

N-channel 200V 29mΩ Power MOSFET

Description

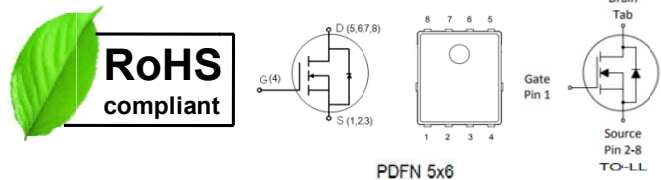
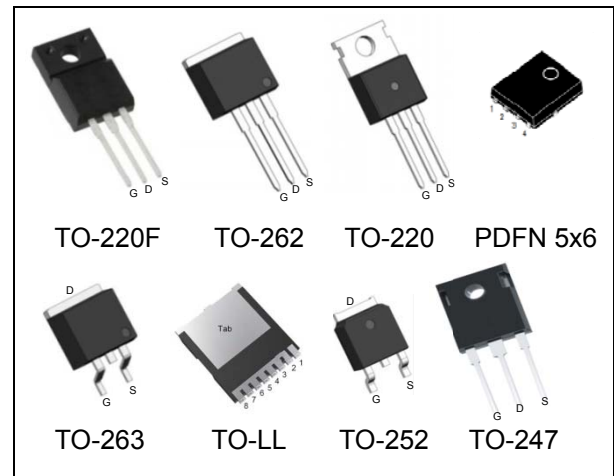
WMOS™ JN is suitable for applications which require superior power density and outstanding efficiency.

Features

- Gate charge minimized
- Typ. $R_{DS(on)} = 29m\Omega$
- 100% UIS tested
- Pb-free plating, Halogen free

Applications

Switching applications



Absolute Maximum Ratings

Parameter	Symbol	WMx50N20JN	WML50N20JN	Unit
Drain-source voltage	V_{DS}	200		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$) ($T_C = 100^\circ C$)	I_D	40		A
		24		A
Pulsed drain current ²⁾	I_{DM}	120		A
Gate-source voltage	V_{GS}	± 20		V
Avalanche energy, single pulse ³⁾	E_{AS}	110		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	0.1		mJ
Avalanche current, repetitive ²⁾	I_{AR}	2		A
Power dissipation ($T_C = 25^\circ C$) - Derate above $25^\circ C$	P_D	90	31	W
		0.72	0.25	W/°C
Operating and storage temperature range	T_i, T_{stg}	-55 to +150		°C
Continuous diode forward current	I_S	40		A
Diode pulse current	$I_{S,pulse}$	120		A

Thermal Characteristics

Parameter	Symbol	WMx50N20JN	WML50N20JN	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	1.38	4	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	80	°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}	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.25\text{mA}$	2.2	3.2	4.2	V
Drain cut-off current	I_{DSS}	$V_{DS}=200\text{ V}, V_{GS}=0\text{V},$ $T_J = 25^{\circ}\text{C}$ $T_J = 125^{\circ}\text{C}$	- -	- 30	1 -	μA
Gate leakage current, forward	I_{GSSF}	$V_{GS}=20\text{V}, V_{DS}=0\text{V}$	-	-	500	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=20\text{A}$ $T_J = 25^{\circ}\text{C}$	- -	 29	 35	 m Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}= 100\text{V}, V_{GS}= 0\text{V},$ $f = 1\text{ MHz}$	-	1570	-	pF
Output capacitance	C_{oss}		-	56	-	
Reverse transfer capacitance	C_{rss}		-	7	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 100\text{V}, I_D = 30\text{A}$ $R_G = 4.7\Omega, V_{GS}=10\text{V}$	-	8	-	ns
Rise time	t_r		-	6	-	
Turn-off delay time	$t_{d(off)}$		-	31	-	
Fall time	t_f		-	4	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=160\text{V}, I_D=30\text{A},$ $V_{GS}=0\text{ to }10\text{V}$	-	10	-	nC
Gate to drain charge	Q_{gd}		-	6.5	-	
Gate charge total	Q_g		-	28	-	
Gate plateau voltage	$V_{plateau}$		-	5.7	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=30\text{A}$	-	-	1.2	V
Reverse recovery time	t_{rr}	$V_R=50\text{V}, I_F=30\text{A},$ $dI_F/dt=100\text{A}/\mu\text{s}$	-	138	-	ns
Reverse recovery charge	Q_{rr}		-	0.6	-	μC
Peak reverse recovery current	I_{rrm}		-	8	-	A

Notes:

- Limited by $T_{j\text{max}}$. Maximum duty cycle $D=0.5$.
- Repetitive rating: pulse width limited by maximum junction temperature.
- $I_{AS} = 2\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, starting $T_j = 25^\circ\text{C}$.

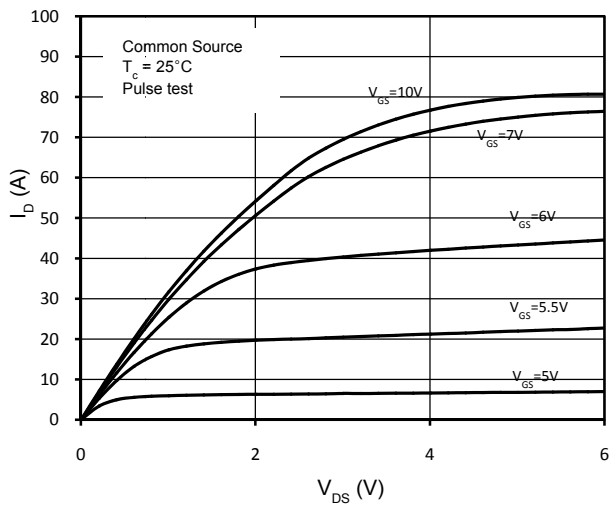


Figure 1. On-Region Characteristics

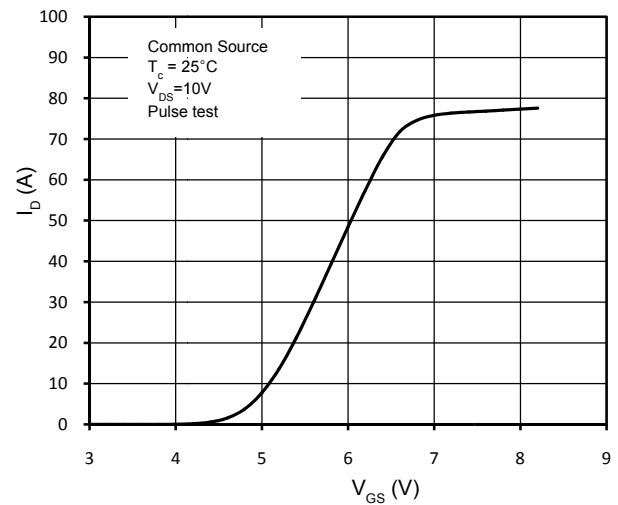


Figure 2. Transfer Characteristics

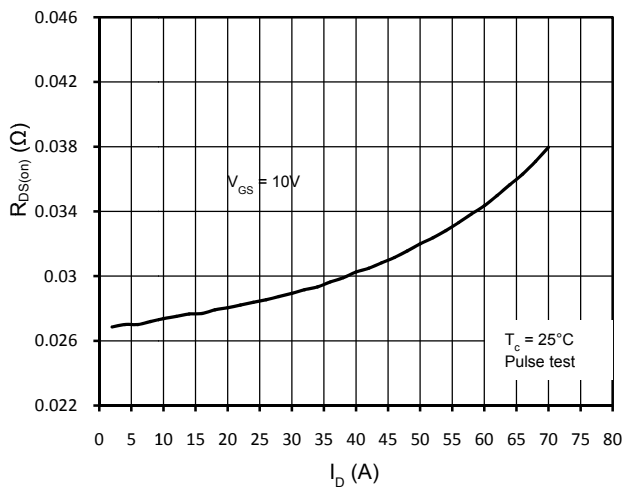


Figure 3. Static Drain-Source On Resistance

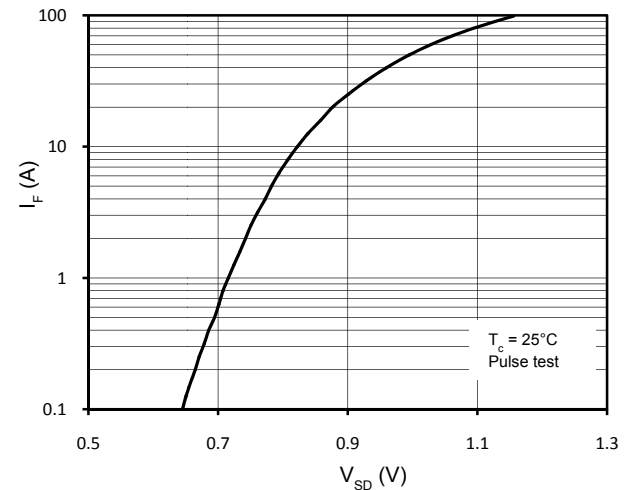
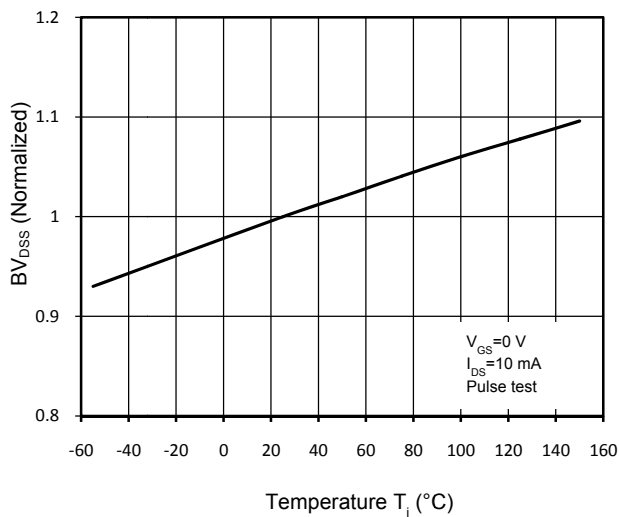
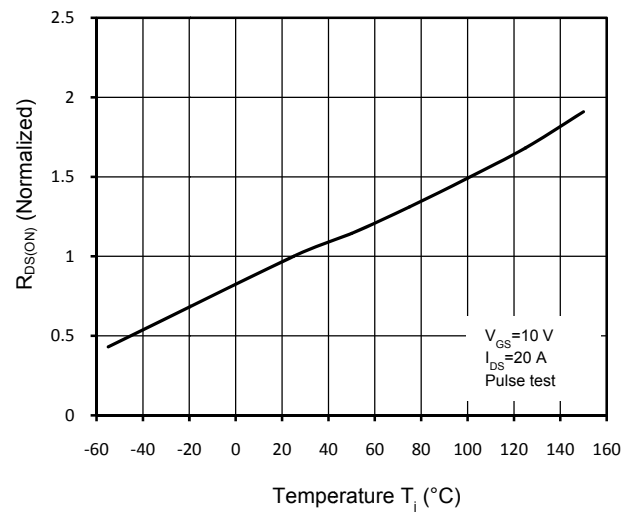


Figure 4. Body-Diode Forward Characteristics

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

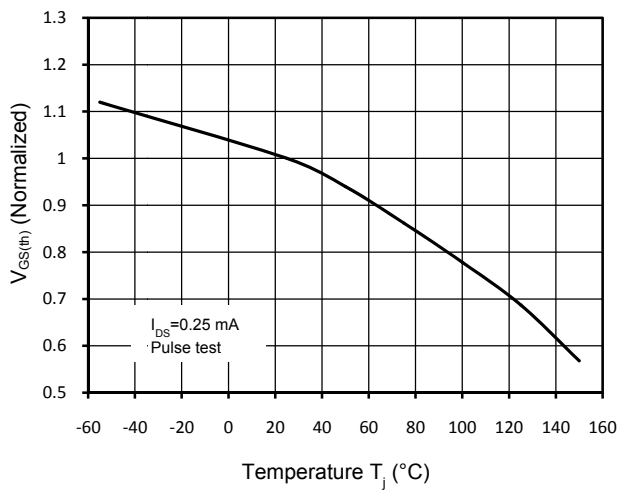


Figure 7. Threshold Voltage vs. Temperature

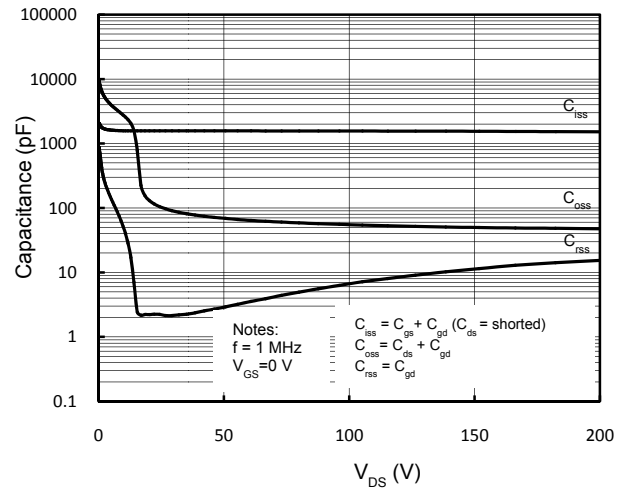


Figure 8. Capacitance Characteristics

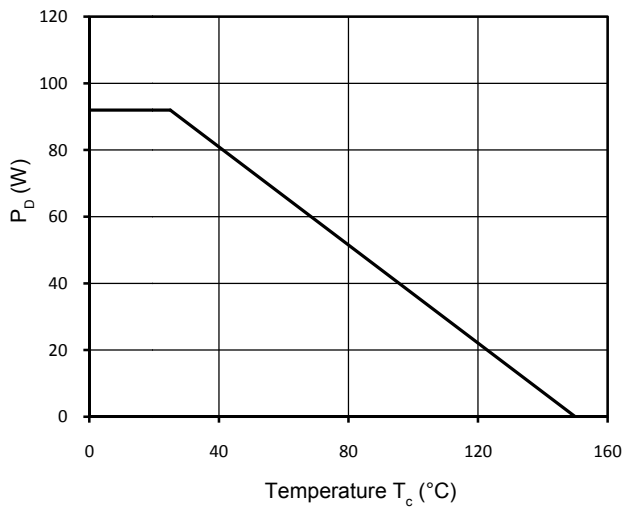


Figure 9. Power Dissipation

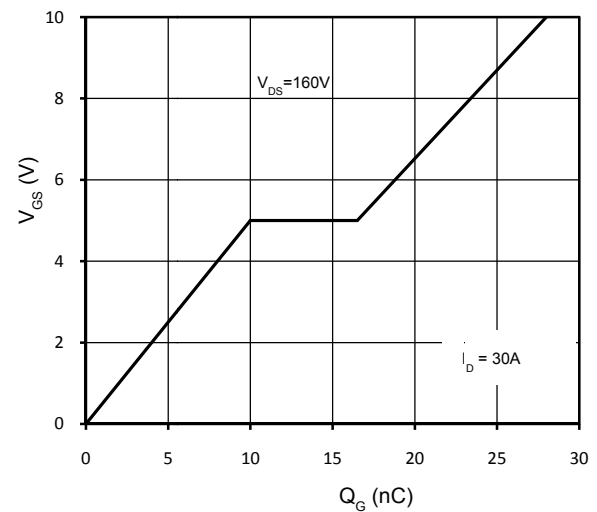


Figure 10. Gate Charge Characteristics

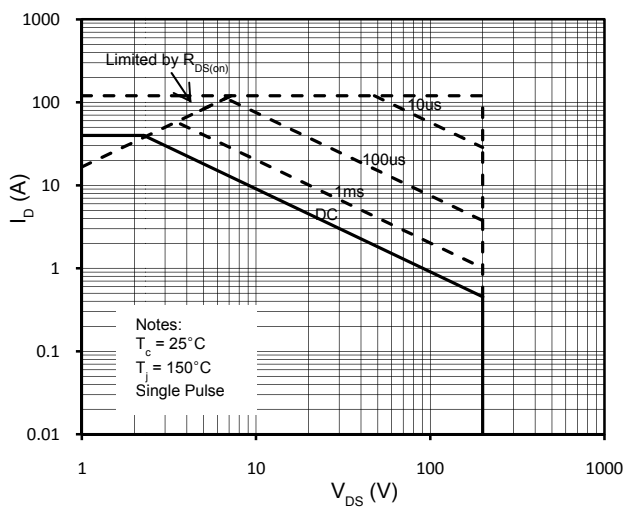


Figure 11. Maximum Safe Operating Area

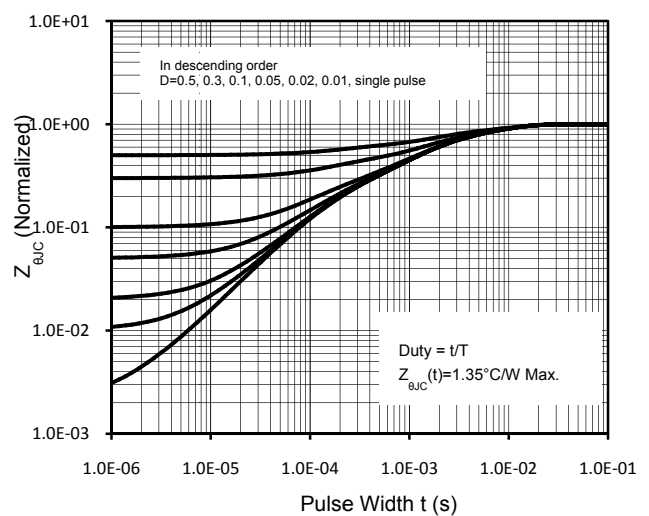


Figure 12. Transient Thermal Response Curve

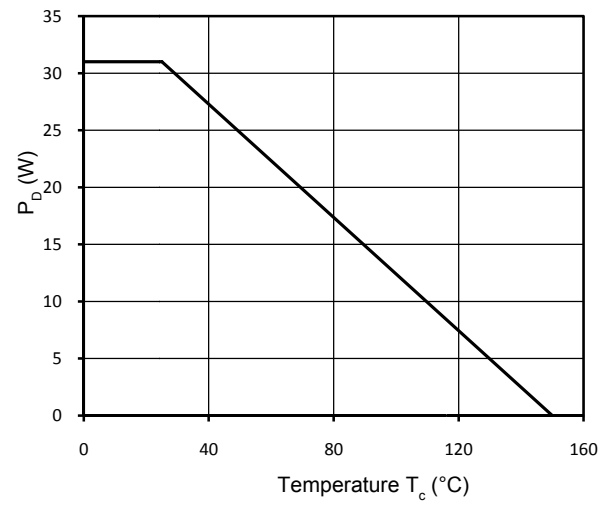
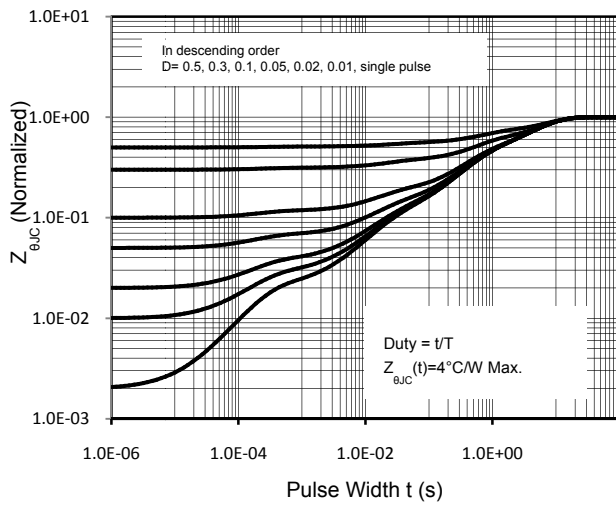


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Power Dissipation (TO-220F)

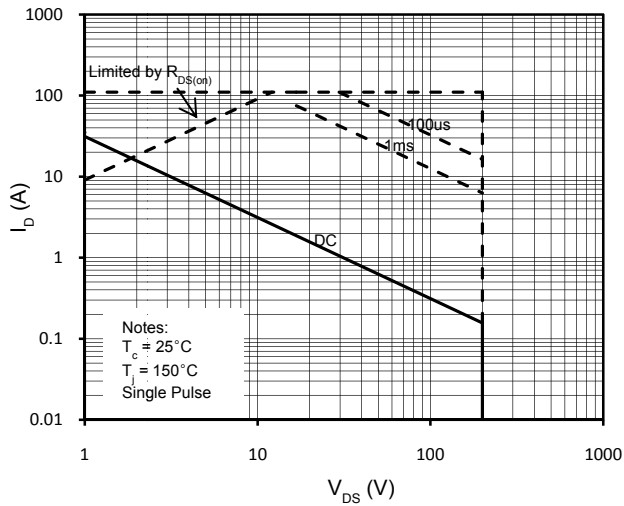
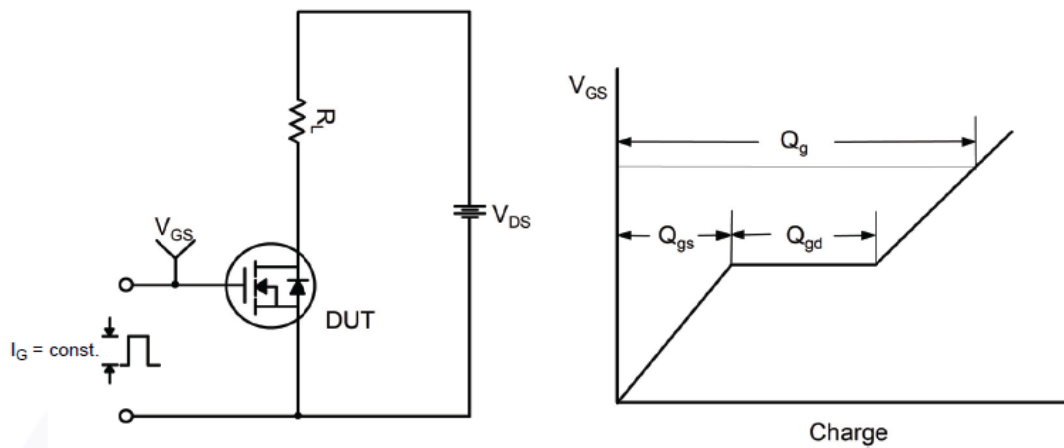
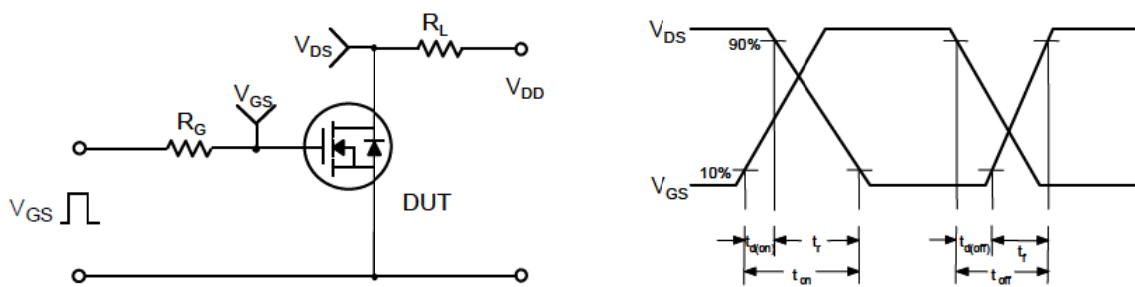


Figure 15. Maximum Safe Operating Area (TO-220F)

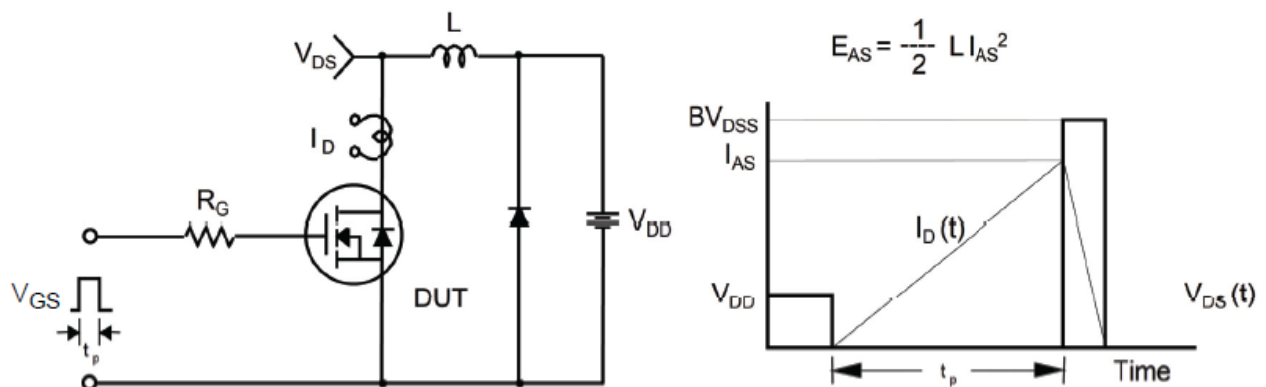
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms

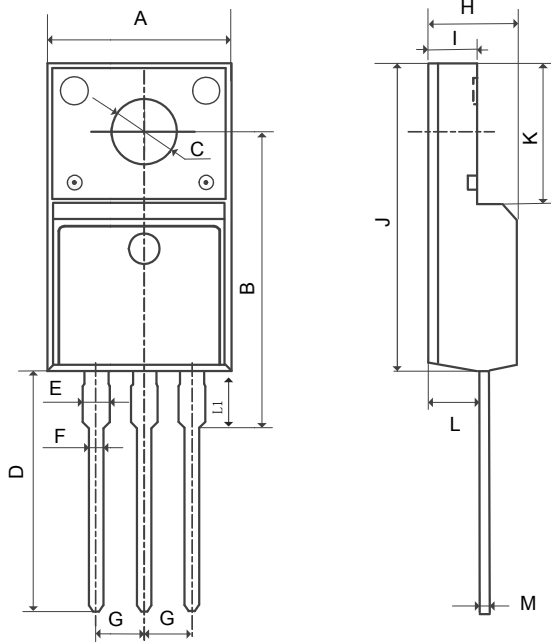


Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F

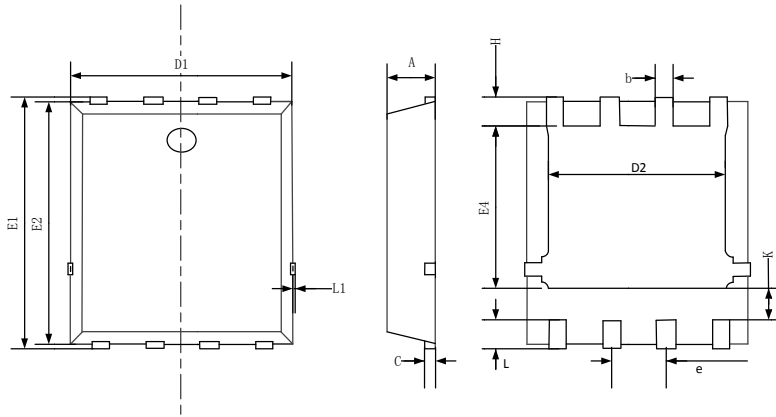
COMMON DIMENSIONS



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 PDFN 5x6

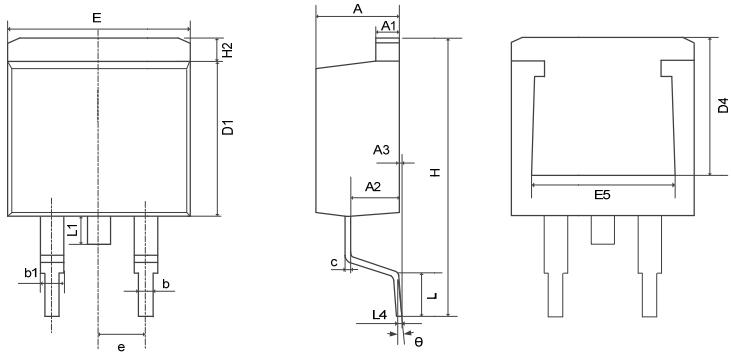
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	1.0	1.2
b	0.3	0.5
C	0.15	0.35
D1	5.0	5.4
D2	3.8	4.3
E1	5.95	6.35
E2	5.66	6.06
E4	3.52	3.92
e	1.17	1.37
H	0.4	0.6
K	1.15	1.6
L	0.3	0.7
L1		0.12

Mechanical Dimensions for TO-263

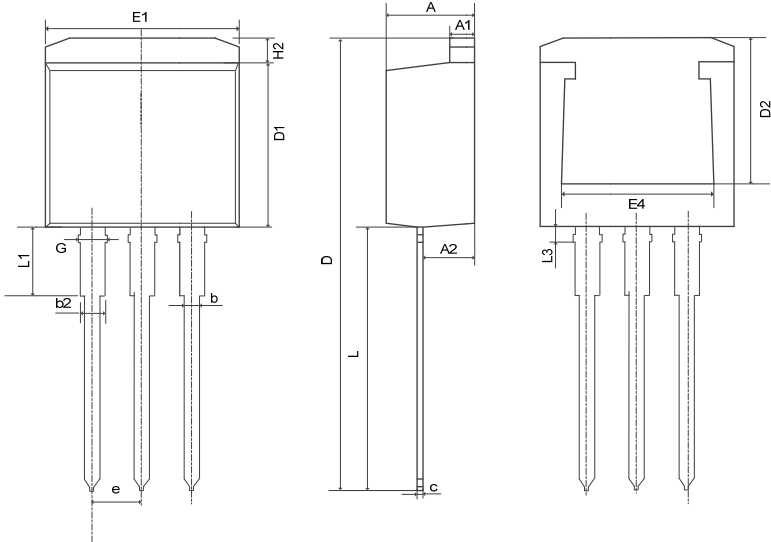
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.37	4.89
A1	1.17	1.42
A2	2.19	2.89
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

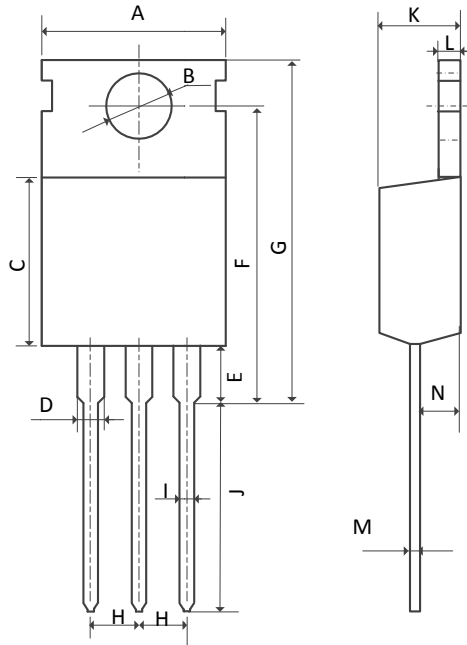
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.37	4.90
A1	1.17	1.42
A2	2.49	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

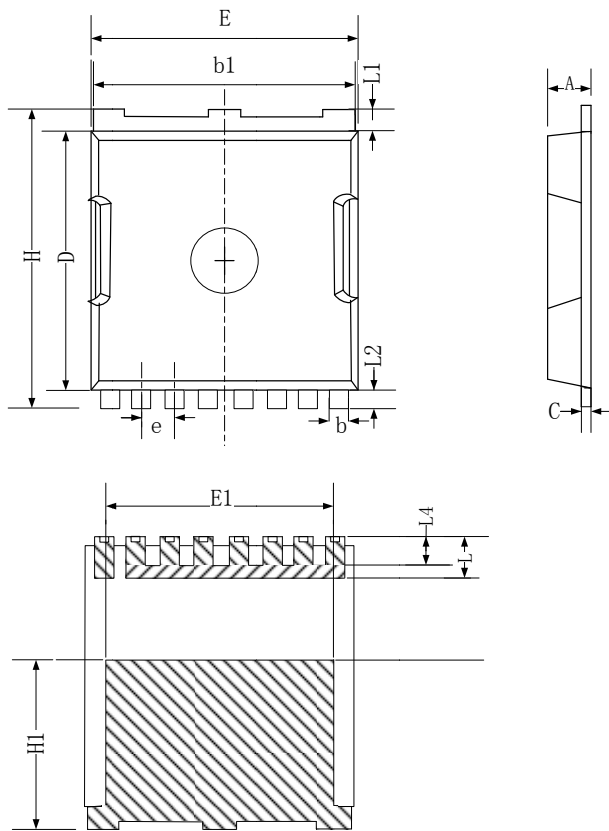
Mechanical Dimensions for TO-220

COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	9.70	10.30
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-LL

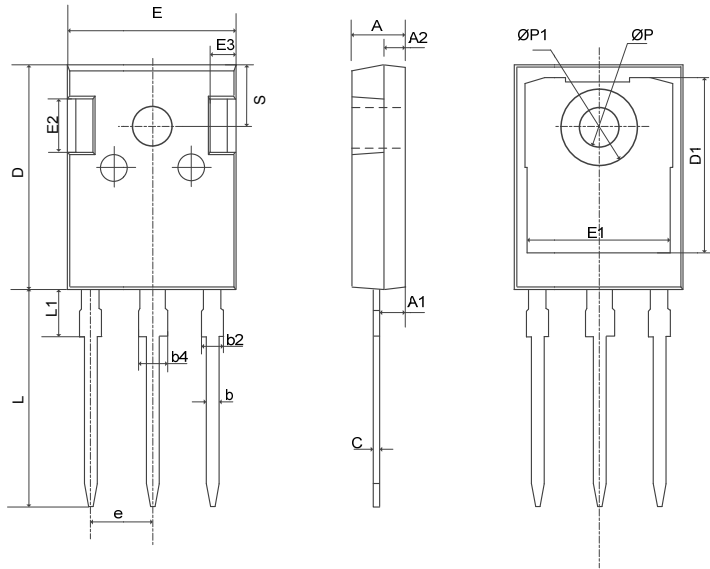


COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	2.15	2.45
b	0.7	0.95
b1	9.6	9.95
C	0.4	0.6
D	10.1	10.6
E	9.6	10.1
E1	7.9	8.5
e	1.20BSC	
H	11.38	11.88
H1	6.65	7.2
L	1.4	2
L1	0.5	0.9
L2	0.48	0.72
L4	1	1.3

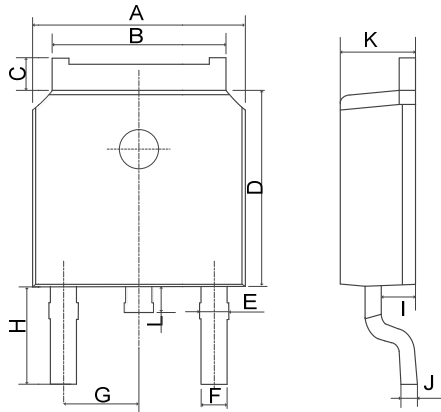
Mechanical Dimensions for TO-247

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	

Mechanical Dimensions for TO-252



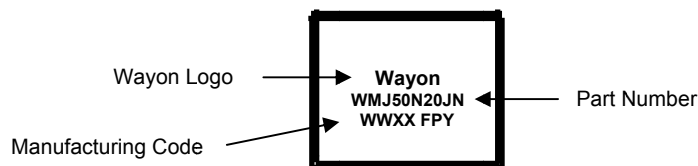
COMMON DIMENSIONS

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
WML50N20JN	TO-220F	WML50N20JN	Tube
WMB50N20JN	PDFN 5x6	WMB50N20JN	Tape and Reel
WMO50N20JN	TO-252	WMO50N20JN	Tape and Reel
WMK50N20JN	TO-220	WMK50N20JN	Tube
WMN50N20JN	TO-262	WMN50N20JN	Tube
WMM50N20JN	TO-263	WMM50N20JN	Tape and Reel
WMLL50N20JN	TO-LL	WMLL50N20JN	Tape and Reel
WMJ50N20JN	TO-247	WMJ50N20JN	Tube

Marking Information



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