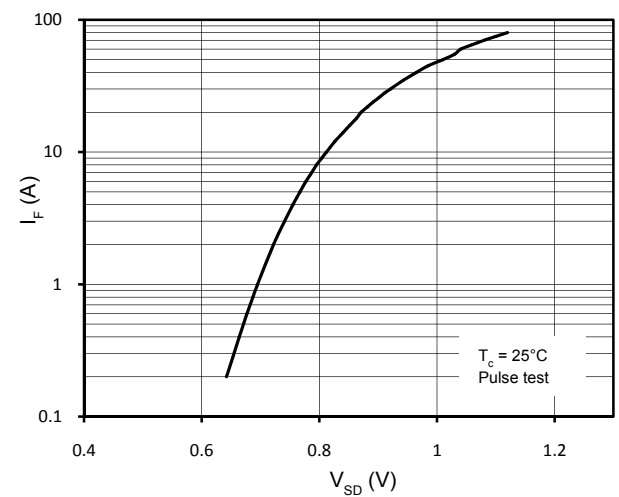
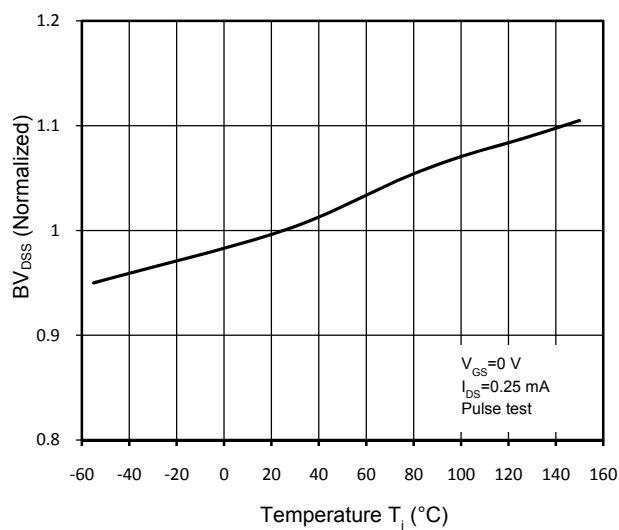
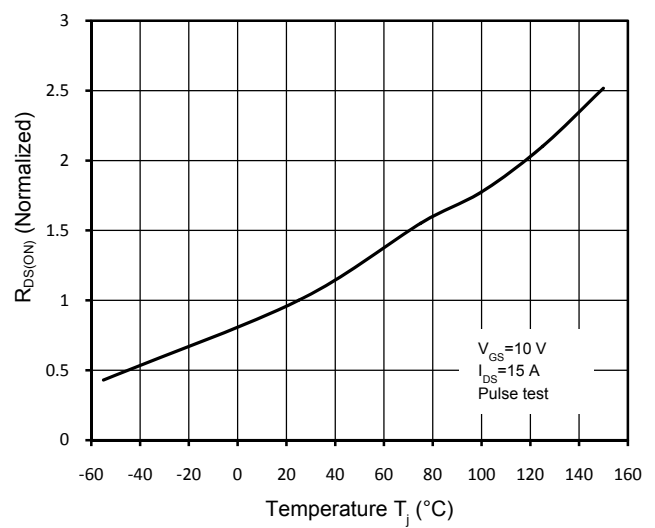


Figure 4. Body-Diode Forward Characteristics

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

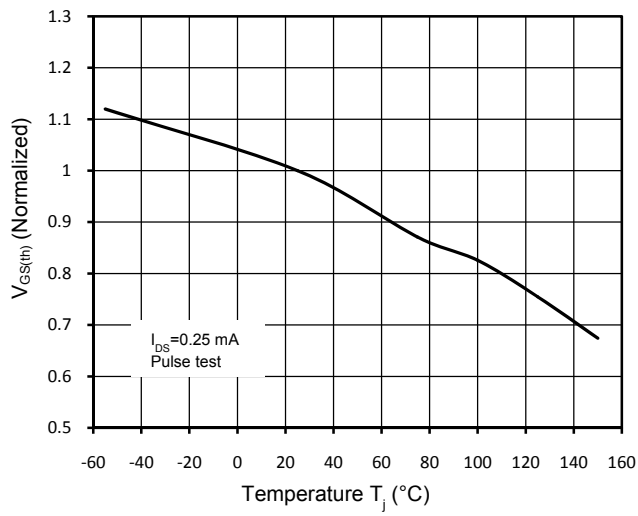


Figure 7. Threshold Voltage vs. Temperature

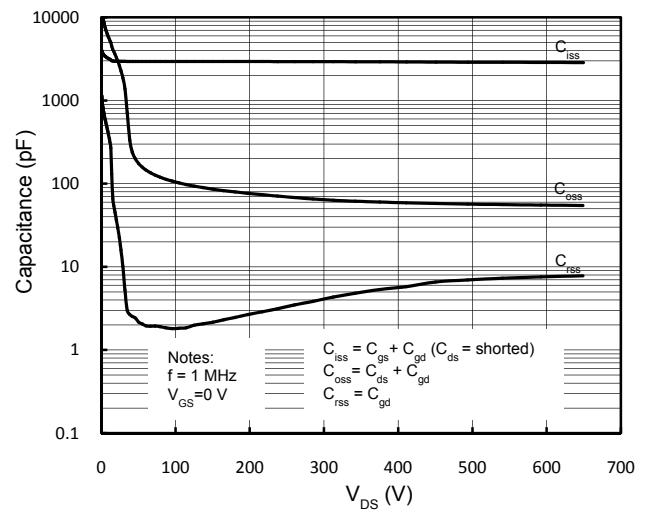


Figure 8. Capacitance Characteristics

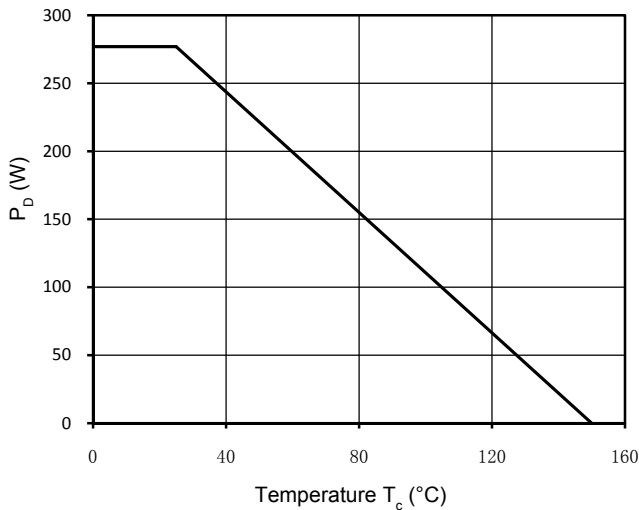


Figure 9. Power Dissipation

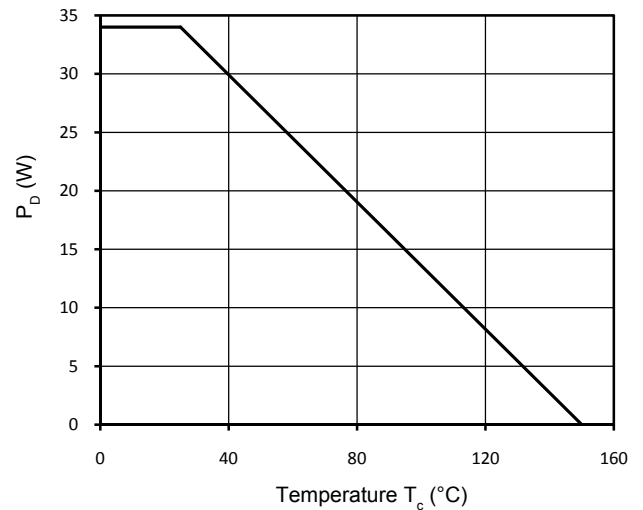


Figure 10. Power Dissipation (TO-220F)

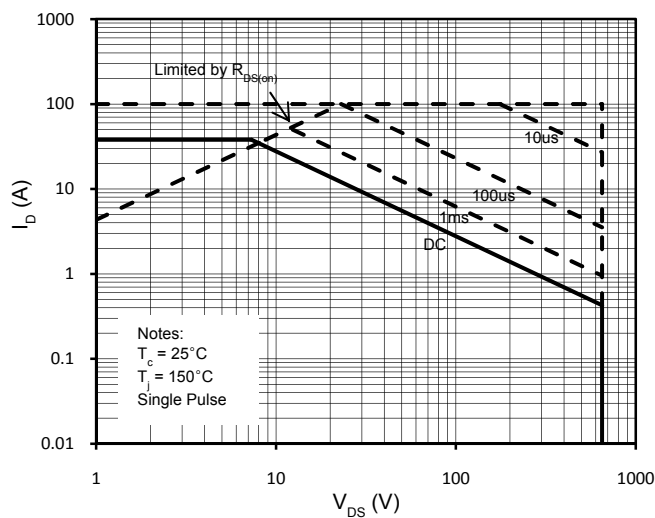


Figure 11. Maximum Safe Operating Area

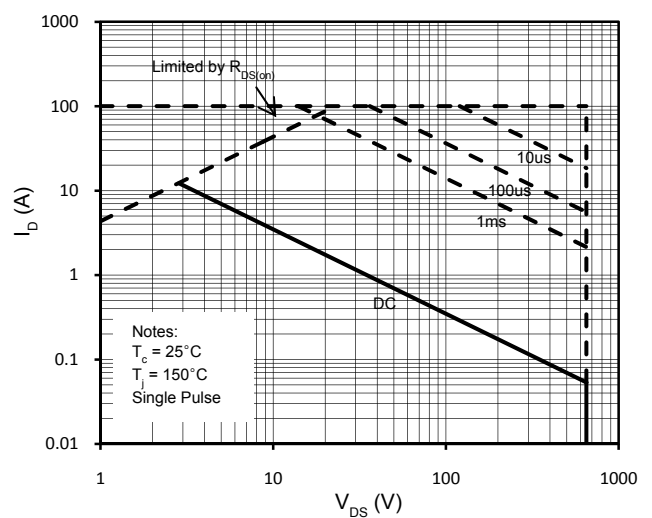


Figure 12. Maximum Safe Operating Area (TO-220F)

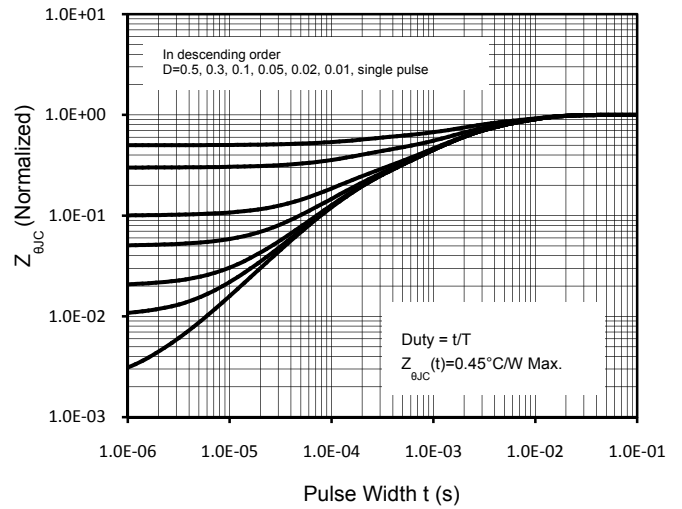
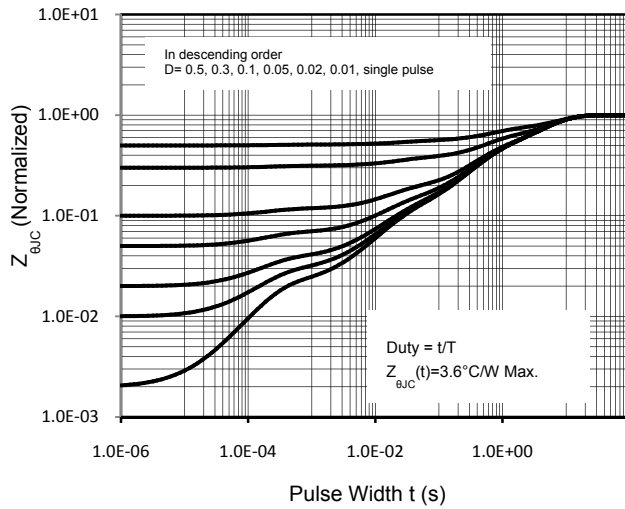


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Transient Thermal Response Curve

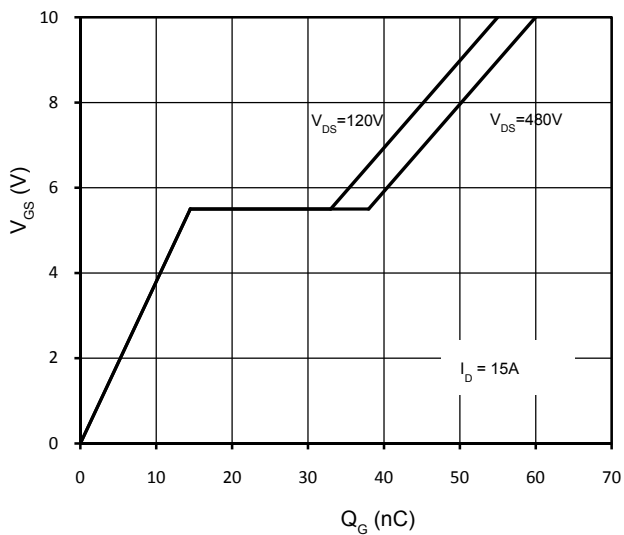
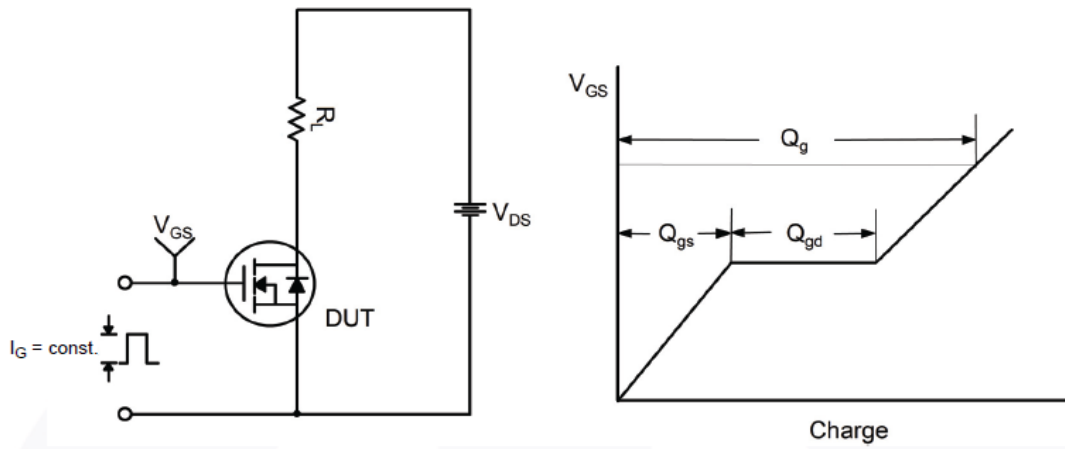
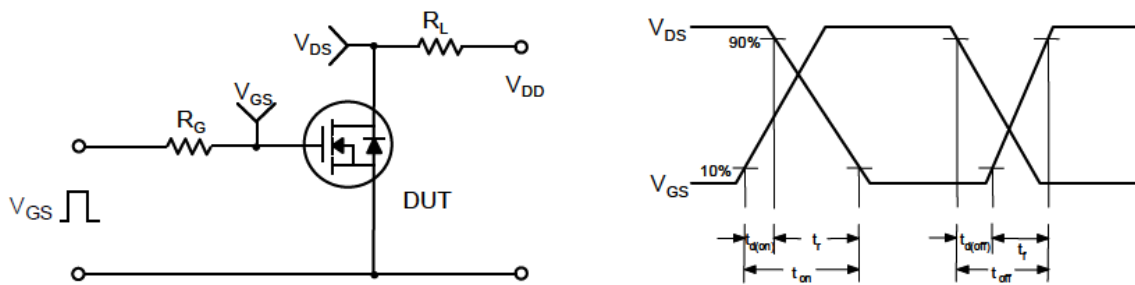


Figure 15. Gate Charge Characteristics

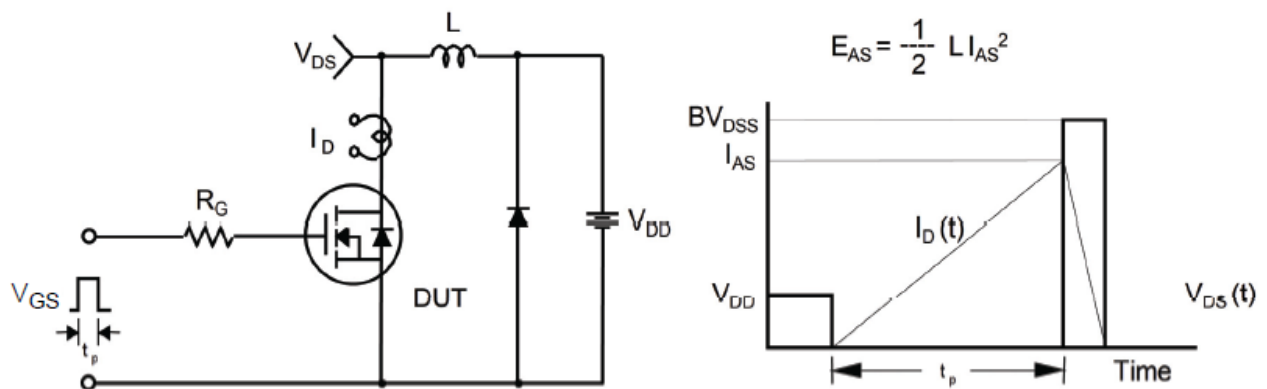
Gate Charge Test Circuit & Waveform



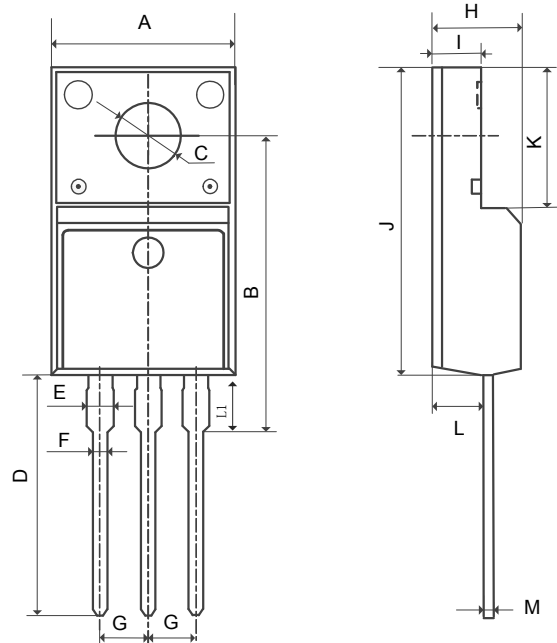
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

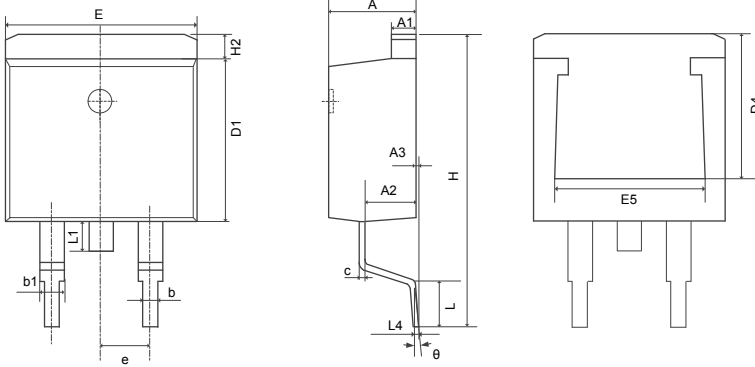


Mechanical Dimensions for TO-220F

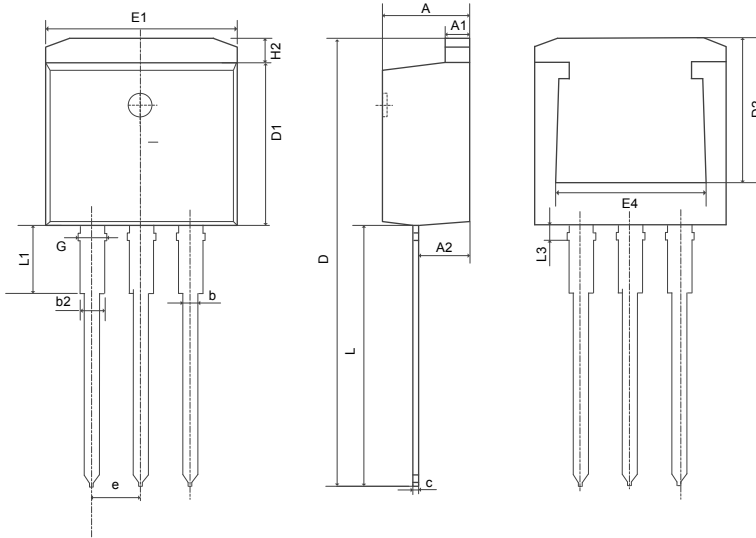


COMMON DIMENSIONS

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


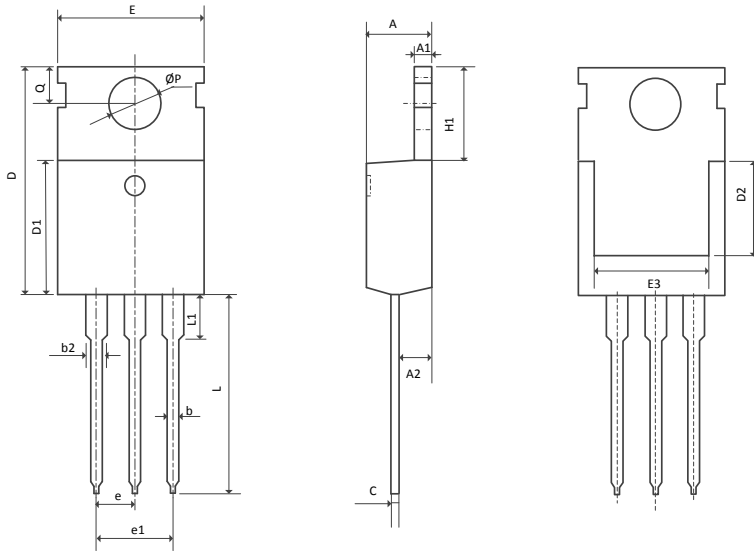
SYMBOL	MM	
	MIN	MAX
A	4.37	4.77
A1	1.22	1.42
A2	2.49	2.89
b	0.70	0.96
b1	1.17	1.47
c	0.30	0.53
D1	8.50	8.90
D4	6.60	—
E	9.86	10.36
E5	7.06	—
e	2.54BSC	
H	14.70	15.50
H2	1.07	1.47
L	2.00	2.60
L1	1.40	1.70
L4	0.25BSC	
θ	0°	9°

Mechanical Dimensions for TO-262
COMMON DIMENSIONS


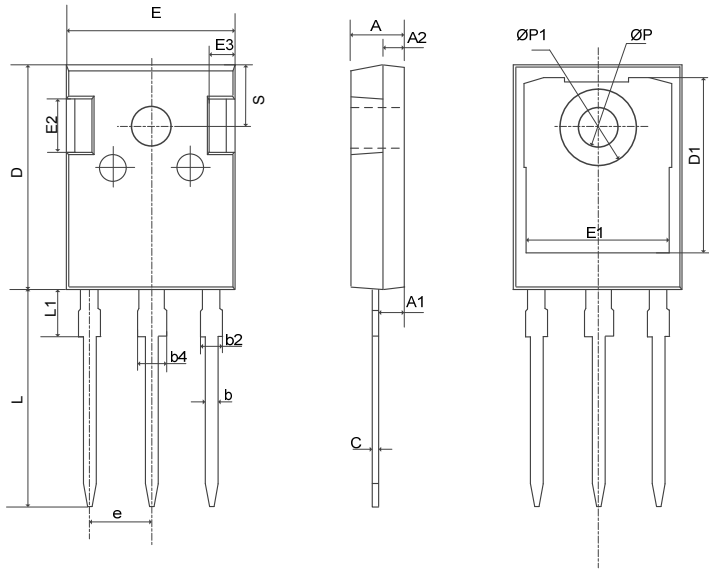
SYMBOL	MM	
	MIN	MAX
A	4.37	4.77
A1	1.22	1.42
A2	2.49	2.89
b	0.71	0.96
b2	1.17	1.42
c	0.28	0.53
D	23.20	24.02
D1	8.50	8.90
D2	6.00	—
E1	9.86	10.36
E4	7.06	—
e	2.54BSC	
G	1.25	1.50
H2	—	1.50
L	13.33	14.13
L1	3.50	4.00
L3	1.28	1.58

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

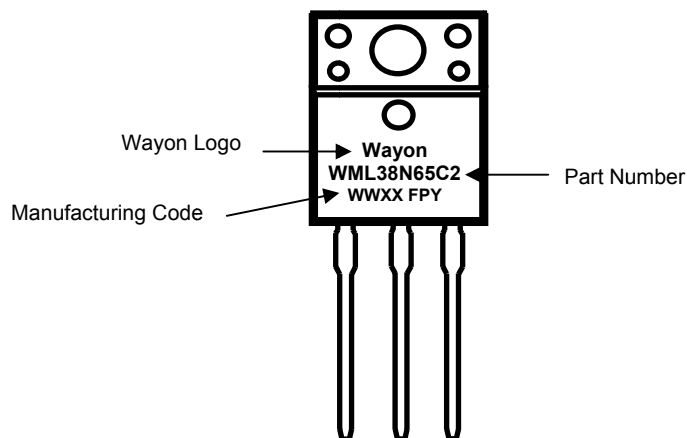
Mechanical Dimensions for TO-247
COMMON DIMENSIONS


SYMBOL	MM	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.11	1.36
b2	1.91	2.21
b4	2.91	3.21
c	0.51	0.75
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.00	13.60
E2	4.80	5.20
E3	2.30	2.70
e	5.44BSC	
L	19.62	20.22
L1	—	4.30
ØP	3.40	3.80
ØP1	—	7.30
S	6.15BSC	

Ordering Information

Part	Package	Marking	Packing method
WML38N65C2	TO-220F	WML38N65C2	Tube
WMK38N65C2	TO-220	WMK38N65C2	Tube
WMN38N65C2	TO-262	WMN38N65C2	Tube
WMM38N65C2	TO-263	WMM38N65C2	Tape and Reel
WMJ38N65C2	TO-247	WMJ38N65C2	Tube

Marking Information



Contact Information

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