UN657N1K2-T20F

N-Channel Enhancement Mode MOSFET

ROHS

Product Summary

V_{DS}	650V
$I_D(T_C=25℃)$	7.0A
$R_{DS(ON)}(@V_{GS}=10V\ I_D=3.5A)$	≤1.55Ω

Features

◆ 100% Avalanche Tested

◆ Low Gate Charge

◆ Low Ciss

◆ Fast Switching

◆ Improved dv/dt Capability
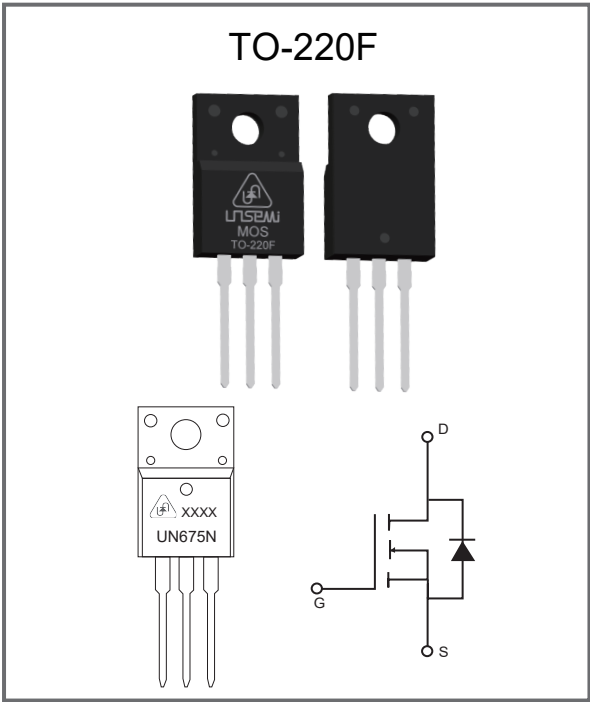
◆ Reliable and Rugged

◆ RoHS Compliant

Applications

◆ LED Driver

◆ Power Factor Correction

◆ Switching Mode Power Supplies

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TO-220F

Package Marking And Ordering information

Part Number	Package Type	Packaging	Tube(pcs)
UN657N1K2-T20F	TO-220F	Tube	50

ROHS

Absolute Maximum Ratings Tc = 25℃ unless otherwise specified

Parameter	Symbol	Max.	Units
Drain to Source Voltage	V_{DS}	650	V
Continuous Drain Current [1]	I_D	7.0	A
Pulsed Drain Current [2]	I_{DM}	28	A
Gate-Source Voltage	V_{GS}	±30	V
Single Pulse Avalanche Energy [3]	E_{AS}	56	mJ
Power Dissipation	P_D	40.3	W
Junction and Storage Temperature Range	T_J,Tstg	-55~+150	℃

Thermal Characteristics

Parameter		Symbol	Typ.	Max.	Units
Junction-to-Ambient Thermal Resistance	Steady State	R_{θJA}	-	74	℃/ W
Junction-to-Case Thermal Resistance	Steady State	R_{θJC}	-	3.1	℃/ W

Notes:

1). The maximum current rating is silicon wafer limited.

2). Single pulse width limited by junction temperature .

3). Limited by $T_{J(MAX)}$, starting TJ=25℃ , Rg=25Ω, L=10mH.

4). Design parameters,Guaranteed by design, not subject to production.

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Electrical Characteristics at Tc = 25℃ unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0V, I_D = 250µA	650			V
Drain-Source Leakage Current	I_{DSS}	V_{DS} = 650V , V_{GS} = 0V			1.0	µA
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±30V , V_{DS} = 0V			±100	nA
Gate-Source Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS} , I_D = 250µA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS} = 10V , I_D = 3.5A		1.21	1.55	Ω
BODY-DIODE PARAMETERS						
Drain-Source Diode	V_{SD}	I_S = 1.0A , V_{GS} = 0V		0.7	1.5	V
Reverse Recovery Time	trr	I_S = 3.5A di/dt = 100A/µs		286		nS
Reverse Recovery Charge	Q_{rr}			913		nC
DYNAMIC PARAMETERS [4]						
Input Capacitance	Ciss	V_{GS} = 0V V_{DS} = 50V F = 1MHz		1100		pF
Output Capacitance	Coss			65		pF
Reverse Transfer Capacitance	Crss			6.6		pF
Gate Charge Total	Q_g	V_{GS} = 10V V_{DS} = 480V I_D = 3.5A		21		nC
Gate to Source Charge	Q_{gs}			6.4		nC
Gate to Drain Charge	Q_{gd}			6.3		nC
SWITCHING PARAMETERS [4]						
Turn-On Delay Time	td(ON)	V_{DS} = 325V V_{GS} = 10V R_G = 4.7Ω I_D = 3.5A		12.1		nS
Turn-On Rise Time	tr			1.8		nS
Turn-Off Delay Time	td(OFF)			32.4		nS
Turn-Off Fall Time	tf			22.6		nS

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3/7

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Electrical Characteristics Curves

Fig 1. Output Characteristics

VGS=10V
VGS=5.5V
VGS=5.0V
VGS=4.8V
VGS=4.5V

ID -Drain Current (A)
VDS- Drain-Source Voltage (V)

Fig 2. Typical Tansfer Characeristic

VDS=20V
25℃
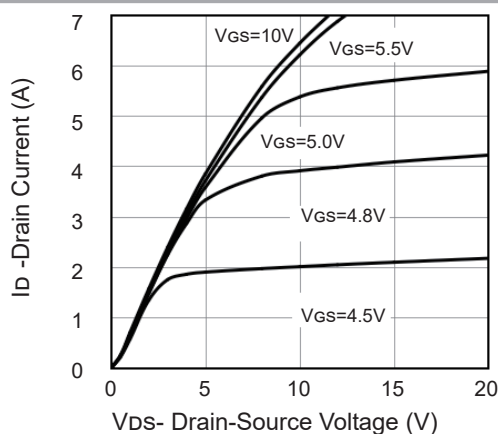
ID - Drain Current (A)
VGS- Gate-Source Voltage (V)
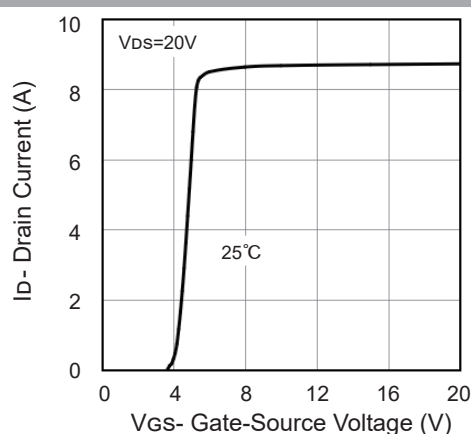
Fig 3. On-Resistance Vs Drain Current

VGS=6.0V
VGS=10V

Rdson On-Resistance(Ω)
ID - Drain Current (A)
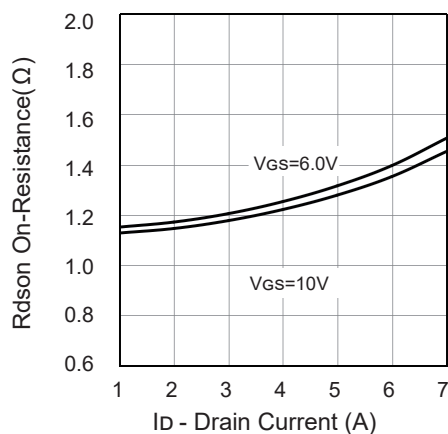
Fig 4. On-Resistance Vs JunctionTemperature

VGS=10V
ID=5.0A
VGS=6.0V
ID=5.0A

Normalized On-Resistance(Ω)
TJ-Junction Temperature(℃)
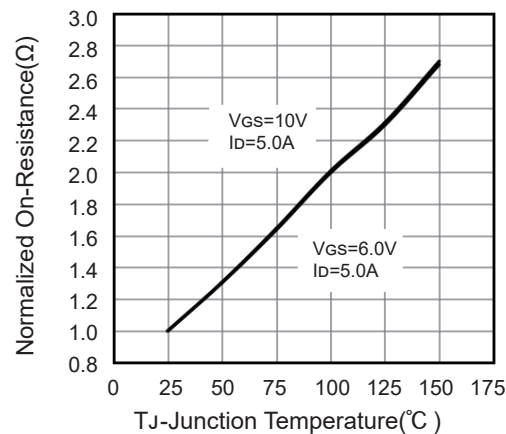
Fig 5. Body-Diode Characteristics

125℃
25℃

Is -Diode Current (A)
VSD-Diode Forward Voltage (V)
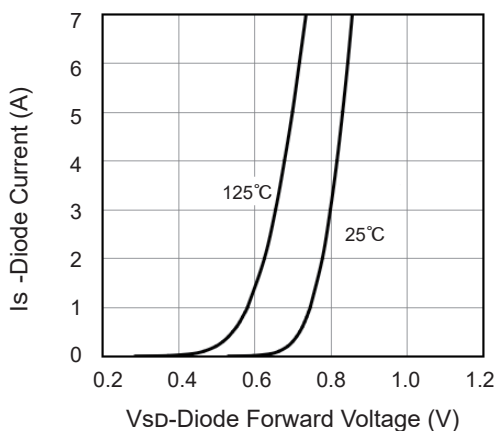
Fig 6. Capacitance Vs Drain-Source Voltage

Ciss
Coss
Crss

C-Capacitance (pF)
VDS-Drain-Source Voltage (V)

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4/7

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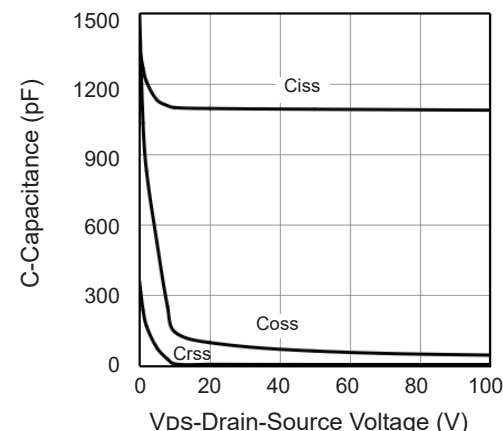
Electrical Characteristics Curves

Fig 7. Safe Operation Area
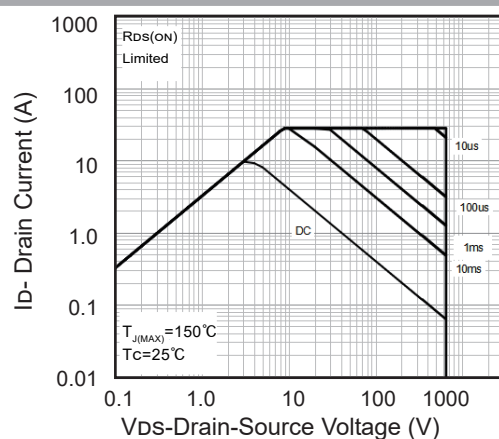
Fig 8. Power Derating
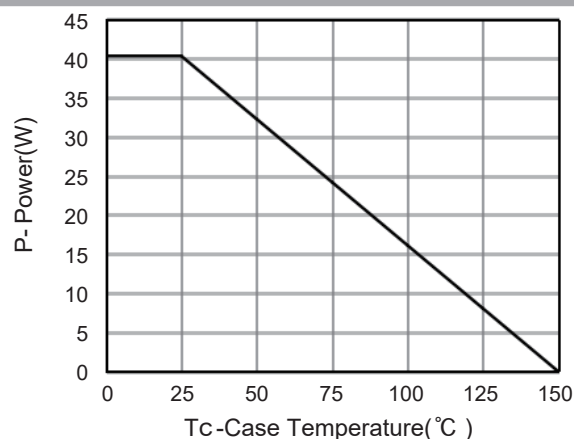
Fig 9. Gate Charge Characteristics
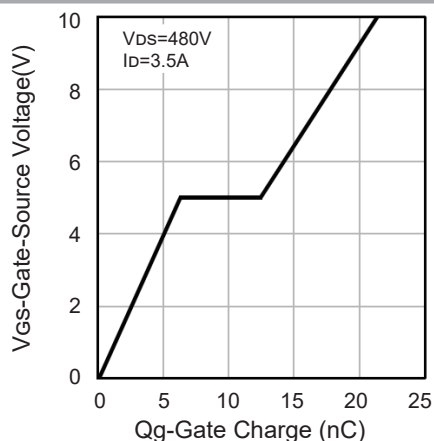
Fig 10. Safe Normalized Maximum Transient Thermal Impedance

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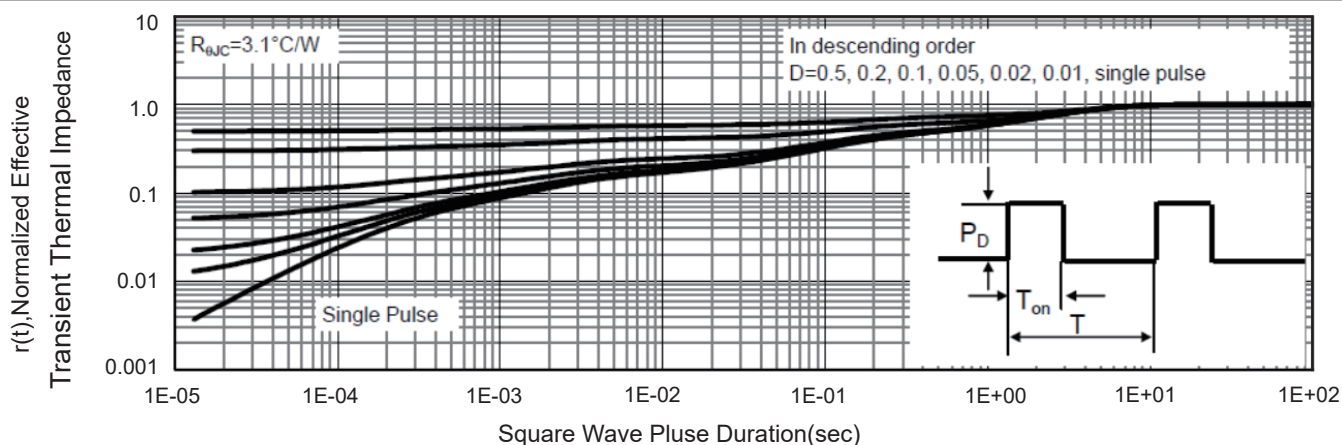
Test Circuit

Gate Charge Test Circuit & Waveform
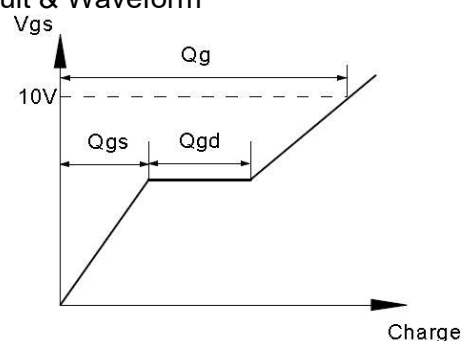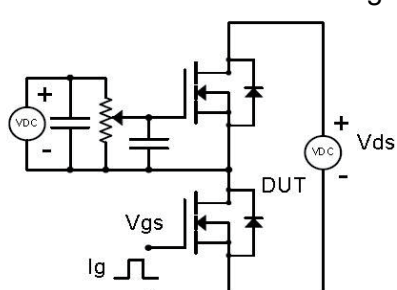
Resistive Switching Test Circuit & Wav eforms
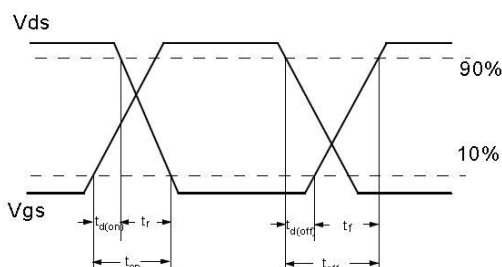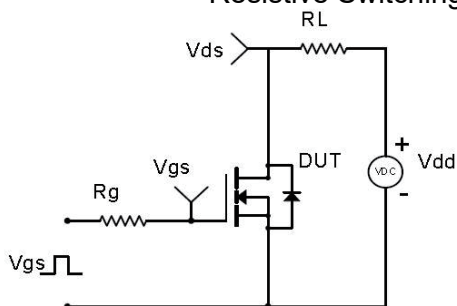
Unclamped Inductive Switching (UIS) T est Circuit & Waveforms

$$E_{AR} = 1/2\ LI_{AR}^2$$
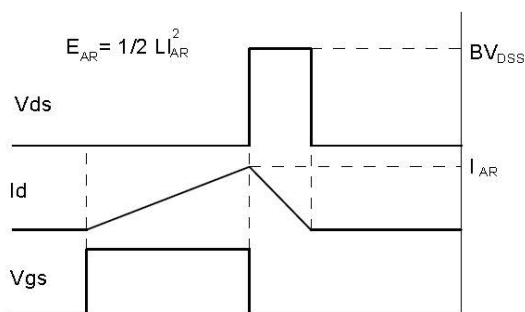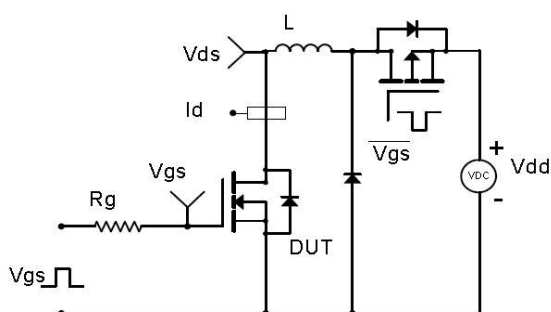
Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$
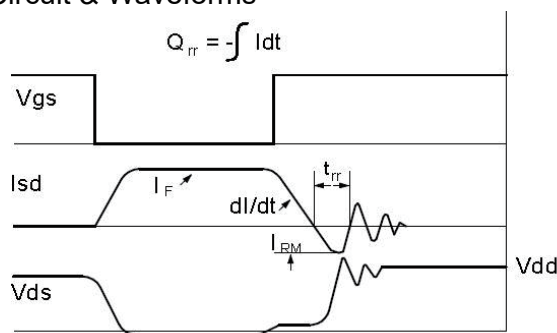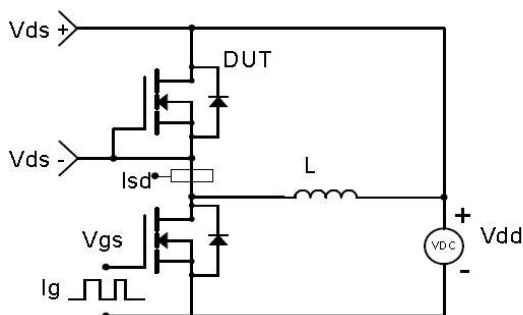
TO-220F Package Outline & Dimensions (Units: mm / in)
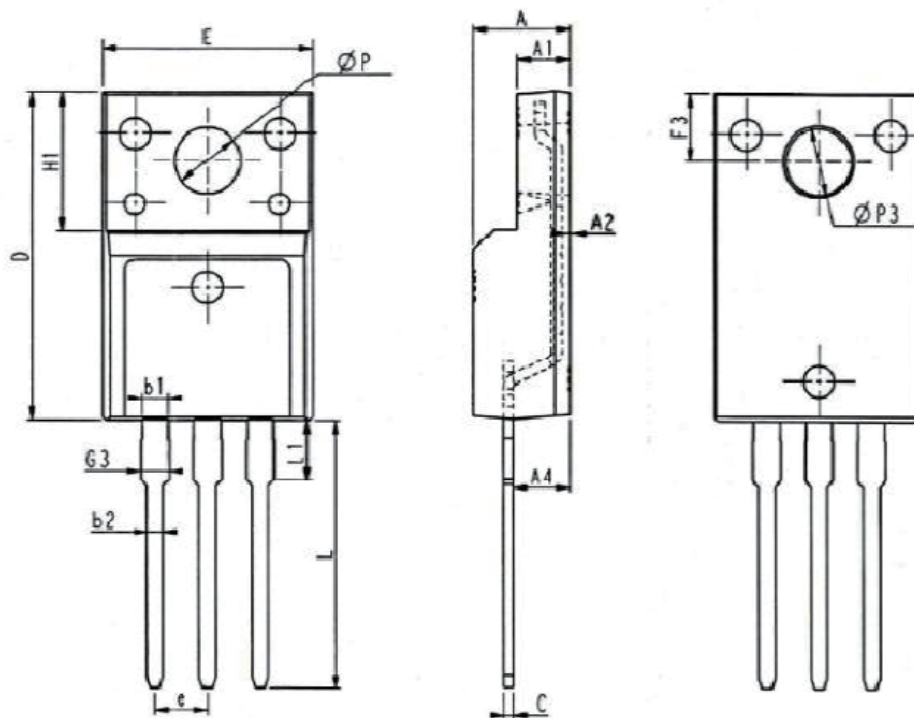
Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Min	Max
E	9.96	10.16	10.36	0.392	0.400	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.30	0.45	0.60	0.012	0.002	0.024
A4	2.65	2.76	2.96	0.104	0.109	0.117
C	0.40	0.50	0.65	0.016	0.020	0.026
D	15.57	15.87	16.17	0.613	0.625	0.637
H1	6.70REF			0.264REF		
e	2.54BSC			0.100BSC		
ØP	3.03	3.18	3.38	0.119	0.125	0.133
L	12.68	12.98	13.28	0.499	0.511	0.523
L1	2.88	3.03	3.18	0.113	0.119	0.125
ØP3	3.150REF			0.124REF		
F3	3.15	3.30	3.45	0.124	0.130	0.136
G3	1.25	1.35	1.55	0.049	0.053	0.061
b1	1.18	1.28	1.43	0.046	0.050	0.056
b2	0.70	0.80	0.95	0.028	0.031	0.037

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