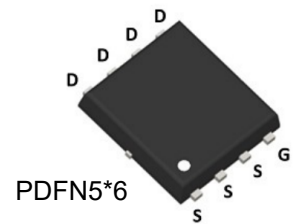
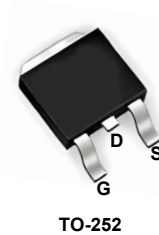
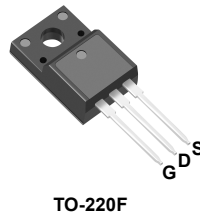


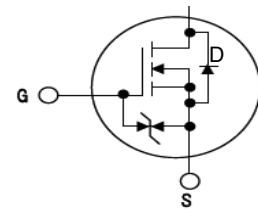
Features

- Very Low FOM ($R_{DS(on)} \times Q_g$)
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode



Application

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- TV power & LED Lighting Power



Device Marking and Package Information

Device	Package	Marking
WTM11N65AD	TO-252	WPM 11N65AD XXX YYWW
WTM11N65AF	TO-220F	WPM 11N65AF XXX YYWW
WTM11N65ANF	PDFN5*6	WPM 11N65ANF XXX YYWW

Absolute Maximum Ratings

$T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	11 *	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	6.6 *	A
$I_{DM}^{(1)}$	Drain Current - Pulsed	37 *	A
$E_{AS}^{(2)}$	Single Pulsed Avalanche Energy	140	mJ
I_{AR}	Avalanche Current	1.8	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0\dots 520\text{V}$	50	V/ns
dv/dt	Reverse diode dv/dt, $V_{DS}=0\dots 520\text{V}$, $I_{DS}\leq I_D$	15	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	78	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=1.5K Ω)	2500	V
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

* Drain current limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.6	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C/W}$

Electrical Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
On Characteristics						
V _{GS}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 370 μA	2.0	-	4.0	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 3.4 A	-	0.33	0.38	Ω
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 1mA	650	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0	-	-	1	μA
		V _{DS} = 650 V, T _C = 150℃	-	-	100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20 V, V _{DS} = 0 V	-	-	±1	μA
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 100 V, V _{GS} = 0 V, f = 1.0 MHz	-	990	-	pF
C _{oss}	Output Capacitance		-	40	-	pF
C _{rss}	Reverse Transfer Capacitance		-	2.3	-	pF
Switching Characteristics						
t _{d(on)}	Turn-On Time	V _{DS} = 325 V, I _D = 4.8 A, R _G = 25 Ω (Note 3,4)	-	30	-	ns
t _r	Turn-On Rise Time		-	23	-	ns
t _{d(off)}	Turn-Off Delay Time		-	190	-	ns
t _f	Turn-Off Fall Time		-	20	-	ns
Q _g	Total Gate Charge	V _{DS} = 520 V, I _D = 4.8 A, V _{GS} = 10 V (Note 3,4)	-	22.6	-	nC
Q _{gs}	Gate-Source Charge		-	4.6	-	nC
Q _{gd}	Gate-Drain Charge		-	6.4	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		-	-	11	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	29	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 4.8 A	-	-	1.3	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 4.8 A di _F /dt = 100 A/μs	-	240	-	ns
Q _{rr}	Reverse Recovery Charge		-	2.1	-	μC

Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS}=1.8\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
4. Essentially Independent of Operating Temperature

Typical Characteristics

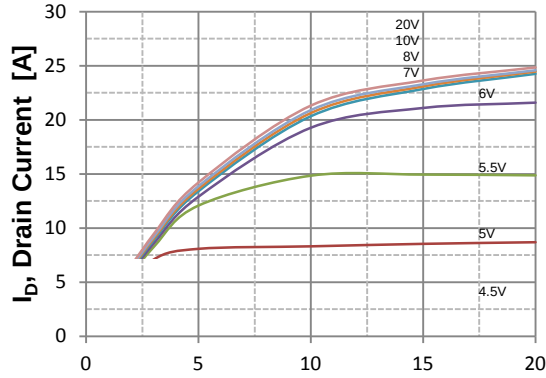


Figure 1. On Region Characteristics

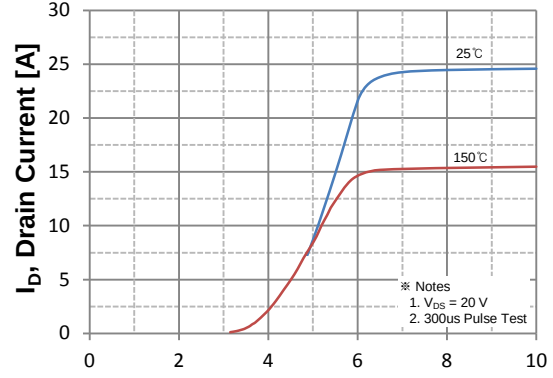


Figure 2. Transfer Characteristics

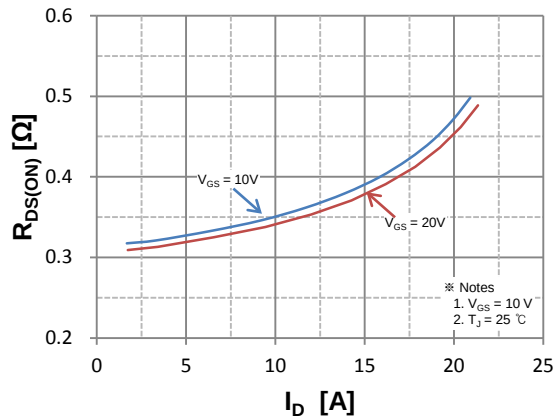


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

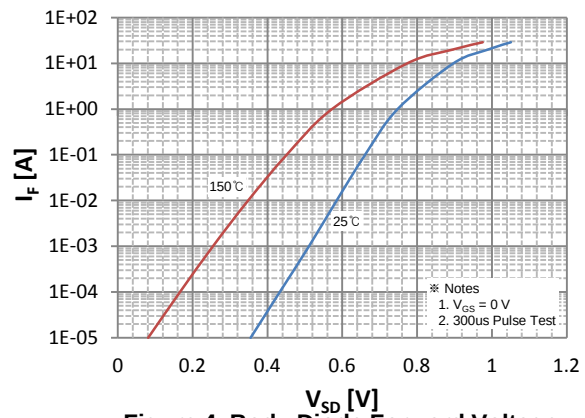


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

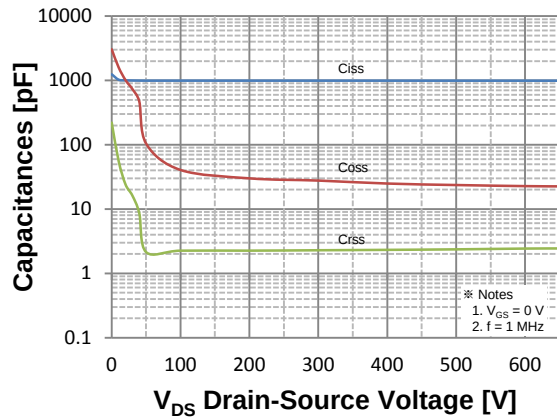


Figure 5. Capacitance Characteristics

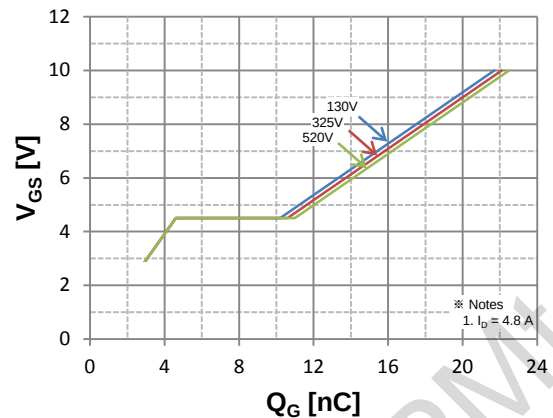


Figure 6. Gate Charge Characteristics

Typical Characteristics

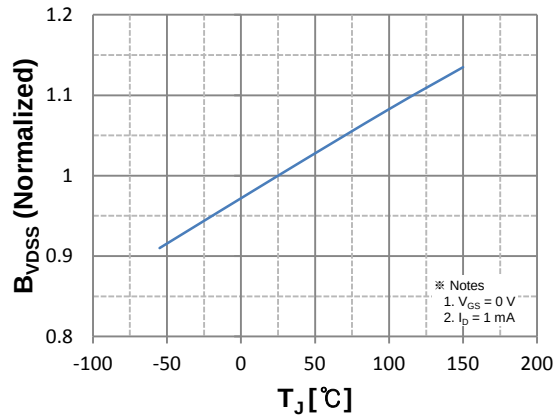


Figure 7. Breakdown Voltage Variation vs. Temperature

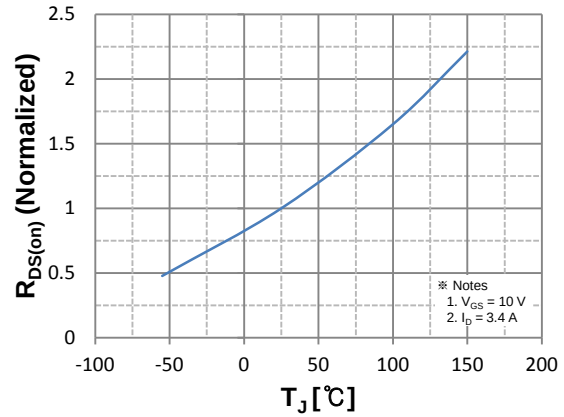


Figure 8. On-Resistance Variation vs. Temperature

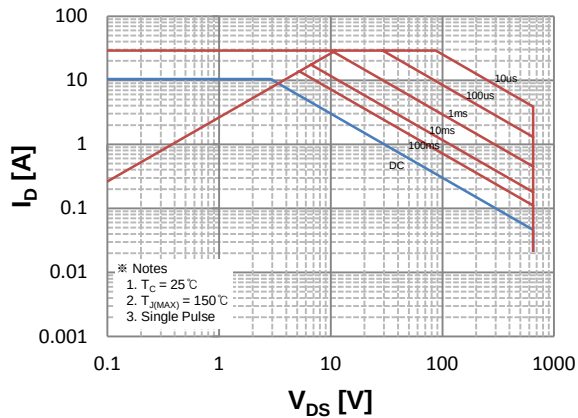


Figure 9. Maximum Safe Operating Area

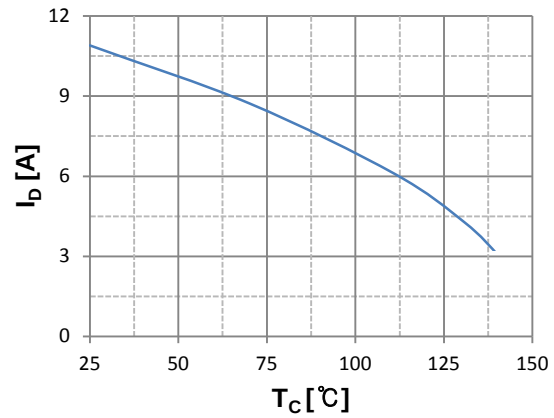


Figure 10. Maximum Drain Current vs. Case Temperature

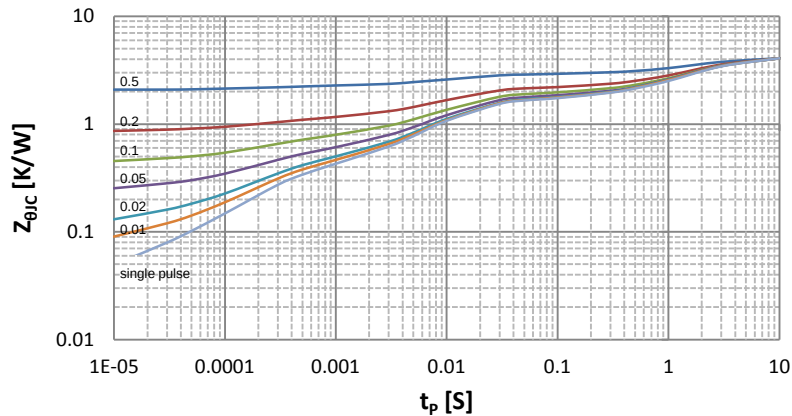


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform

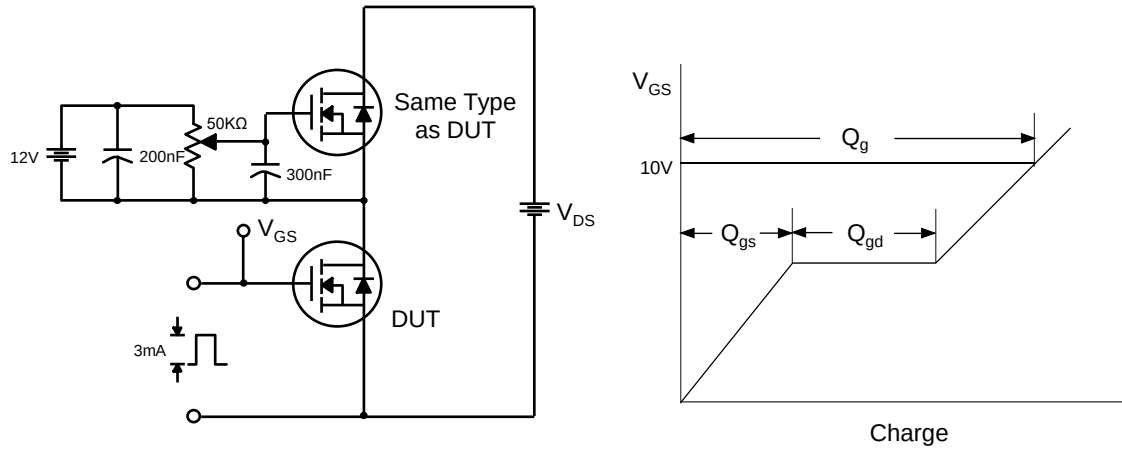


Fig 13. Resistive Switching Test Circuit & Waveforms

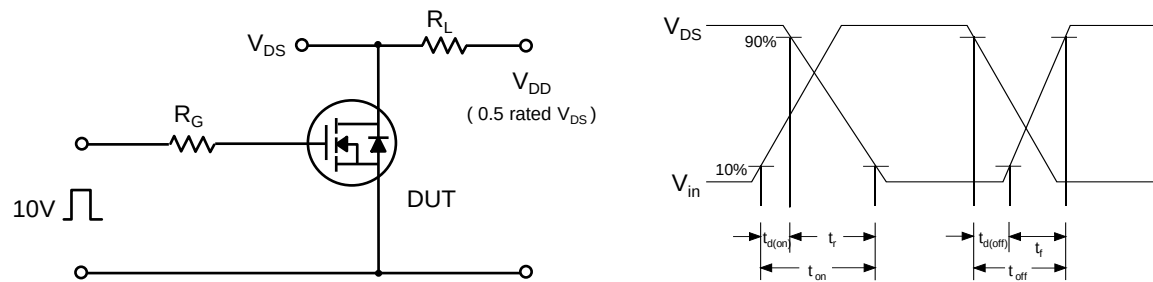
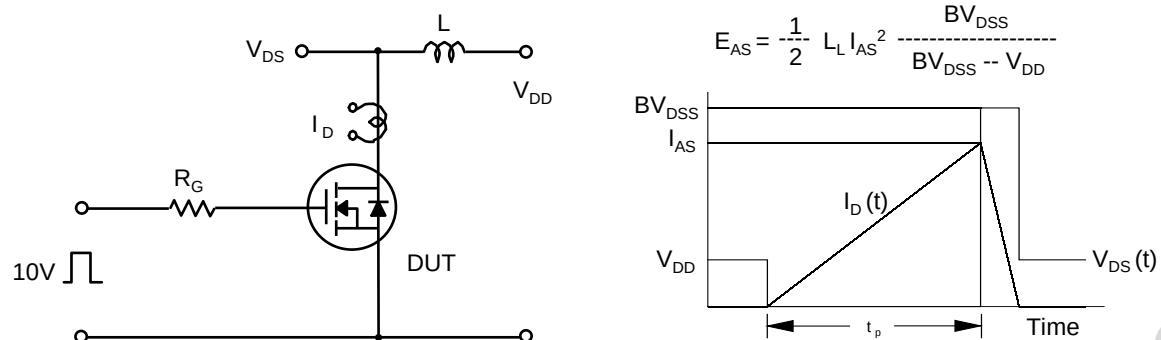


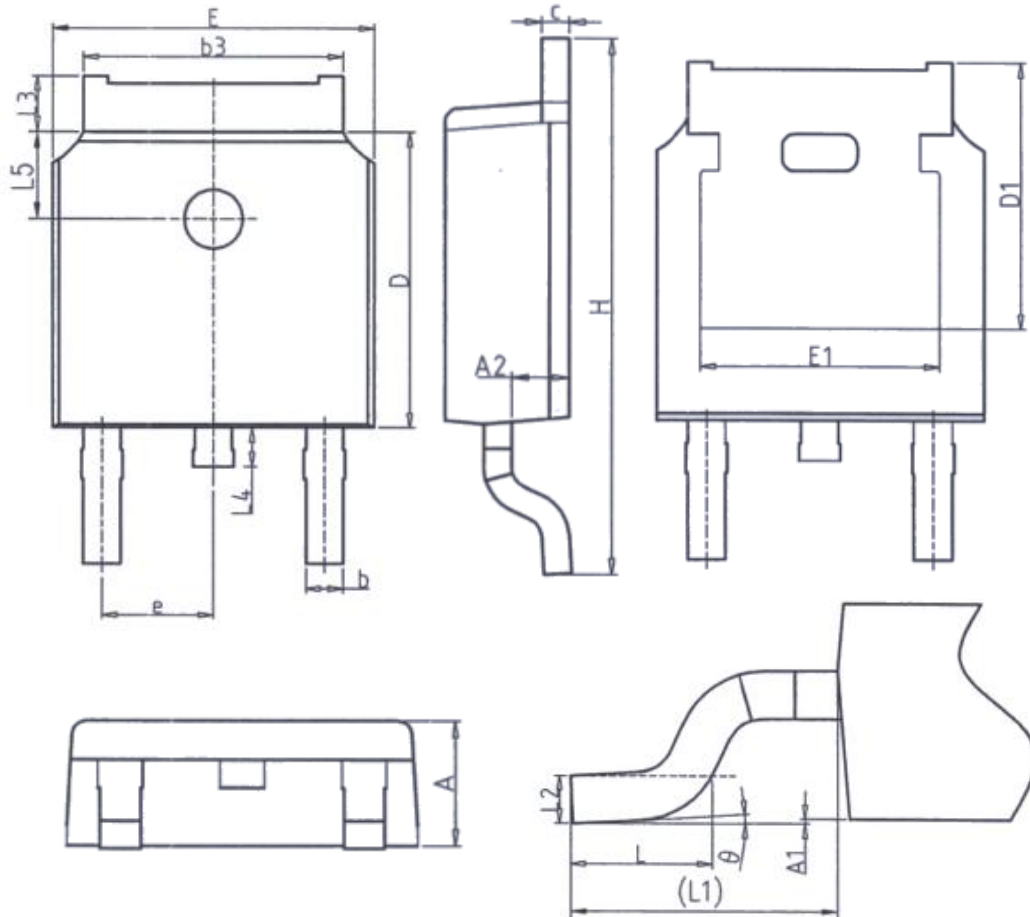
Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



The circuit diagram shows a MOSFET (DUT) with its gate connected to a driver circuit. The driver consists of a MOSFET (Same Type as DUT) with a gate resistor R_G and a gate voltage V_{GS} . The DUT's drain is connected to a load inductor L and a supply voltage V_{DD} . The source of the DUT is connected to ground. The drain current I_S is measured. The drain-source voltage V_{DS} is also indicated.

The waveforms show the gate voltage V_{GS} (Driver) as a square wave with duty cycle $D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$ and amplitude 10V. The drain current I_S (DUT) shows the body diode forward current I_{FM} and reverse current I_{RM} during the switching transient. The drain-source voltage V_{DS} (DUT) shows the body diode forward voltage drop V_f and the recovery dv/dt during the reverse current phase.

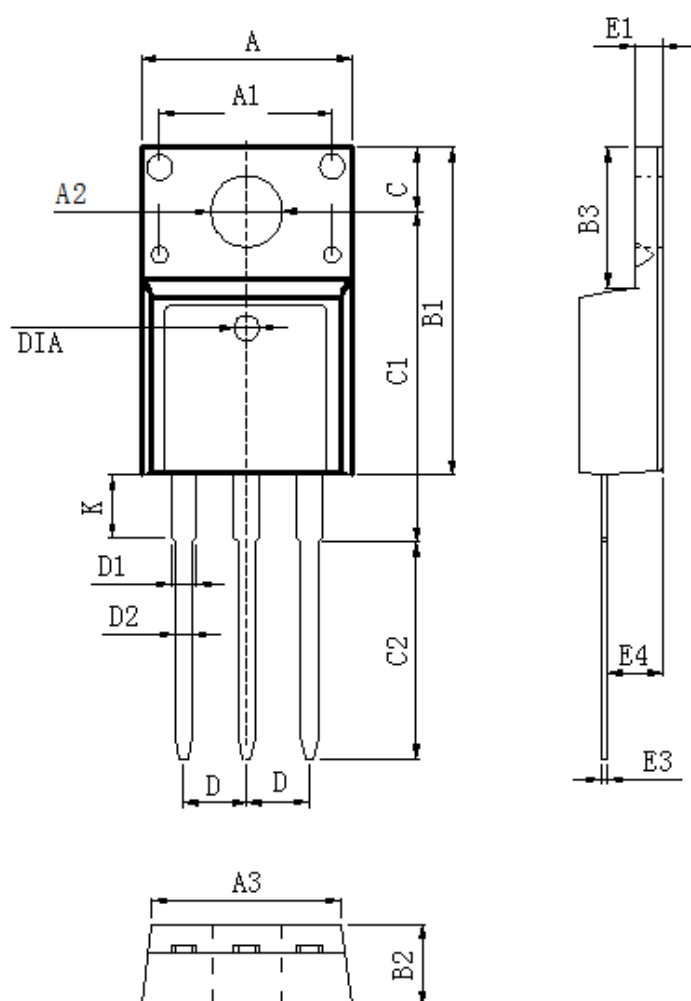
TO-252



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	—

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	—	1.00
L5	1.65	1.95
θ	0°	8°

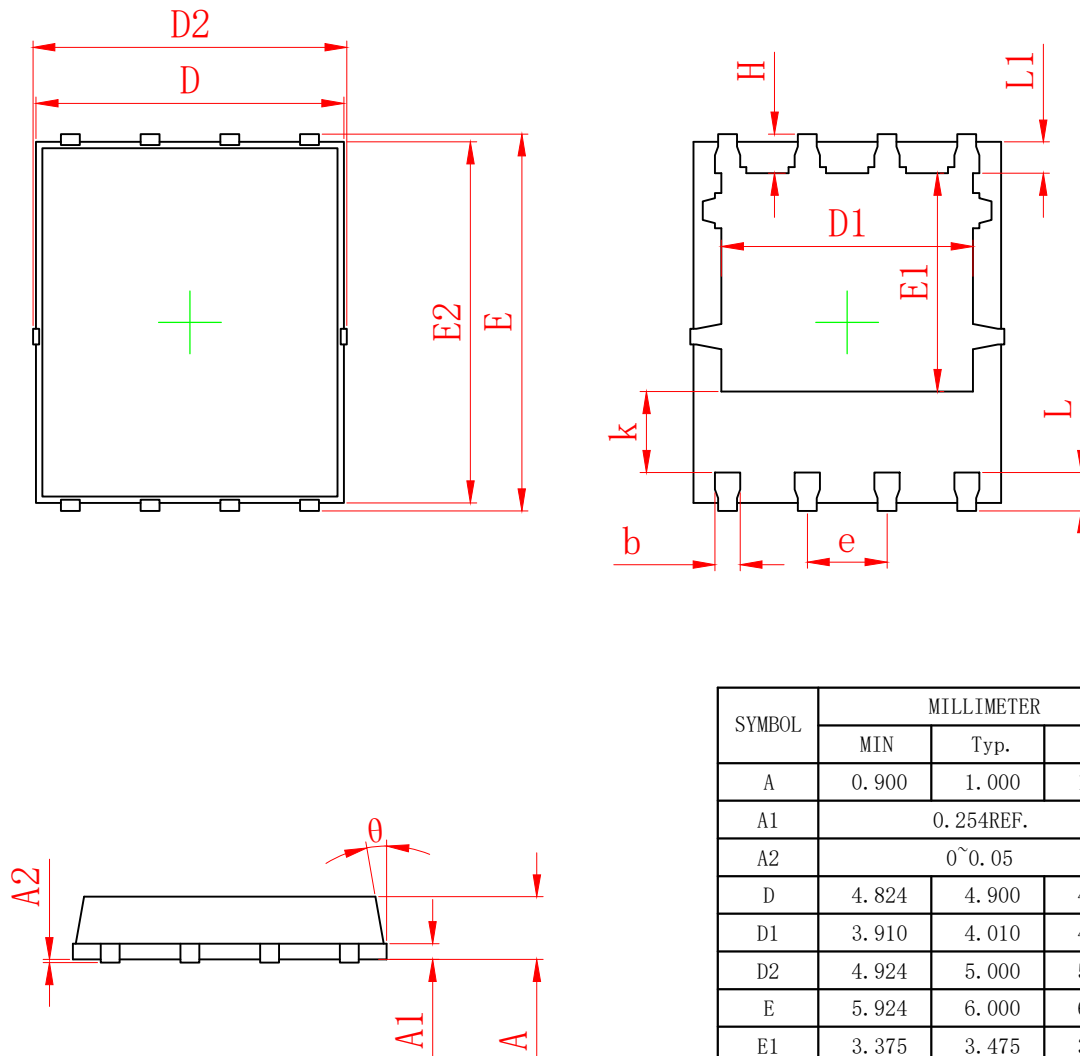
TO-220F



DIM	MILLIMETERS
A	10.16 ± 0.3
A1	7.00 ± 0.1
A2	3.3 ± 0.2
A3	9.5 ± 0.2
B1	15.87 ± 0.3
B2	4.7 ± 0.2
B3	6.68 ± 0.4
C	3.3 ± 0.2
C1	12.57 ± 0.3
C2	10.02 ± 0.5
D	2.54 ± 0.05
D1	1.28 ± 0.2
D2	0.8 ± 0.1
K	3.1 ± 0.3
E1	2.54 ± 0.1
E3	0.5 ± 0.1
E4	2.76 ± 0.2
DIA	$\odot 1.5$ (deep 0.2)

Unit :mm

PDFN5x6-8



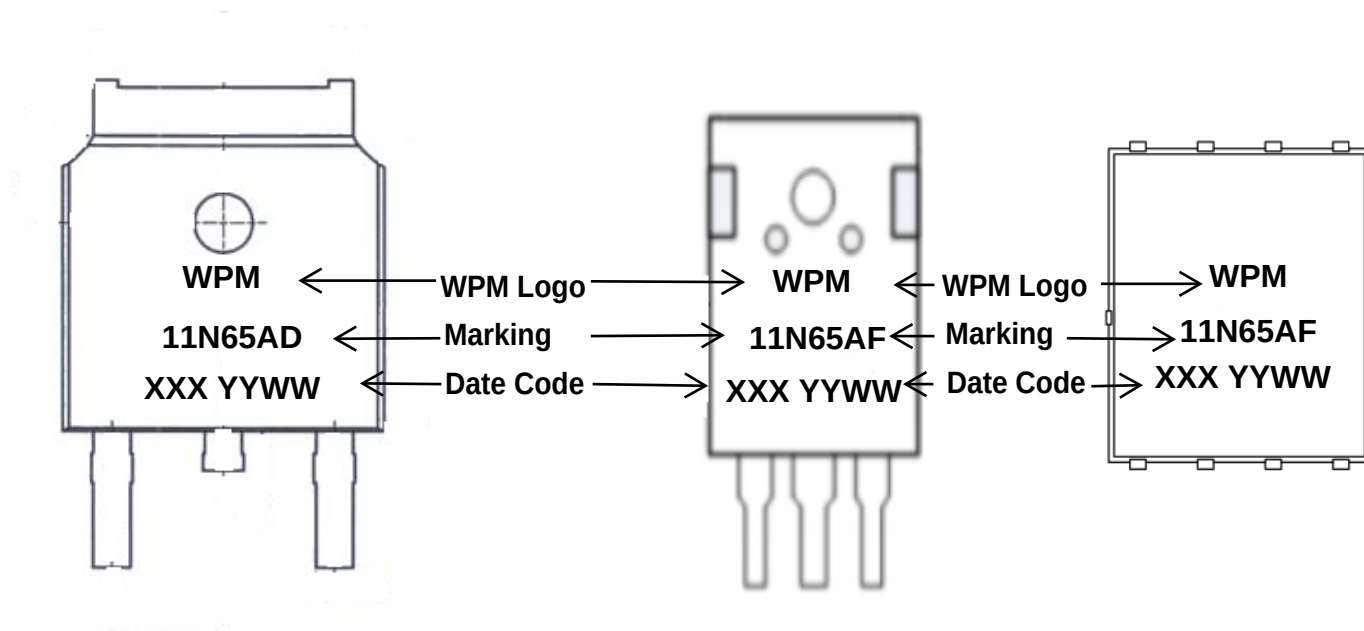
SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	0.900	1.000	1.100
A1	0.254REF.		
A2	0~0.05		
D	4.824	4.900	4.976
D1	3.910	4.010	4.110
D2	4.924	5.000	5.076
E	5.924	6.000	6.076
E1	3.375	3.475	3.575
E2	5.674	5.750	5.826
b	0.350	0.400	0.450
e	1.270TYP.		
L	0.534	0.610	0.686
L1	0.424	0.500	0.576
k	1.190	1.290	1.390
H	0.549	0.625	0.701
θ	8°	10°	12°

Marking Information

TO-252

TO-220F

PDFN5x6



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