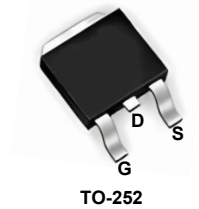
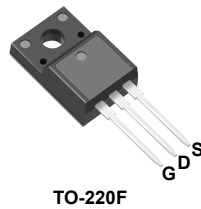


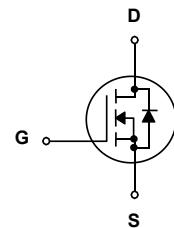
Features

- 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



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 ($T_C = 25^\circ\text{C}$) TO-252	87	W
	Power Dissipation ($T_C = 25^\circ\text{C}$) TO-220F	31	
$V_{ESD(G-S)}$	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	$^\circ\text{C/W}$

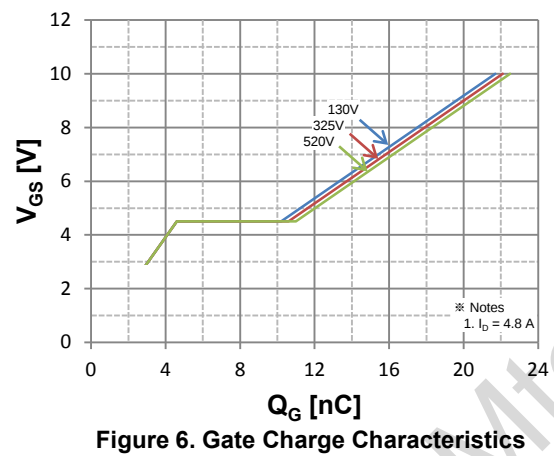
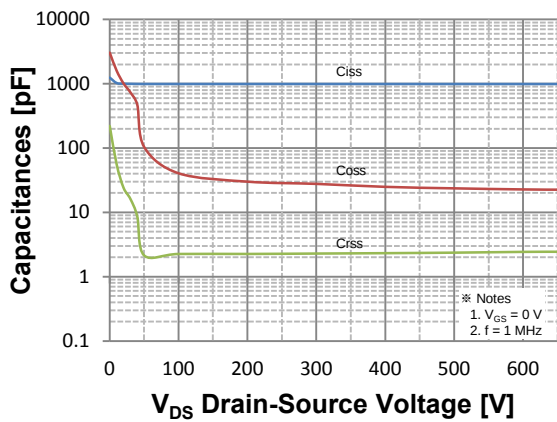
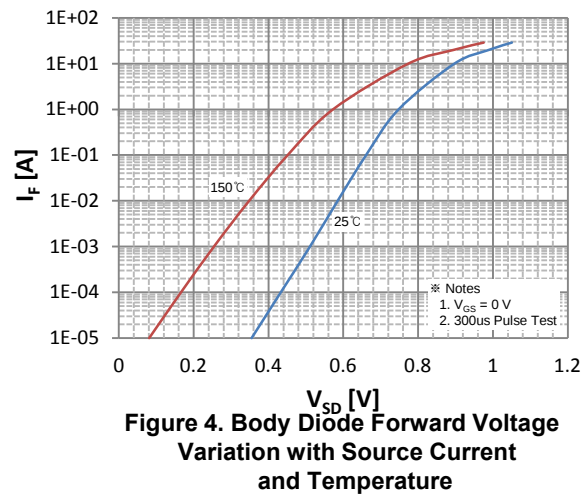
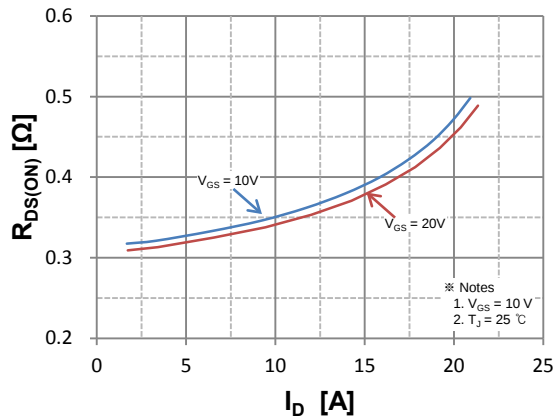
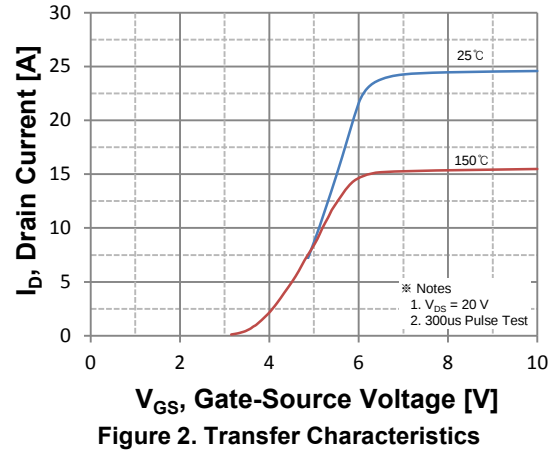
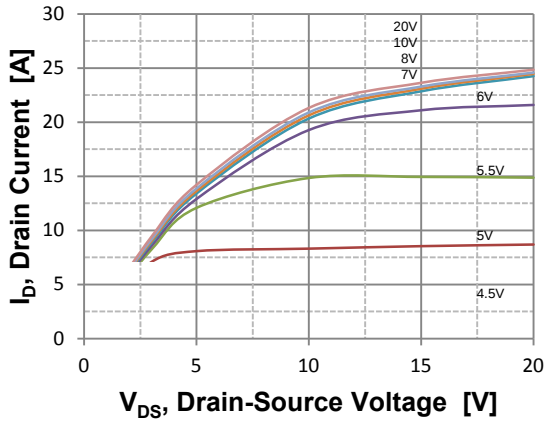
Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise specified

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



Typical Characteristics

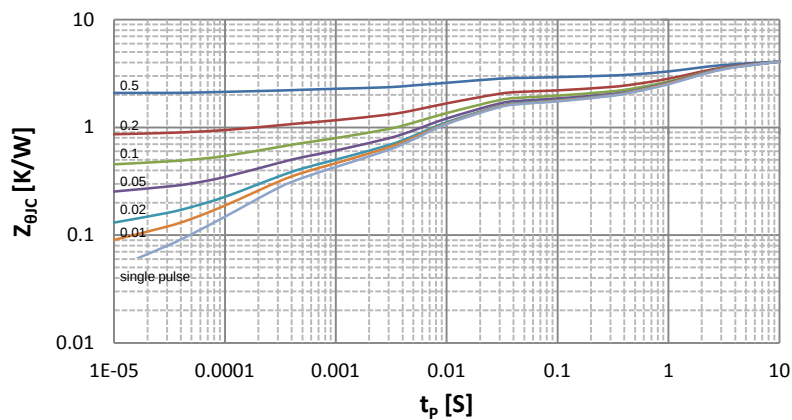
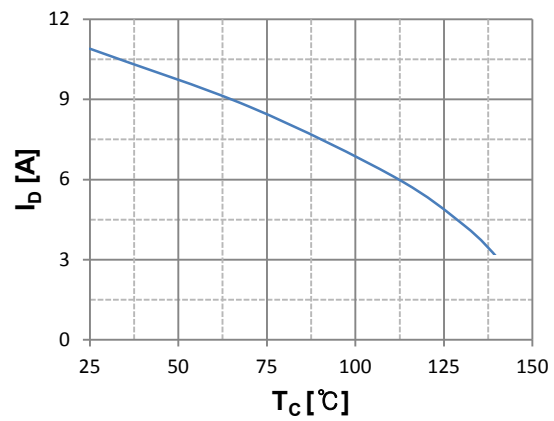
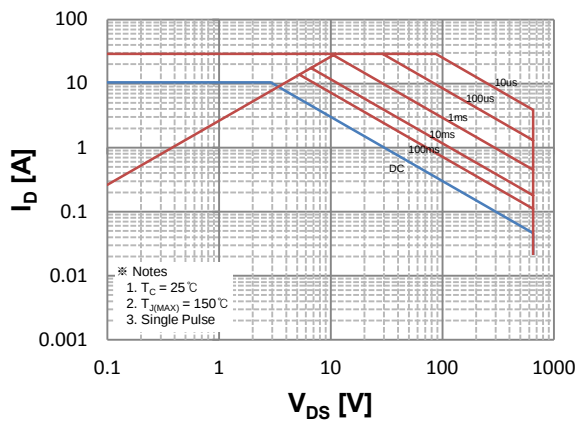
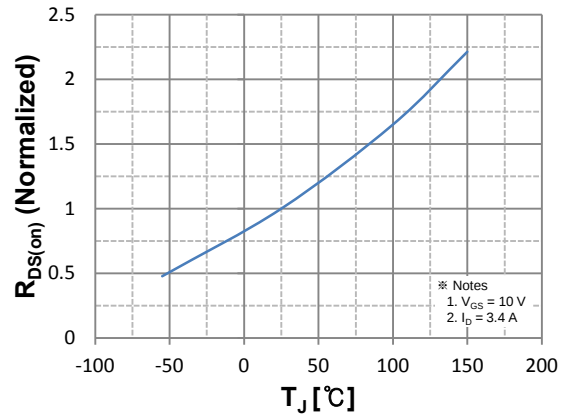
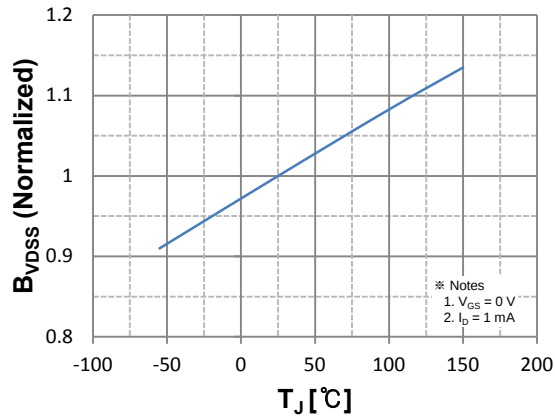


Fig 12. Gate Charge Test Circuit & Waveform

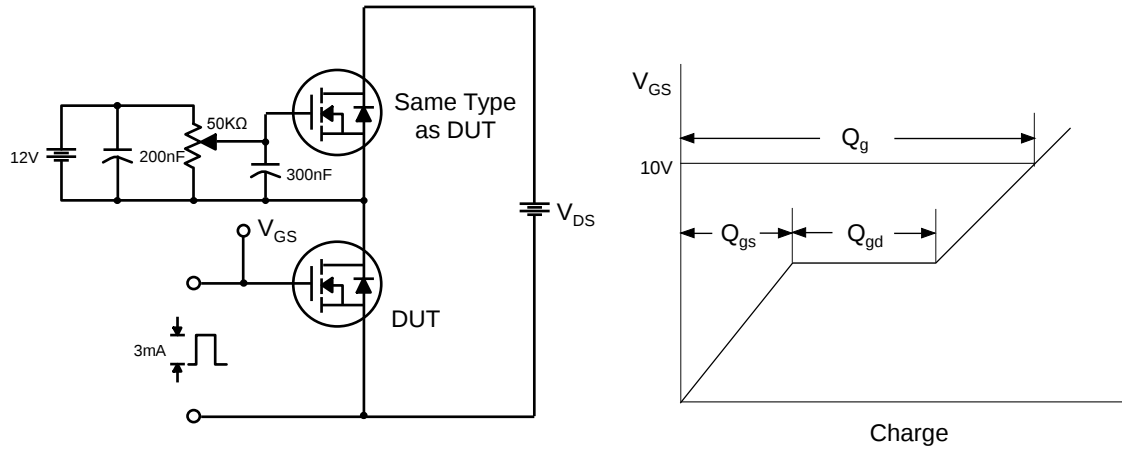


Fig 13. Resistive Switching Test Circuit & Waveforms

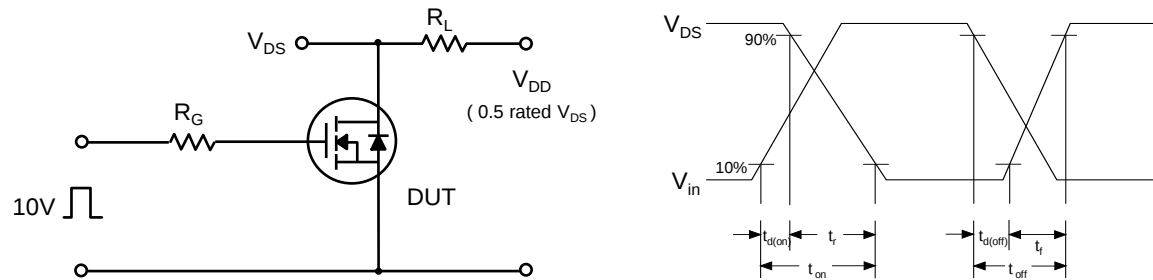


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

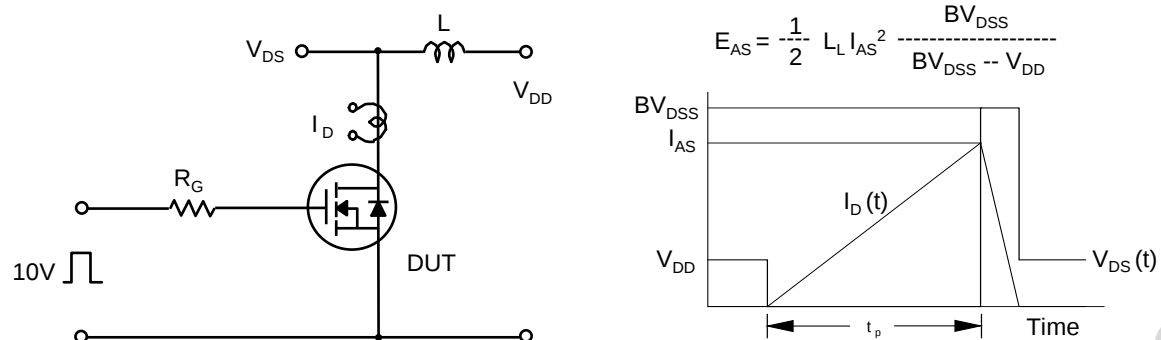
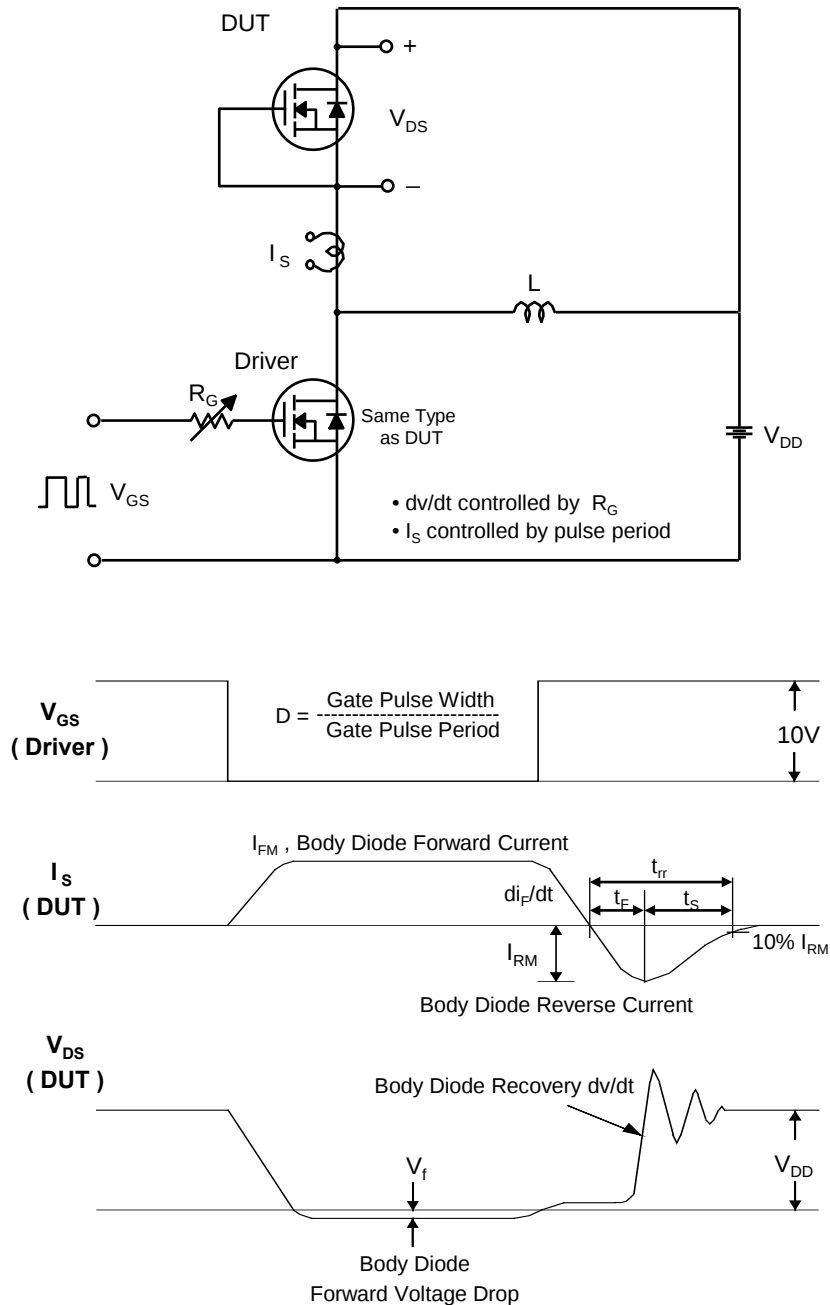
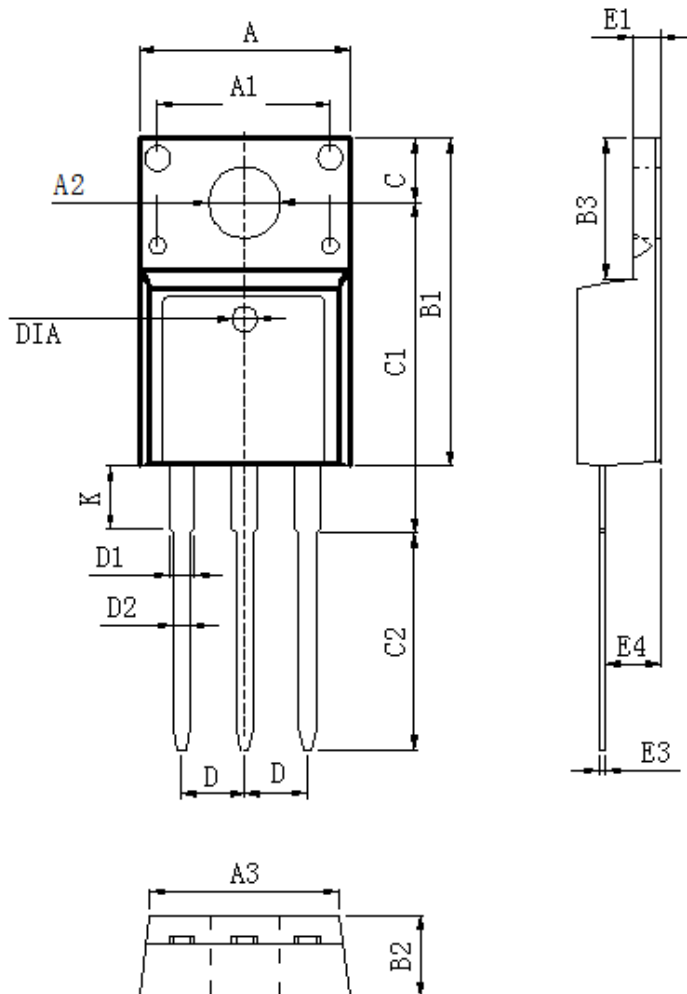


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Outline

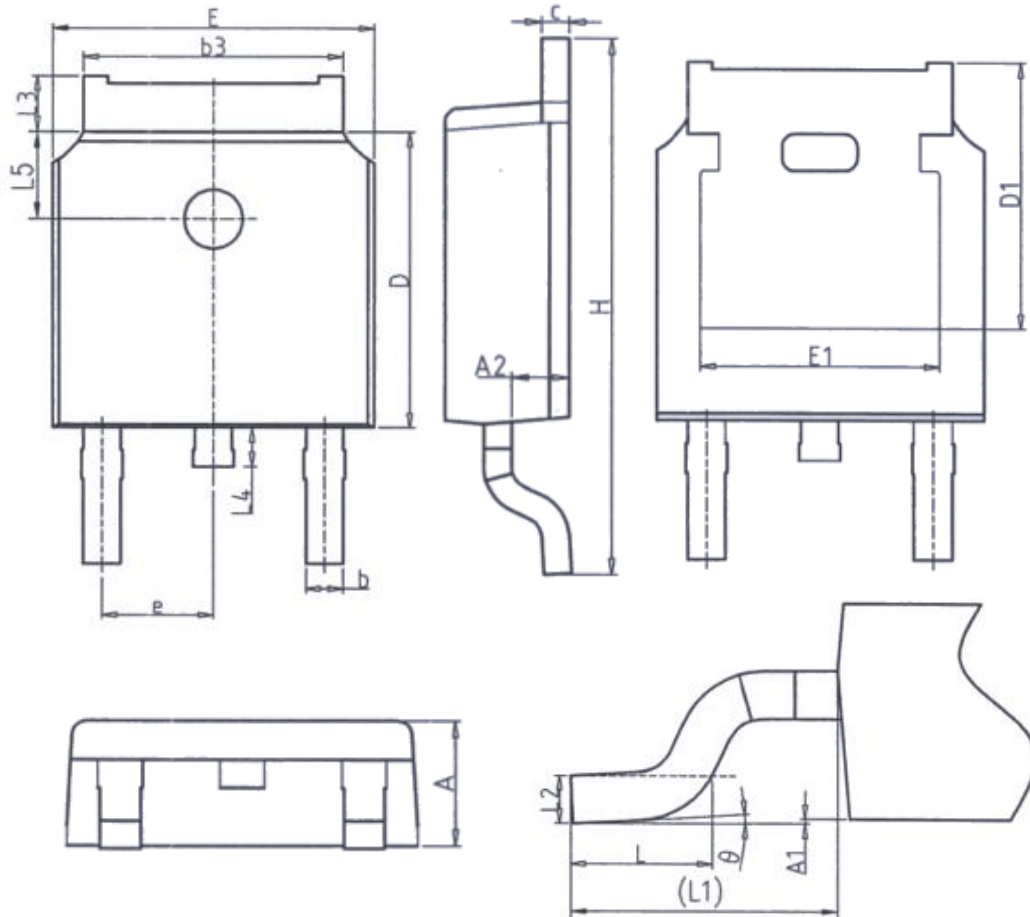
TO-220F Outline



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

TO-252 Outline

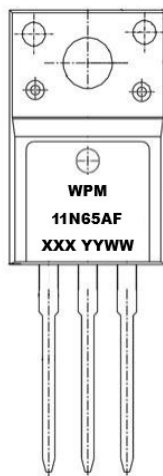


Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	—

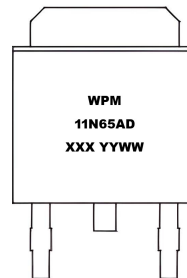
Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	—	1.00
L5	1.65	1.95
θ	0°	8°

Marking Information

TO-220F



TO-252



WPM=WPMtek's Logo
11N65AD=Marking
XXX YYWW=Date Code

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