

UN657N1K2-T20F

N-Channel Enhancement Mode MOSFET

ROHS

Product Summary

V_{DS}	650V
$I_D(T_c=25^{\circ}C)$	7.0A
$R_{DS(ON)}(@V_{GS}=10V\ I_D=3.5A)$	$\leq 1.55\Omega$

Features

- ◆ 100% Avalanche Tested
- ◆ Low Gate Charge
- ◆ Low Ciss
- ◆ Fast Switching
- ◆ Improved dv/dt Capability
- ◆ Reliable and Rugged
- ◆ RoHS Compliant

Applications

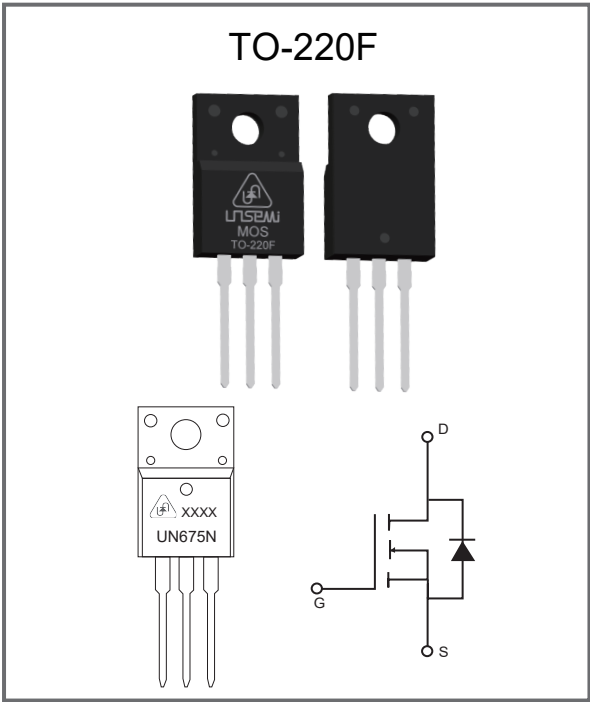
- ◆ LED Driver
- ◆ Power Factor Correction
- ◆ Switching Mode Power Supplies

Package Marking And Ordering information

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



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Absolute Maximum Ratings Tc = 25°C 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 , T _{stg}	-55~+150	°C

Thermal Characteristics

Parameter		Symbol	Typ.	Max.	Units
Junction-to-Ambient Thermal Resistance	Steady State	R _{θJA}	-	74	°C/W
Junction-to-Case Thermal Resistance	Steady State	R _{θJC}	-	3.1	°C/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 T_J=25°C , R_g=25Ω, L=10mH.
- 4). Design parameters, Guaranteed by design, not subject to production.

Electrical Characteristics at Tc = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	BVDSS	VGS = 0V, ID = 250μA	650			V
Drain-Source Leakage Current	IDSS	VDS = 650V , VGS = 0V			1.0	μA
Gate-Source Leakage Current	IGSS	VGS = ±30V , VDS = 0V			±100	nA
Gate-Source Threshold Voltage	VGS(TH)	VGS = VDS , ID = 250μA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	RDS(ON)	VGS = 10V , ID = 3.5A		1.21	1.55	Ω
BODY-DIODE PARAMETERS						
Drain-Source Diode	VSD	IS = 1.0A , VGS = 0V		0.7	1.5	V
Reverse Recovery Time	trr	IS = 3.5A di/dt = 100A/μs		286		nS
Reverse Recovery Charge	Qrr			913		nC
DYNAMIC PARAMETERS ⁴⁾						
Input Capacitance	Ciss	VGS = 0V VDS = 50V F = 1MHz		1100		pF
Output Capacitance	Coss			65		pF
Reverse Transfer Capacitance	Crss			6.6		pF
Gate Charge Total	Qg	VGS = 10V VDS = 480V ID = 3.5A		21		nC
Gate to Source Charge	Qgs			6.4		nC
Gate to Drain Charge	Qgd			6.3		nC
SWITCHING PARAMETERS ⁴⁾						
Turn-On Delay Time	td(ON)	VDS = 325V VGS = 10V RG = 4.7Ω ID = 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

Electrical Characteristics Curves

Fig 1. Output Characteristics

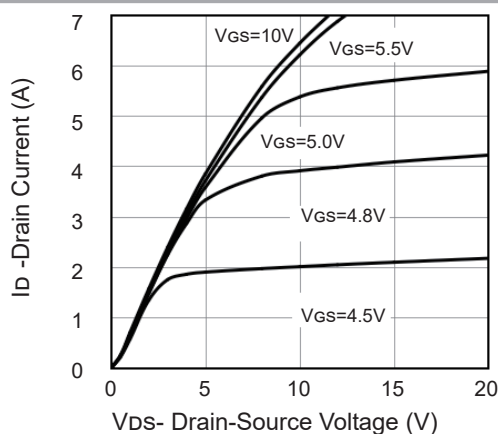


Fig 2. Typical Transfer Characteristic

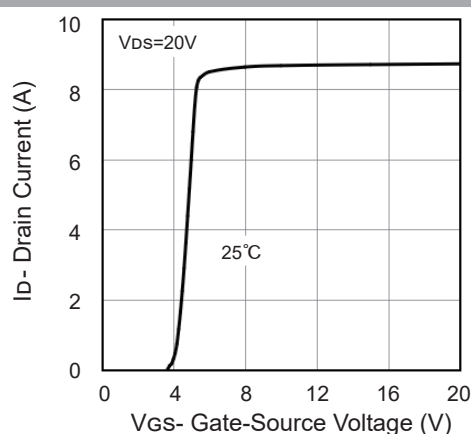


Fig 3. On-Resistance Vs Drain Current

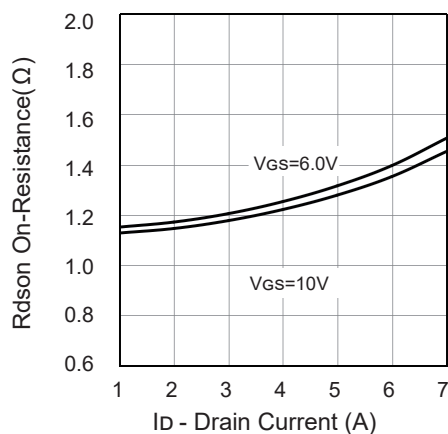


Fig 4. On-Resistance Vs Junction Temperature

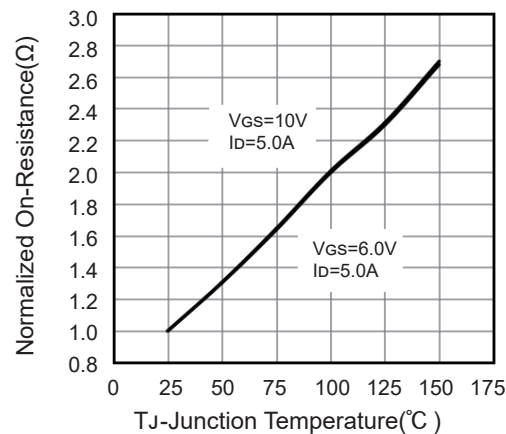


Fig 5. Body-Diode Characteristics

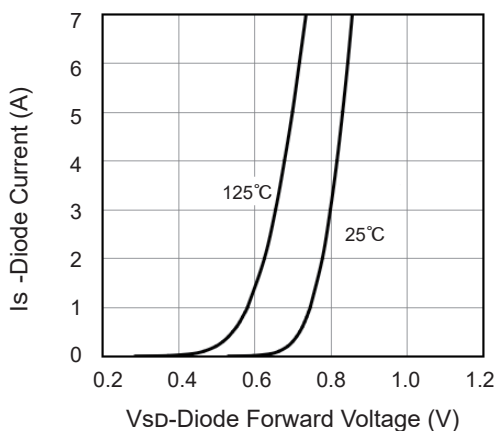
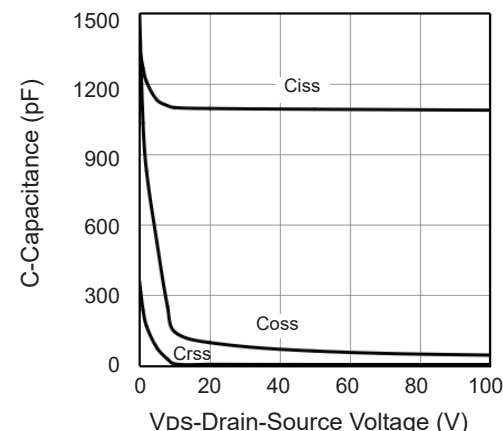


Fig 6. Capacitance Vs Drain-Source Voltage



Electrical Characteristics Curves

Fig 7. Safe Operation Area

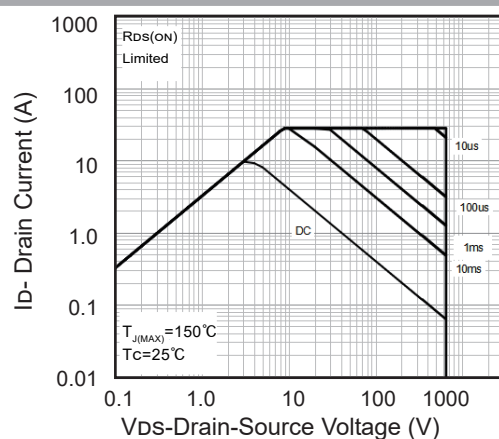


Fig 8. Power Derating

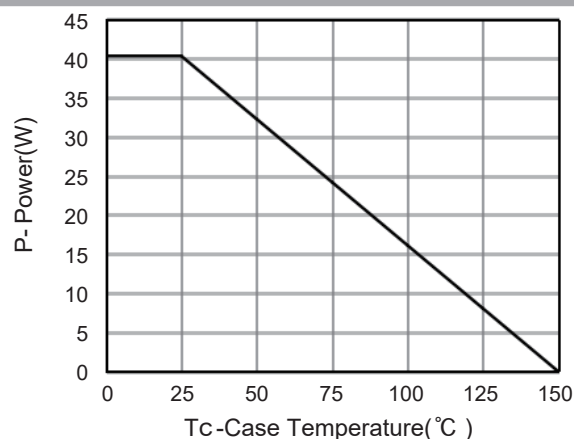


Fig 9. Gate Charge Characteristics

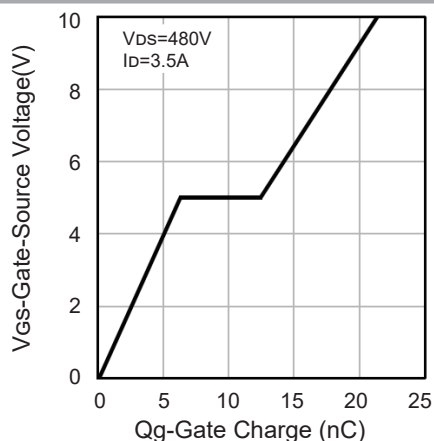
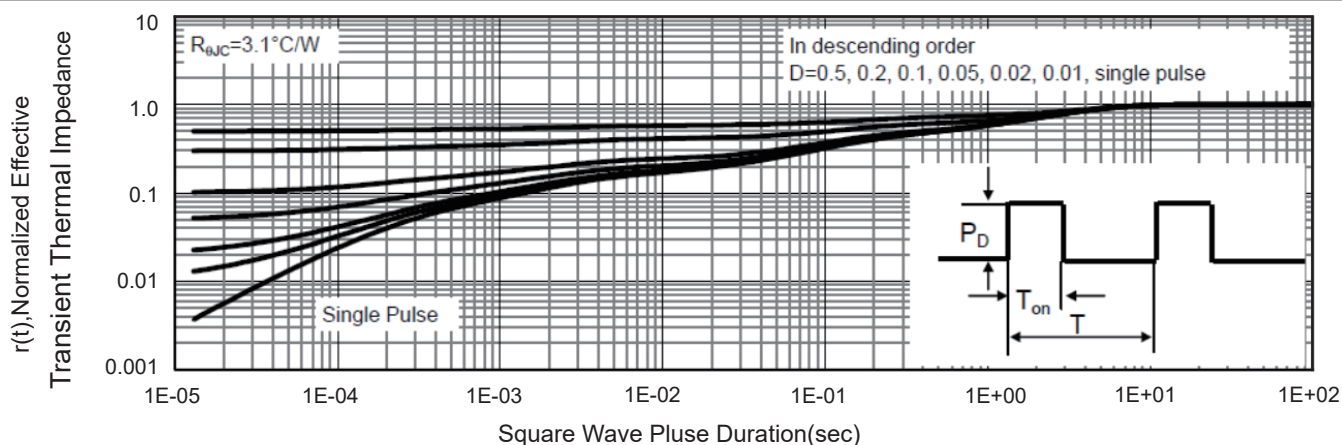
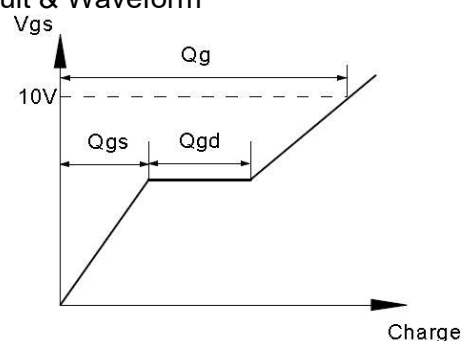
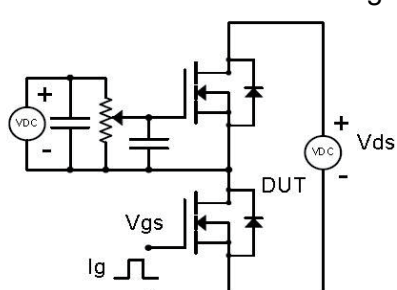


Fig 10. Safe Normalized Maximum Transient Thermal Impedance

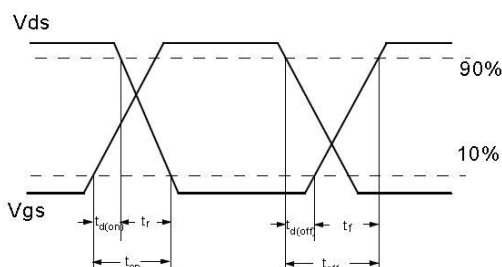
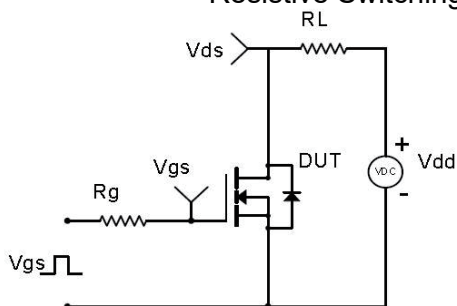


Test Circuit

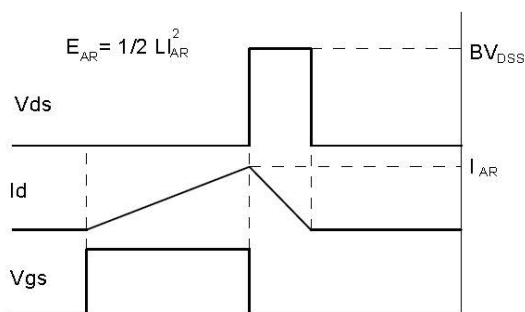
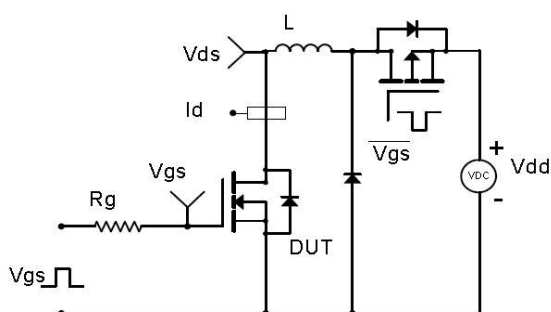
Gate Charge Test Circuit & Waveform



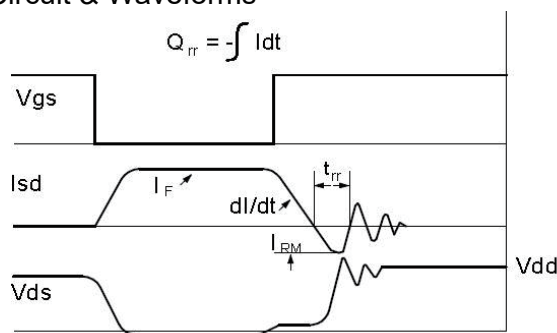
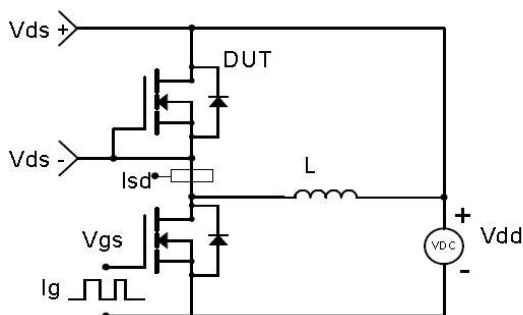
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

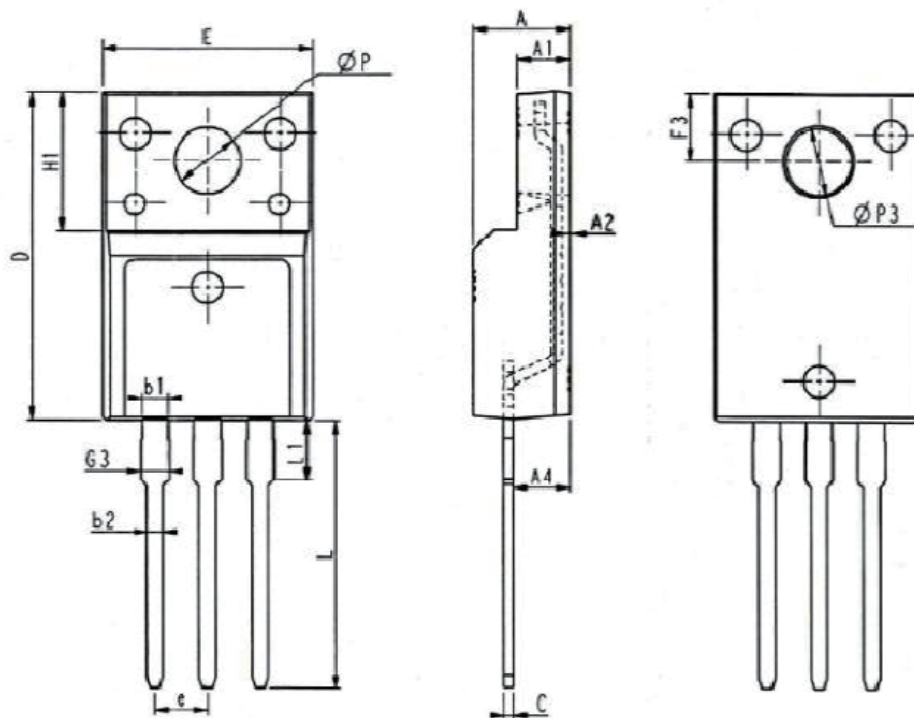


Diode Recovery Test Circuit & Waveforms





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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