

## N-channel 250V 14.6mΩ Power MOSFET

### Description

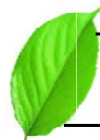
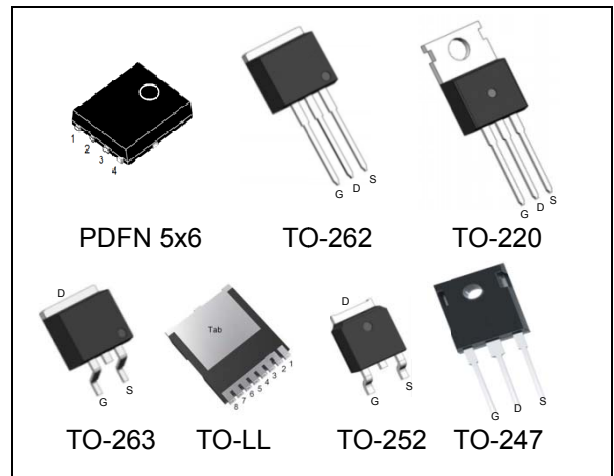
WMOS™ JN is suitable for applications which require superior power density and outstanding efficiency.

### Features

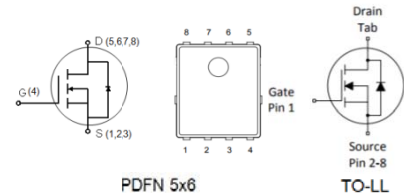
- Gate charge minimized
- Typ.  $R_{DS(on)} = 14.6m\Omega$
- 100% UIS tested
- Pb-free plating, Halogen free

### Applications

Switching applications



**RoHS**  
compliant



### Absolute Maximum Ratings

Parameter	Symbol	WMK/WMM/WMN/WMJ/WMLL/WMB/WMO	Unit
Drain-source voltage	$V_{DSS}$	250	V
Continuous drain current <sup>1)</sup> ( $T_C = 25^\circ C$ )	$I_D$	70	A
( $T_C = 100^\circ C$ )		42	A
Pulsed drain current <sup>2)</sup>	$I_{DM}$	280	A
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Avalanche energy, single pulse <sup>3)</sup>	$E_{AS}$	240	mJ
Avalanche energy, repetitive <sup>2)</sup>	$E_{AR}$	0.15	mJ
Avalanche current, repetitive <sup>2)</sup>	$I_{AR}$	3	A
Power dissipation ( $T_C = 25^\circ C$ )	$P_D$	180	W
- Derate above $25^\circ C$		1.44	W/°C
Operating and storage temperature range	$T_i, T_{stg}$	-55 to +150	°C
Continuous diode forward current	$I_S$	70	A
Diode pulse current	$I_{S,pulse}$	280	A

### Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMN/WMJ/WMLL/WMB/WMO	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.7	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	°C/W

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	250	-	-	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	$I_{DSS}$	$V_{DS}=250\text{ V}, V_{GS}=0\text{V},$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	-	-	1	$\mu\text{A}$
Gate leakage current, forward	$I_{GSSF}$	$V_{GS}=20\text{V}, V_{DS}=0\text{V}$	-	-	500	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=30\text{A}$ $T_j = 25^\circ\text{C}$	-	14.6	17	$\text{m}\Omega$
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS}= 100\text{V}, V_{GS}= 0\text{V},$ $f = 1\text{ MHz}$	-	3380	-	pF
Output capacitance	$C_{oss}$		-	115	-	
Reverse transfer capacitance	$C_{rss}$		-	5	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 100\text{V}, I_D = 30\text{A}$ $R_G = 4.7\Omega, V_{GS}=10\text{V}$	-	13	-	ns
Rise time	$t_r$		-	27	-	
Turn-off delay time	$t_{d(off)}$		-	73	-	
Fall time	$t_f$		-	4	-	
<b>Gate charge characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DD}=160\text{V}, I_D=30\text{A},$ $V_{GS}=0\text{ to }10\text{V}$	-	21	-	nC
Gate to drain charge	$Q_{gd}$		-	13	-	
Gate charge total	$Q_g$		-	62	-	
Gate plateau voltage	$V_{plateau}$		-	5.0	-	V
<b>Reverse diode characteristics</b>						
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=30\text{A}$	-	-	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=50\text{V}, I_F=30\text{A},$ $di_F/dt=100\text{A}/\mu\text{s}$	-	190	-	ns
Reverse recovery charge	$Q_{rr}$		-	0.95	-	$\mu\text{C}$
Peak reverse recovery current	$I_{rrm}$		-	10	-	A

## Notes:

- Limited by  $T_{j\text{max}}$ . Maximum duty cycle  $D=0.5$ .
- Repetitive rating: pulse width limited by maximum junction temperature.
- $I_{AS} = 3\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , starting  $T_j = 25^\circ\text{C}$ .

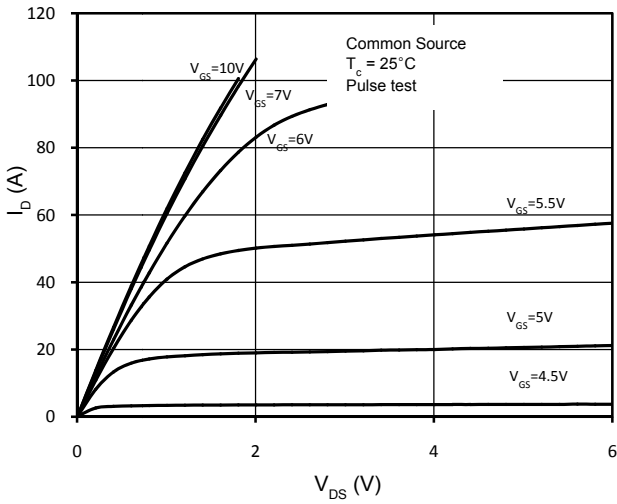


Figure 1. On-Region Characteristics

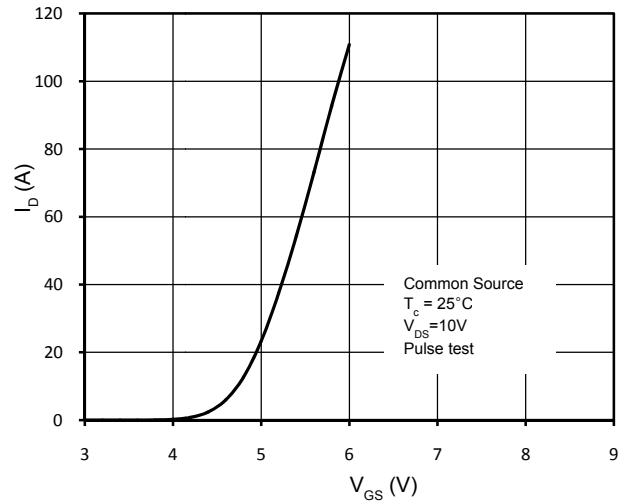


Figure 2. Transfer Characteristics

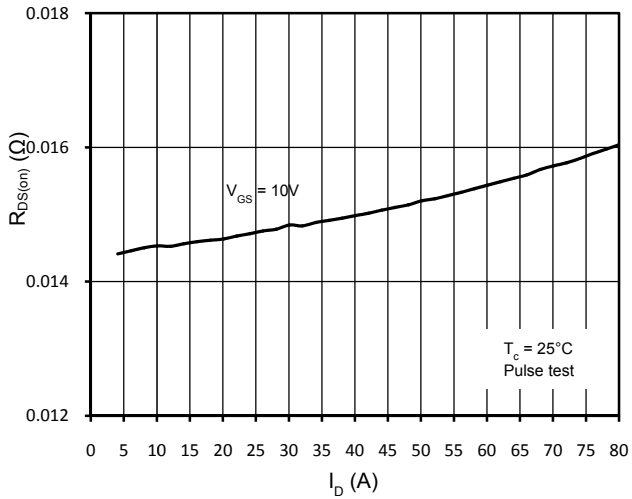


Figure 3. Static Drain-Source On Resistance

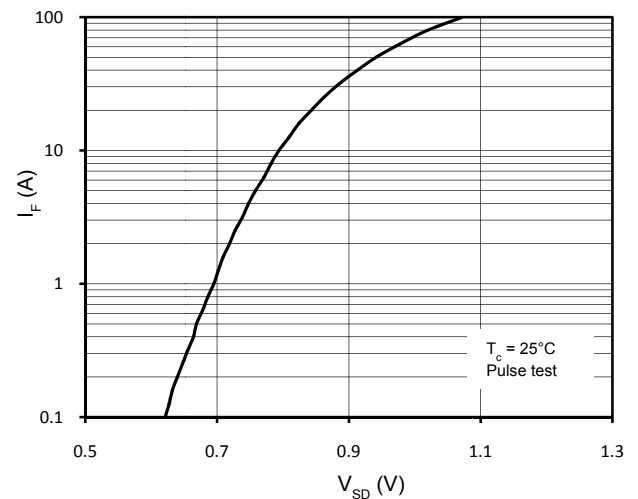


Figure 4. Body-Diode Forward Characteristics

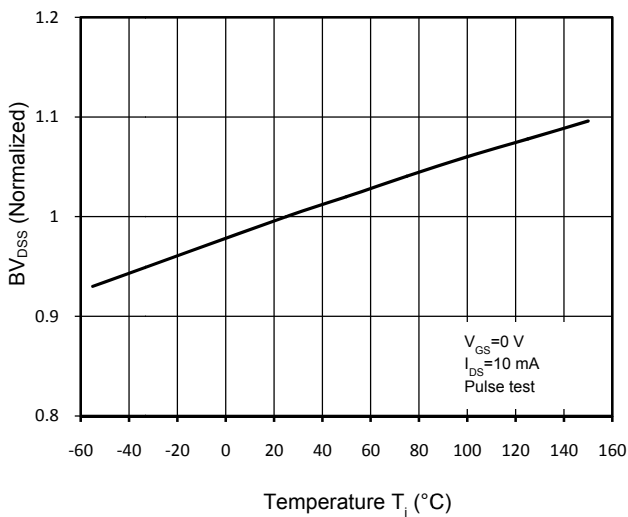


Figure 5. Normalized  $BV_{DS(s)}$  vs. Temperature

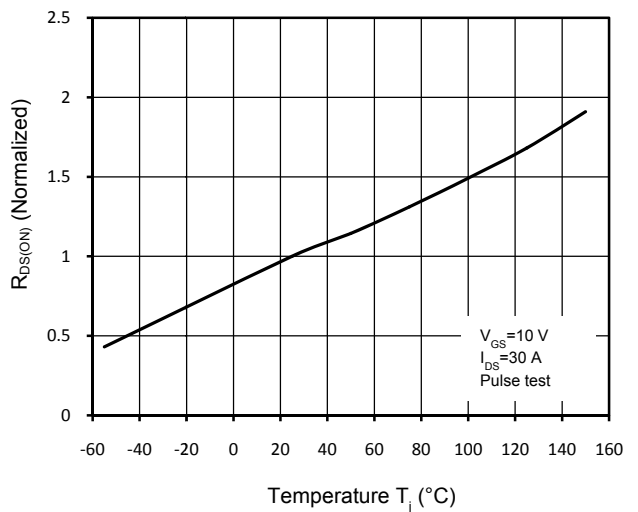


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

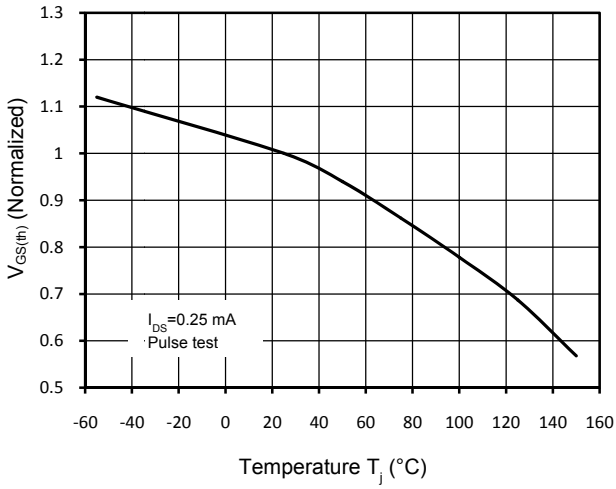


Figure 7. Threshold Voltage vs. Temperature

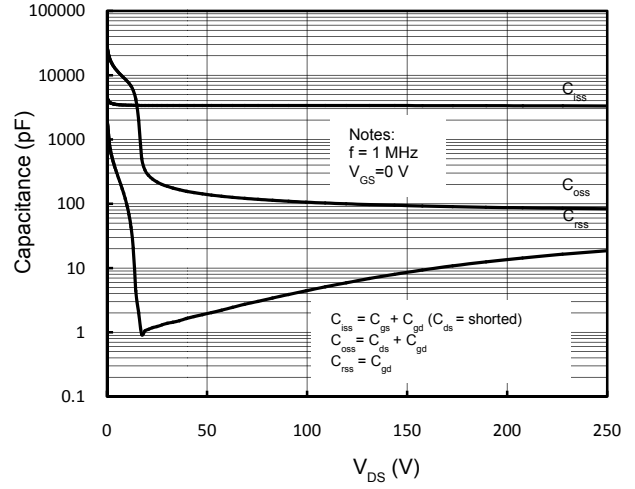


Figure 8. Capacitance Characteristics

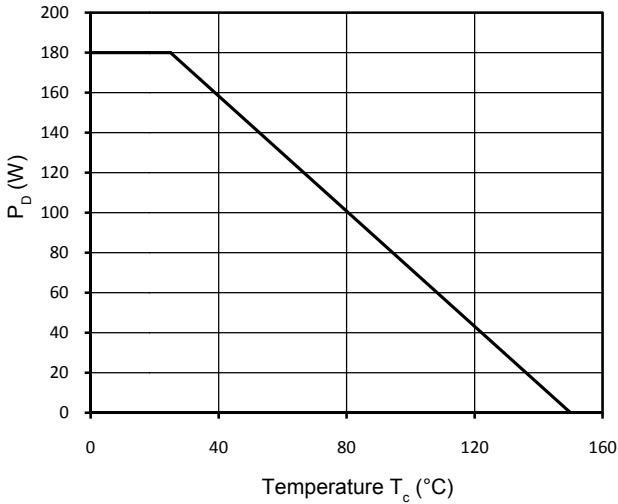


Figure 9. Power Dissipation

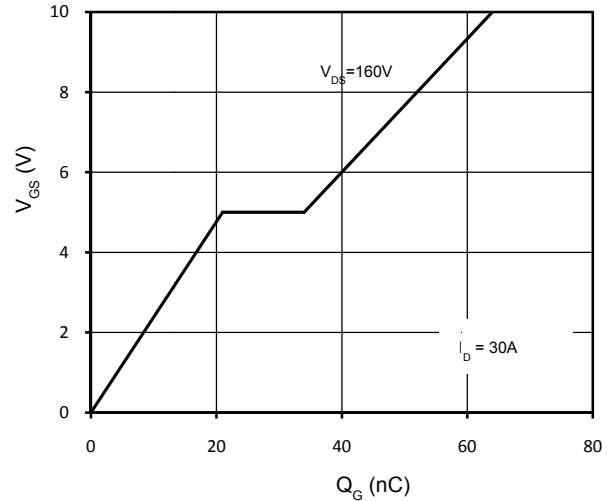


Figure 10. Gate Charge Characteristics

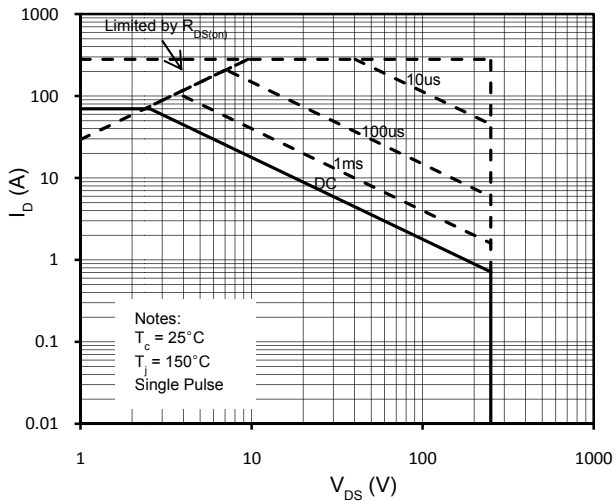


Figure 11. Maximum Safe Operating Area

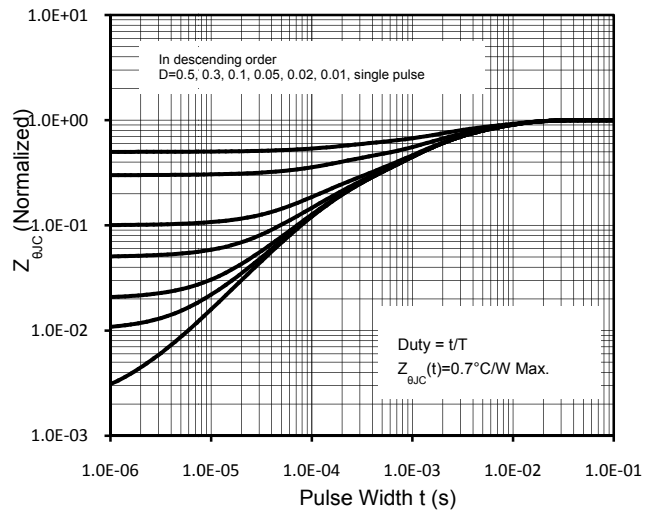
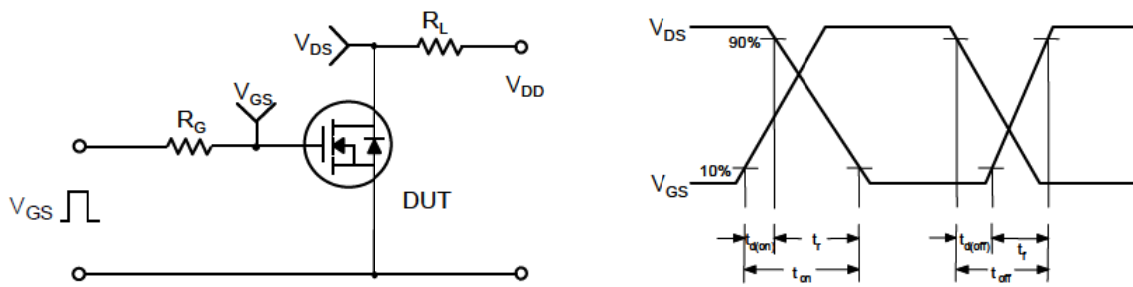


Figure 12. Transient Thermal Response Curve

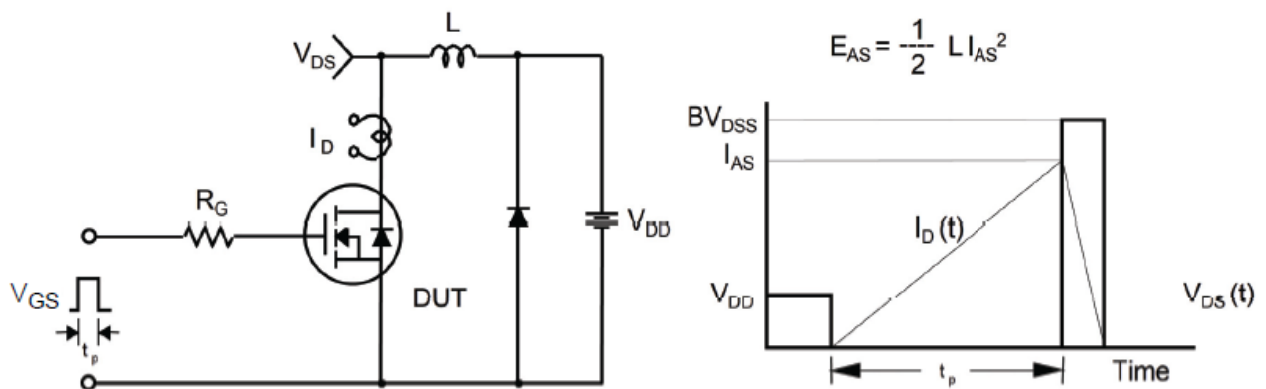
### Gate Charge Test Circuit & Waveform



### Switching Test Circuit & Waveforms

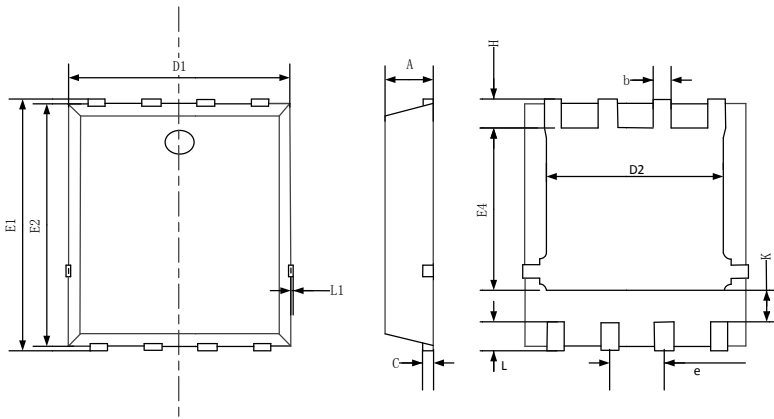


### Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for PDFN 5x6

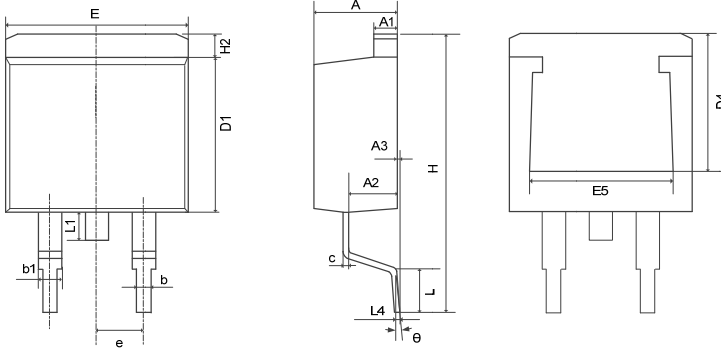
COMMON DIMENSIONS



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

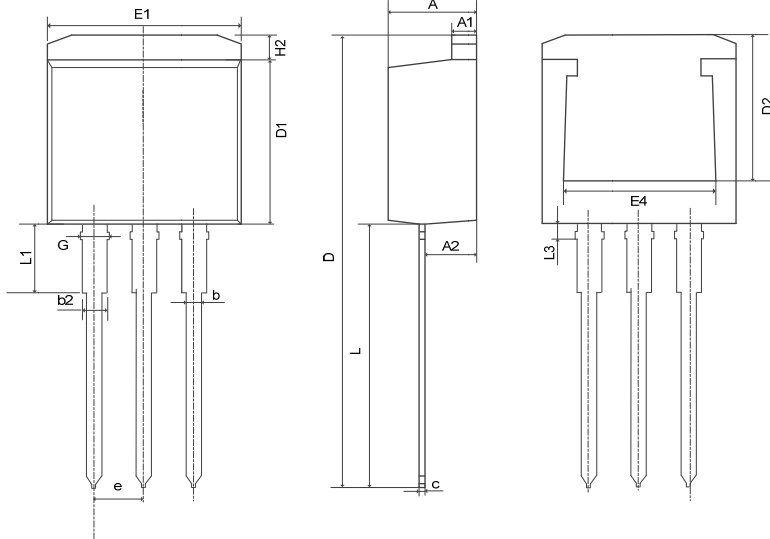
COMMON DIMENSIONS



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

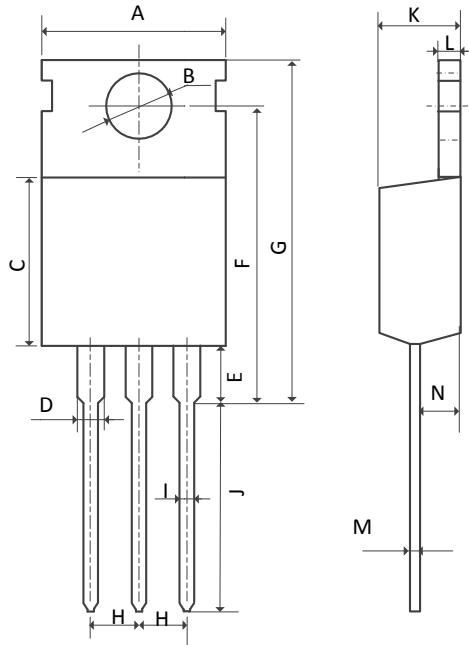
## COMMON DIMENSIONS



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



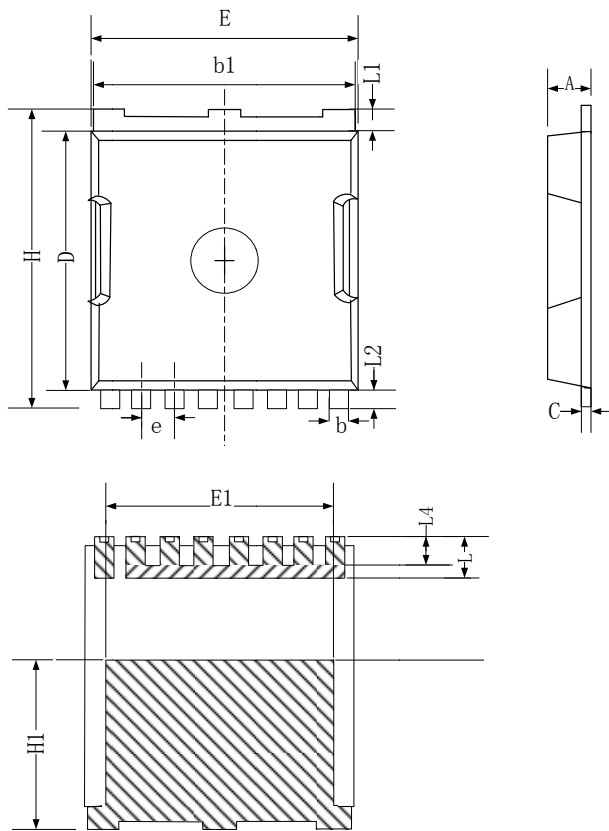
## Mechanical Dimensions for TO-220



## 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**

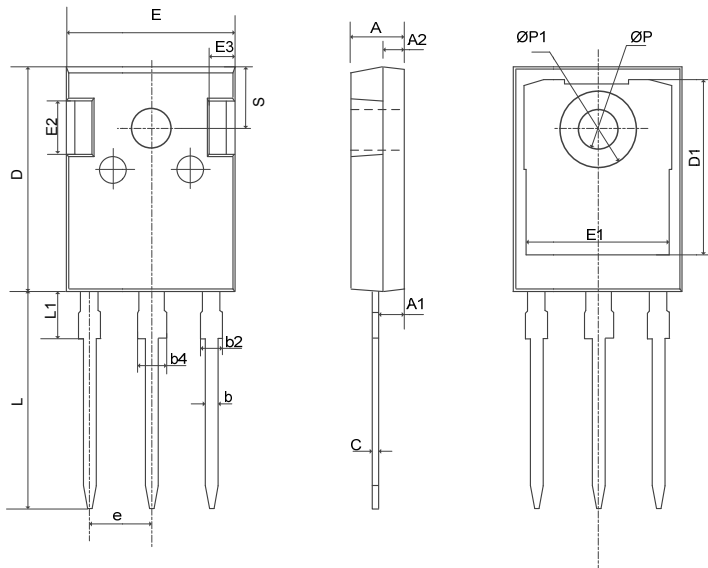


**COMMON DIMENSIONS**

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

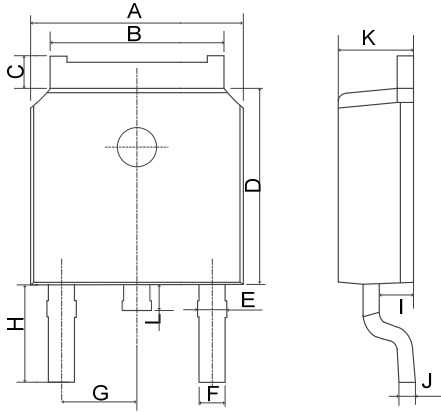
## COMMON DIMENSIONS



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

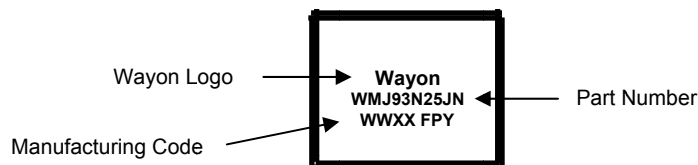


SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.13	5.50
C	0.88	1.28
D	5.90	6.22
E	0.68	1.10
F	0.68	0.91
G	2.29REF	
H	2.90REF	
I	0.85	1.17
J	0.51REF	
K	2.10	2.50
L	0.40	1.00

## Ordering Information

Part	Package	Marking	Packing method
WMB93N25JN	PDFN 5x6	WMB93N25JN	Tape and Reel
WMO93N25JN	TO-252	WMO93N25JN	Tape and Reel
WMK93N25JN	TO-220	WMK93N25JN	Tube
WMN93N25JN	TO-262	WMN93N25JN	Tube
WMM93N25JN	TO-263	WMM93N25JN	Tape and Reel
WMLL93N25JN	TO-LL	WMLL93N25JN	Tape and Reel
WMJ93N25JN	TO-247	WMJ93N25JN	Tube

## Marking Information



## Contact Information

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

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