UT4N60F

N-Ch 600V Fast Switching MOSFETs

General Description

The UT4N60F is the highest performance trench P-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The UT4N60F meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

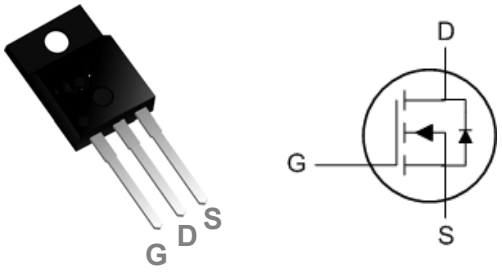
Product Summery

BV_{DSS}	$R_{DS(ON)}$	ID
600V	2.2Ω	4A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

TO220F Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	TO220F	Unites
V_{DSS}	Drain-source Voltage	600	V
I_D	Drain current -Continuous (Tc=25℃)	4	A
	-Continuous (Tc=100℃)	2.8	A
I_{DM}	Drain current - pulsed (Note1)	16	A
V_{GSS}	Gate-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note2)	8.8	mJ
Dv/Dt	Peak Diode Recovery Dv/Dt (Note3)	4.5	V/ns
P_D	Power Dissipation (Tc=25℃)	33	W
	- Derate above 25℃	0.26	W/℃
$T_J T_{STG}$	Operating and Storage Temperature Range	-55-150	℃
T_L	Maximum Lead temperature for soldering purposes, 1/8" from case for seconds	300	℃

Thermal Data

Symbol	Parameter	Type	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-case	--	3.8	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	6.5	℃/W

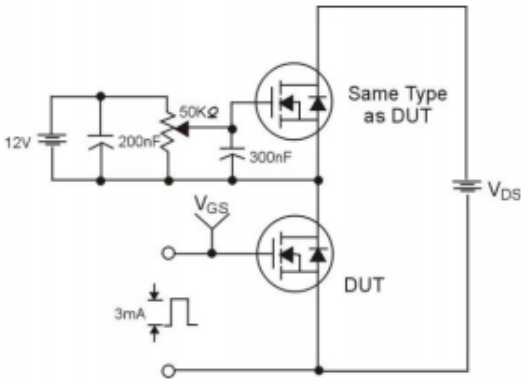
Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

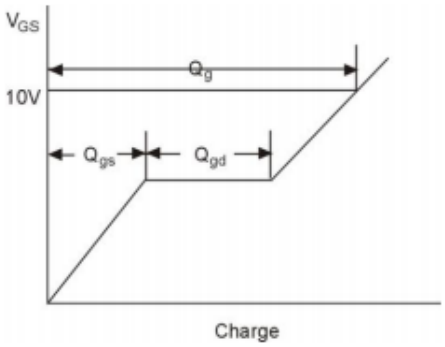
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250μA	600	644	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250μ A, Referenced to 25℃	--	0.6	--	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600 V, V_{GS} = 0 V (T_C = 25℃)	--	--	10	μA
		V_{DS} = 480 V, V_{GS} = 0 V (T_C = 125℃)	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain-Source On-resistance	V_{GS} = 10 V, I_D = 2 A	--	2.2	2.5	Ω
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 2 A (Note 4)	--	3.0	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHZ	--	484	629	pF
C_{oss}	Output Capacitance		--	51.7	67	pF
C_{rss}	Reverse Transfer Capacitance		--	8.7	11	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 300 V, I_D = 4 A, R_G = 25 Ω (Note 4, 5)	--	11	27	ns
t_r	Turn-On Rise Time		--	20	48	ns
$t_{d(off)}$	Turn-Off Delay Time		--	30	72	ns
t_f	Turn-Off Fall Time		--	19	46	ns
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 4 A, V_{GS} = 10 V (Note 4, 5)	--	14.5	20	nC
Q_{gs}	Gate-Source Charge		--	3.4	--	nC
Q_{gd}	Gate-Drain Charge		--	7.0	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	4	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	16	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 4 A	--	0.97	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS}= 0 V, I_S = 4 A, dI_F/dt = 100 A/μ s (Note 4)	--	557	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.6	--	μ C

Notes:

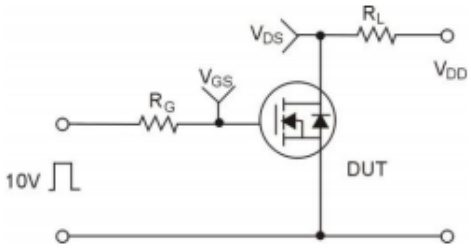
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 1mH, I_{AS} = 4A, V_{DD} = 50V, R_G =25Ω, Starting T_J = 25℃
3. I_{SD} ≤ 4A, di/dt ≤ 200A/μS, V_{DD} ≤ BV_{DSS}, Starting T_J = 25℃
4. Pulse Test : Pulse width ≤ 300μS, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

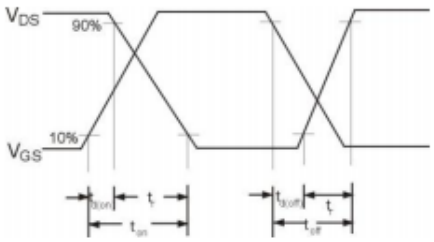
Gate Charge Test Circuit Waveform



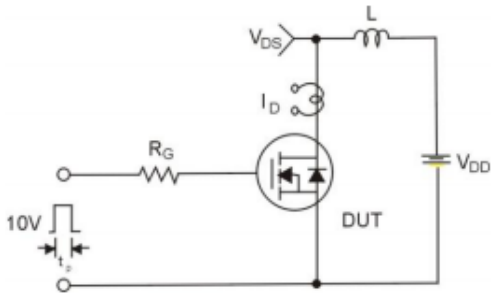


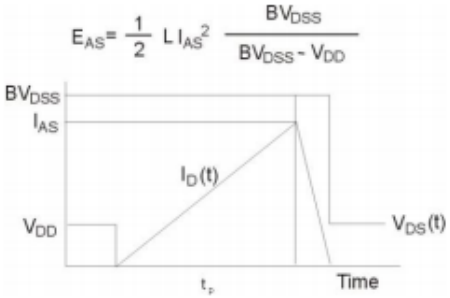
Resistive Switching Test Circuit Waveforms



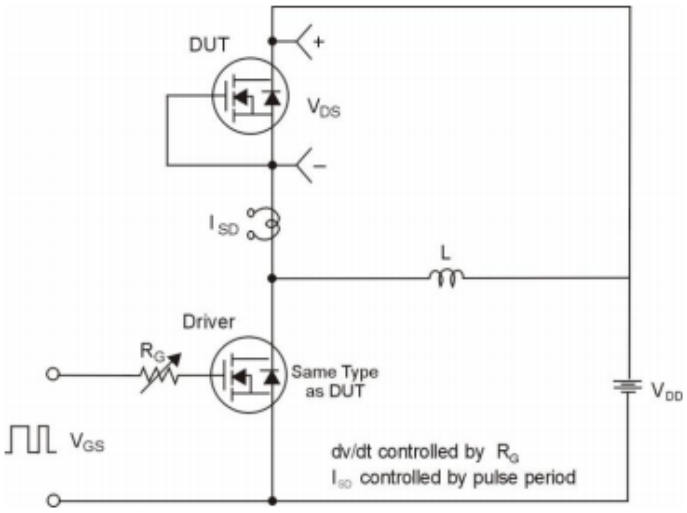


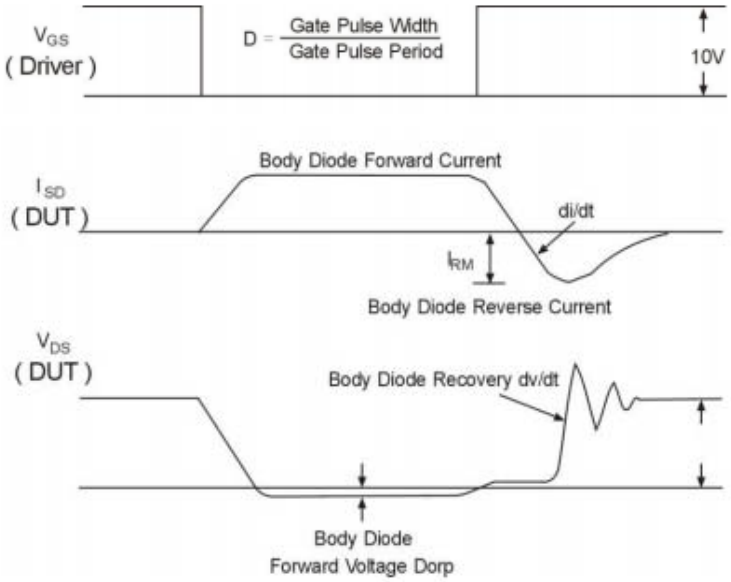
Unclamped Inductive Switching Test Circuit Waveforms





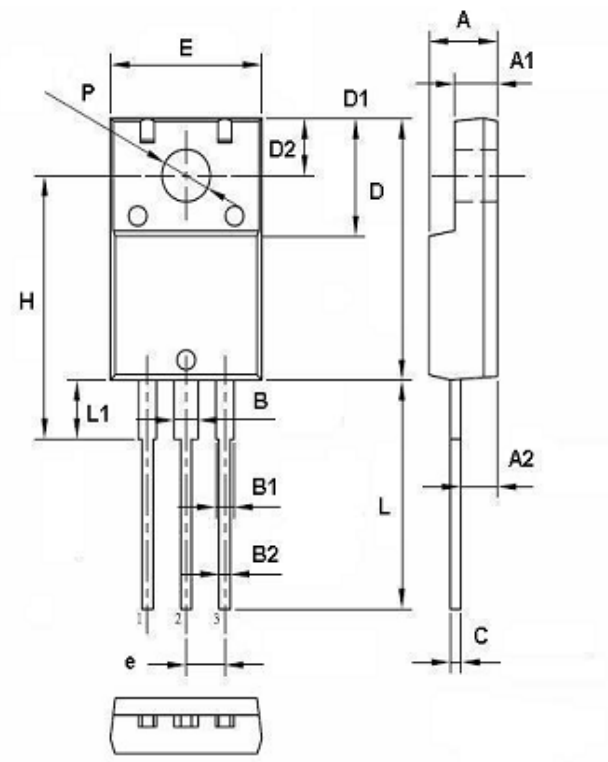
Gate Charge Test Circuit Waveform





Gate Charge Test Circuit Waveform

TO-220F Mechanical Drawing



TO-220F DIMENSION				
Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.200	4.800	0.165	0.189
A1	2.500	3.100	0.098	0.122
A2	2.100	2.700	0.083	0.106
B	1.300	1.900	0.051	0.075
B1	0.900	1.500	0.035	0.059
B2	0.650	1.050	0.026	0.041
C	0.400	1.000	0.016	0.039
D	15.700	16.300	0.618	0.642
D1	6.900	7.500	0.272	0.295
D2	3.200	3.800	0.126	0.150
E	9.700	10.300	0.382	0.406
e	2.350	2.750	0.093	0.108
H	15.800	16.400	0.622	0.646
L	13.500	14.500	0.531	0.571
L1	3.400	3.800	0.134	0.150