

Features

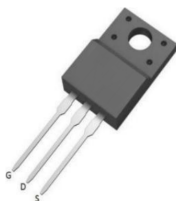
- N-channel SJ MOSFET with deep trench process
- Extremely low losses due to very low Eon and Eoff
- Qualified for industrial grade applications according to JEDEC
- Excellent stability and uniformity

Application

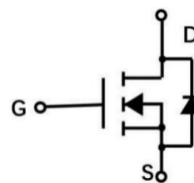
- SMPS
- Adapter
- LED lighting
- EV Charger
- Telecom power
- Solar Inverter

Key Performance Parameters

Parameter	Value	Unit
V_{DS}	650	V
I_D	13	A
$R_{DS(ON)_{max}}$	380	mΩ



TO-220F



Equivalent Circuit

Table 1. Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter		Value	Units
V_{GS}	Drain-Source Voltage(static)		± 20	V
V_{GS}	Gate-Source Voltage (dynamic)(AC ($f>1\text{Hz}$))		± 30	
I_D	Continuous Drain Current	($T_C=25^\circ\text{C}$)	13	A
		($T_C=100^\circ\text{C}$)	8	
$I_{D,pulse}$	Pulsed Drain Current ($T_C = 25^\circ\text{C}$)		24	
I_S	Continuous diode forward current	($T_C=25^\circ\text{C}$)	11	
$I_{S,pulse}$	Diode pulse current	($T_C=25^\circ\text{C}$)	25	
E_{AS}	Avalanche energy, single pulse($I_D=3.4\text{A}, V_{DD}=50\text{V}$)		320	mJ
I_{AS}	Avalanche current, single pulse		3.4	A
dv/dt	MOSFET dv/dt ruggedness• $V_{DS}=0\ldots 400\text{V}$ • •		50	V/ns
dv/dt	Recovery diode dv/dt ($V_{DS}=0\ldots 400\text{V}, I_{SD}\leq 7\text{A}$)		15	V/ns
P_{tot}	Power Dissipation	($T_C=25^\circ\text{C}$)	63	W
T_J, T_{STG}	Operating Junction Storage Temperature Range		-55 to +150	$^\circ\text{C}$

Table 2. Thermal Characteristic

Symbol	Parameter	Value			Units
		Min	Typ	Max	
R_{thJA}	Thermal resistance,junction – ambient	--	--	62	°C/ W
R_{thJC}	Thermal resistance,junction – case	--	--	1.9	°C/ W

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 1mA	650	--	--	V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2.9	3.4	3.9	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650V, V _{GS} = 0V, T _J = 25°C	--	--	1	μA
I _{GSS}	Gate to Source Leakage Current	V _{DS} = 0 V ,V _{GS} = ±30V	-100	±2	100	nA
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} = 10V, I _D = 7A, T _J = 25°C	--	352	380	mΩ
		V _{GS} = 10V, I _D =7A, T _J = 150°C	--	704	--	
R _G	Gate Resistance	f = 1.0MHz,open drain	--	9	--	Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0V,V _{DS} = 50V,f = 100kHz	--	410	--	pF
C _{oss}	Output Capacitance		--	49	--	
C _{rss}	Reverse Transfer Capacitance		--	3.9	--	
t _{d(on)}	Turn-on Delay Time	V _{DS} = 400 V, I _D = 5A V _{GS} = 15V, R _g = 10Ω	--	21	--	ns
t _r	Turn-on Rise Time		--	12	--	
t _{d(off)}	Turn-off Delay Time		--	36	--	
t _f	Turn-off Fall Time		--	13	--	
Q _g	Total Gate Charge	I _D = 5 A ,V _{DD} =400V V _{GS} = 0~10V	--	19	--	nC
Q _{gs}	Gate-Source Charge		--	4.1	--	
Q _{gd}	Gate-Drain Charge		--	9	--	
V _{plateau}	Gate plateau voltage		--	6	--	V
Body Diode Characteristics						
V _{SD}	Body Diode Forward Voltage	V _R = 400V I _F = 5 A, diF/dt = 100A/μs,	--	--	1.3	V
t _{rr}	Reverse Recovery Time		--	190	--	ns
Q _{rr}	Reverse Recovery Charge		--	2	--	μC
I _{rm}	Peak reverse recovery current		--	13	--	A

Typical Electrical and Thermal Characteristics (T_J = 25°C, unless otherwise noted)

Fig 1: Typical Output characteristics (25°C)

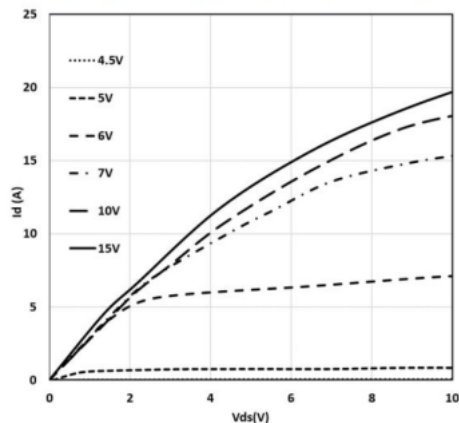


Fig 2: Transfer characteristics

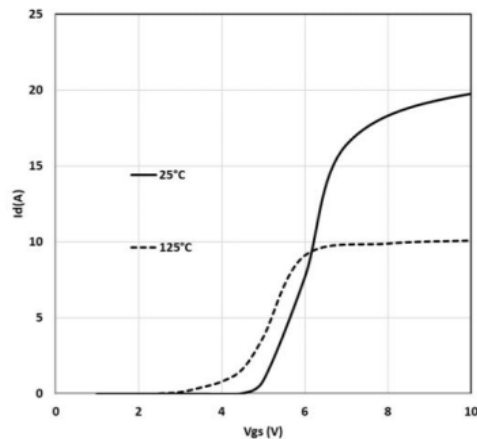


Fig 3: Safe Operating Area

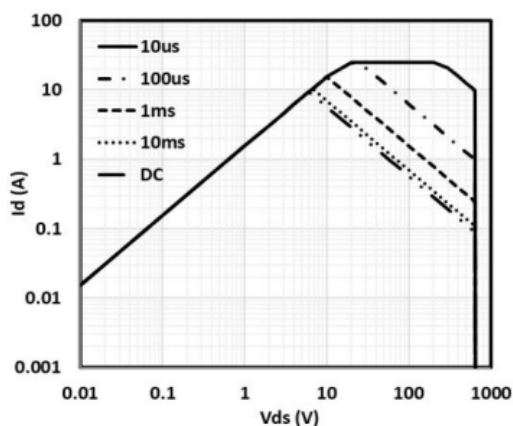


Fig 4: Power dissipation

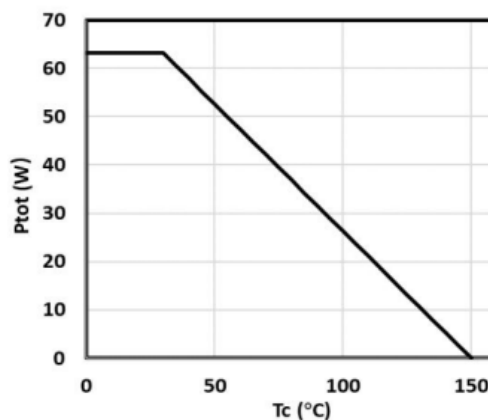


Fig 5: Gate charge

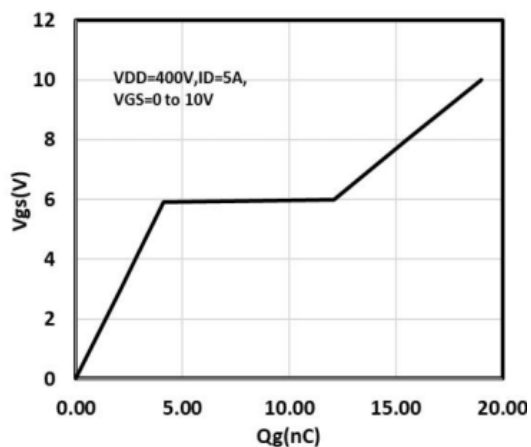


Fig 6: Typical capacitance characteristics

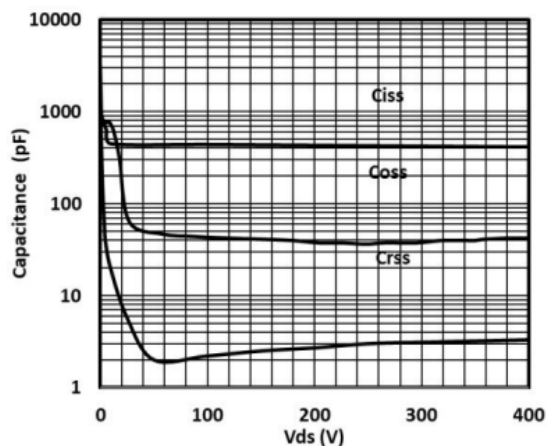


Fig 7: On Resistor vs.Junction temperature

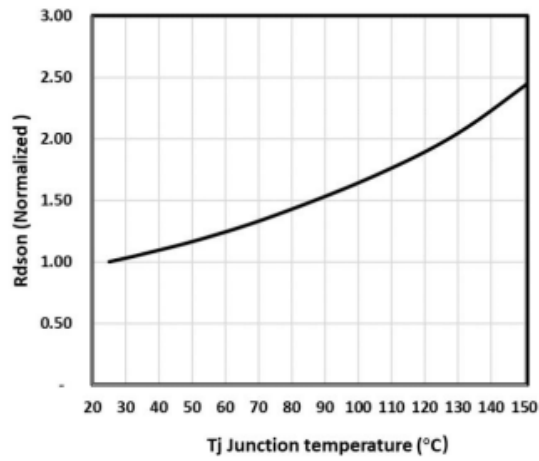
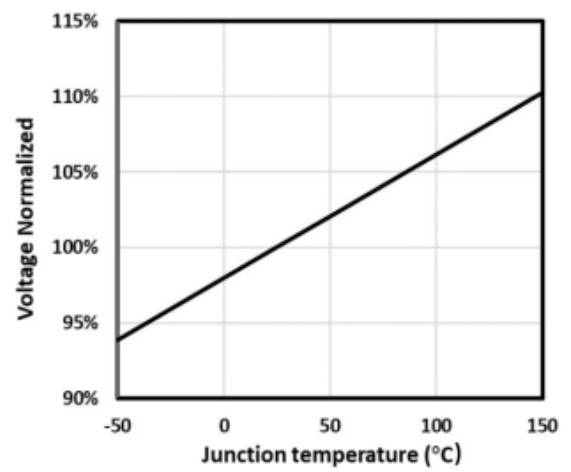


Fig 8: Drain-Source Breakdown Voltage



Test Circuit and Waveforms

Fig A: Switching Test Circuit & Waveforms

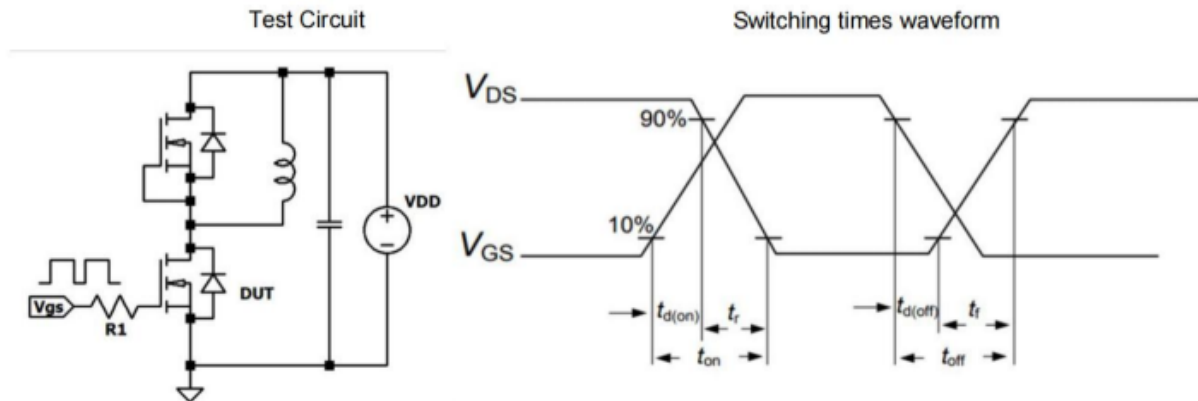
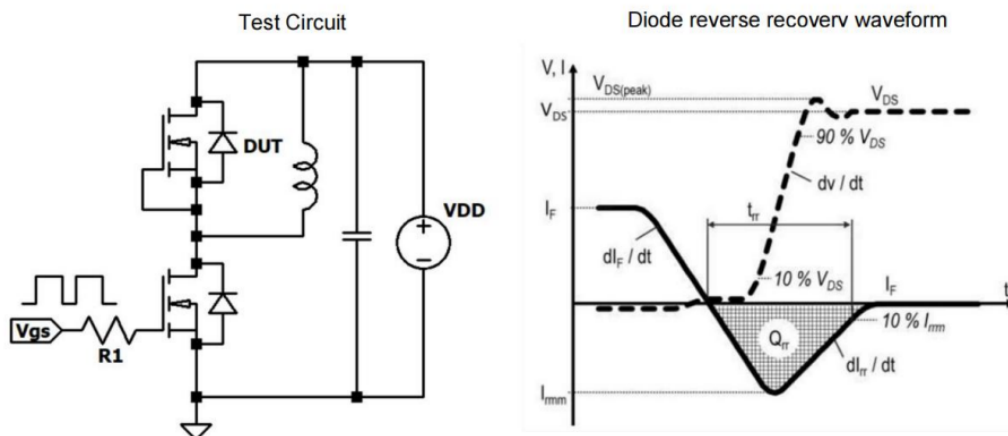
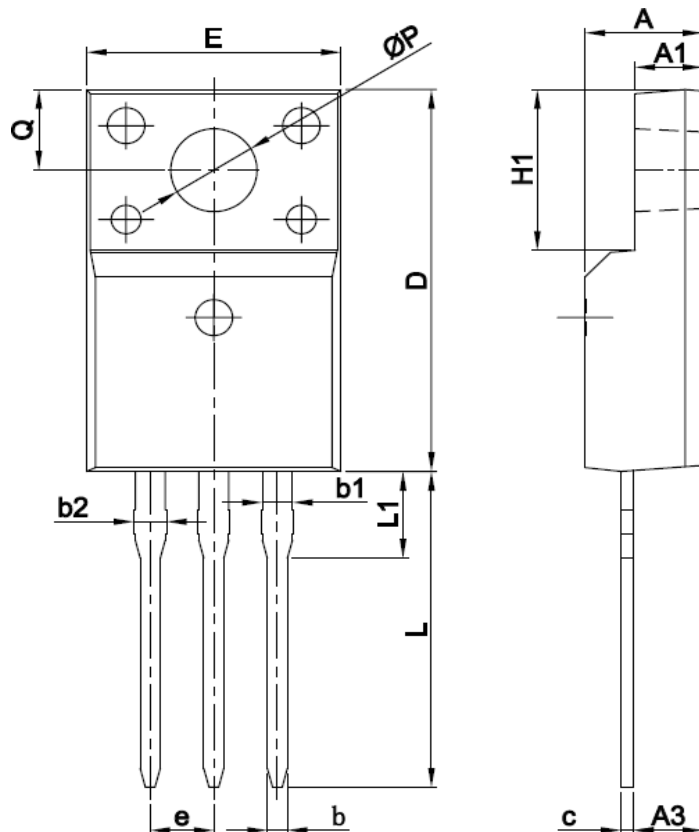


Fig B: Diode Recovery Test Circuit & Waveforms



Package Dimensions

TO-220F



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.90	0.169	0.193
A1	2.34	2.87	0.092	0.113
A3	2.20	2.96	0.087	0.117
b	0.60	0.90	0.024	0.035
b1	0.95	1.45	0.037	0.057
b2	1.15	1.55	0.045	0.061
c	0.40	0.70	0.016	0.028
D	15.50	16.17	0.610	0.637
e	2.54 BSC		0.100 BSC	
E	9.70	10.66	0.382	0.420
H1	6.70 REF		0.264 REF	
L	12.46	13.75	0.491	0.541
L1	2.80	3.80	0.110	0.150
Q	3.05	3.55	0.120	0.140
P	2.98	3.38	0.117	0.133