

General Description

The series of devices use advanced trench gate super junction technology and design to provide ultra-low $R_{DS(ON)}$ and low gate charge and With a rapid recovery body diode. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, industrial power applications, Fast charger, new energy vehicle charging pile, on-board OBC etc.

Features

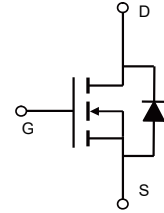
- New technology for high voltage device
- Ultra low on-resistance and ultra low conduction losses
- Ultra Low Gate Charge cause lower driving requirements
- Diode reverse recovery speed is super fast
- 100% Avalanche Tested and 100% T_{rr} Tested
- High reliability
- ROHS compliant

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- On-board charger(OBC)



TO-220F



Schematic

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	600	V
Gate-Source Voltage ($V_{DS}=0V$), AC ($f>1$ Hz)	V_{GS}	± 30	V
Gate-Source Voltage ($V_{DS}=0V$), DC	V_{GS}	± 20	V
Continuous Drain Current at $T_c=25^\circ C$	$I_{D(DC)}$	1.8	A
Continuous Drain Current at $T_c=100^\circ C$	$I_{D(DC)}$	1.26	A
Pulsed drain current (Note 1)	I_{DM} (pluse)	5.4	A
Maximum Power Dissipation ($T_c=25^\circ C$)	P_D	8.1	W
Derate above $25^\circ C$		0.054	W/ $^\circ C$
Single pulse avalanche energy (Note 2)	EAS	1.25	mJ
Single pulse avalanche current (Note 2)	I_{AS}	0.5	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	0.02	mJ

Reverse diode dv/dt, $V_{DS} \leq 480V, I_{SD} < I_D$	dv/dt	15	V/ns
Drain Source voltage slope, $V_{DS} \leq 480V$	dv/dt	50	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+175	°C

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	18.5	°C /W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	°C /W

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250uA	600			V
Zero Gate Voltage Drain Current(Tc=25℃)	I _{DSS}	V _{DS} =600V, V _{GS} =0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I _{DSS}	V _{DS} =600V, V _{GS} =0V			100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V			±200	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	2.5	3.2	4.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =0.9A		1950	2100	mΩ
Dynamic Characteristics						
Gate Resistance	R _g	F=1MHZ, D-S short		17		Ω
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1MHZ		119		pF
Output Capacitance	C _{oss}			17.3		pF
Reverse Transfer Capacitance	C _{rss}			6.8		pF
Total Gate Charge	Q _g	V _{DS} =450V, I _D =0.8A, V _{GS} =10V		3.9		nC
Gate-Source Charge	Q _{gs}			0.4		nC
Gate-Drain Charge	Q _{gd}			1		nC
Gate plateau voltage	V _{gp}			4.9		V
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =380V, I _D =0.9A, R _G =3Ω, V _{GS} =10V		6		nS
Turn-on Rise Time	t _r			6		nS
Turn-Off Delay Time	t _{d(off)}			29		nS
Turn-Off Fall Time	t _f			48		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			1.8	A
Pulsed-Source-drain current(Body Diode)	I _{SDM}				5.4	A
Forward on voltage	V _{SD}	T _J =25℃, I _{SD} =1.8A, V _{GS} =0V		0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _J =25℃, I _F =0.9 A, di/dt=100A/μs		130		nS
Reverse Recovery Charge	Q _{rr}			0.52		uC
Peak reverse recovery current	I _{rm}			8		A

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

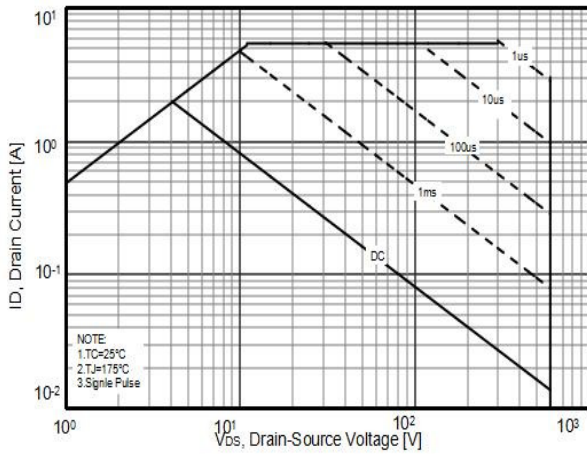
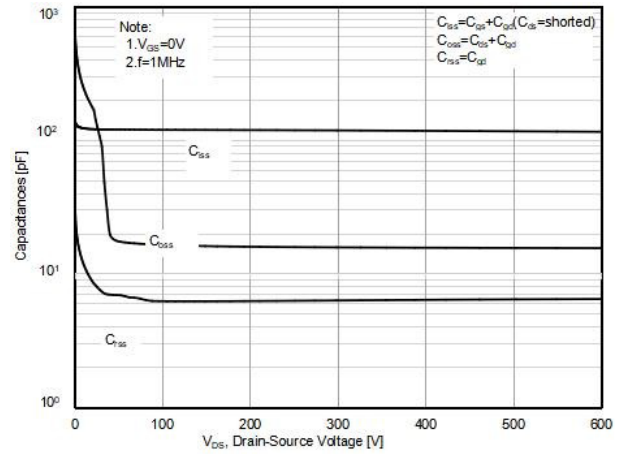
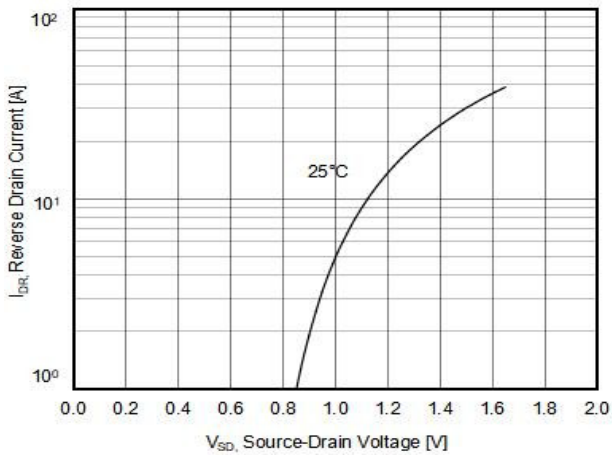
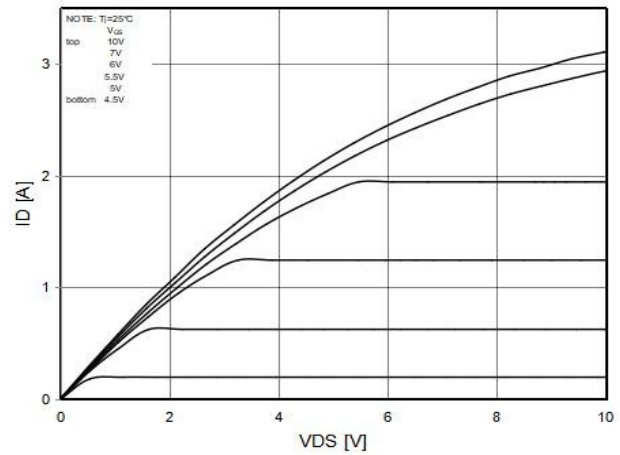
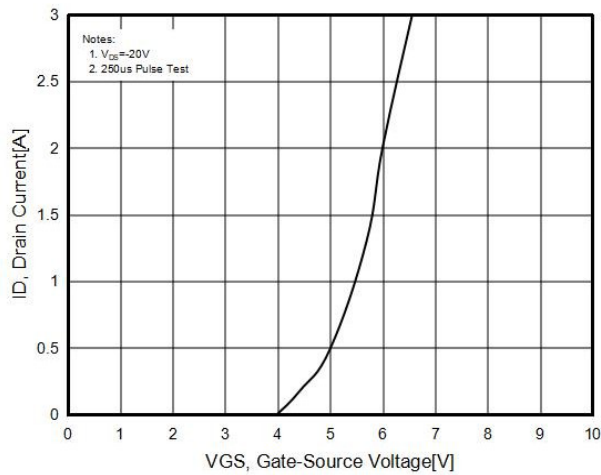
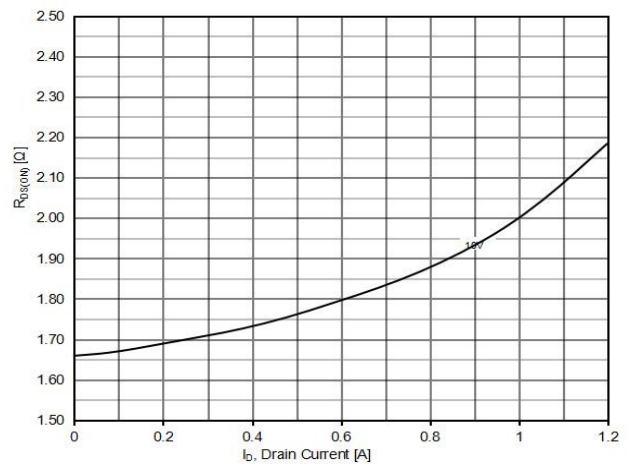
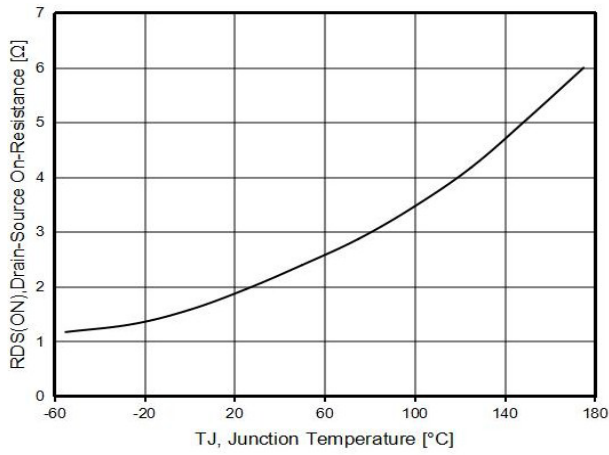
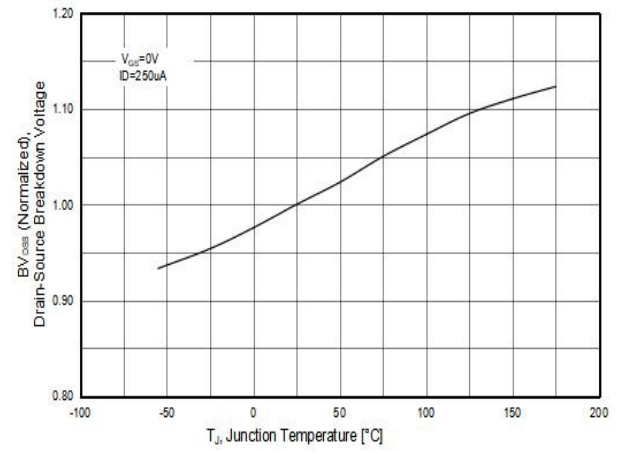
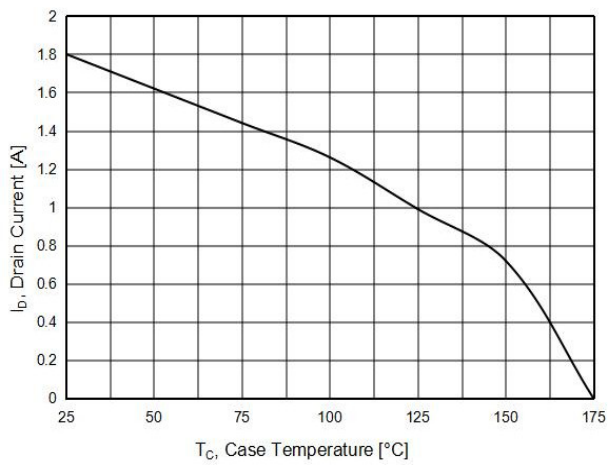
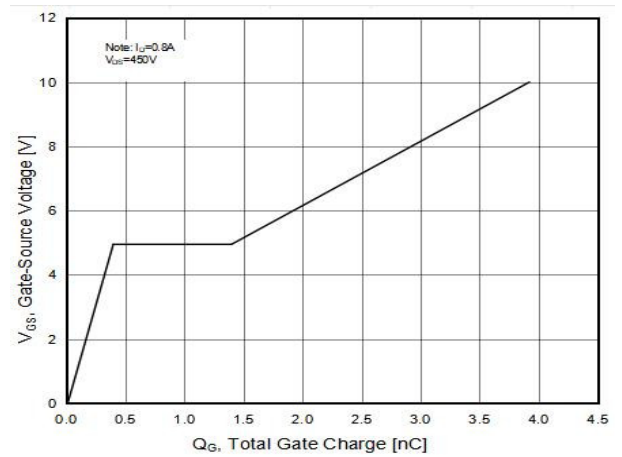
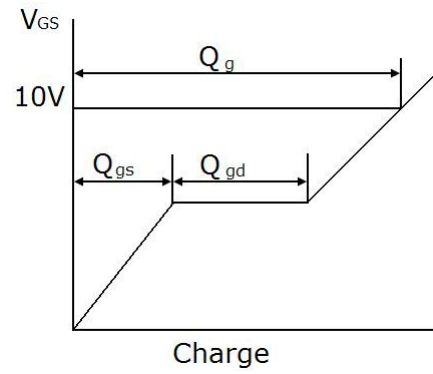
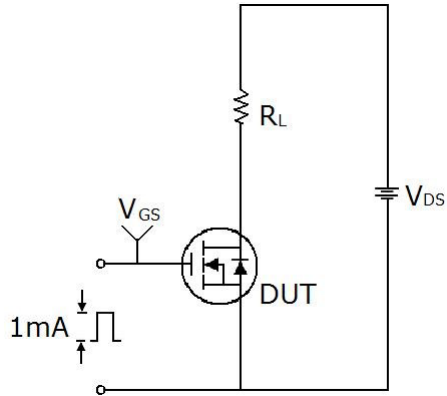
Figure1. Safe operating area

Figure2. Capacitance

Figure3. Source-Drain Diode Forward Voltage

Figure4. Output characteristics

Figure5. Transfer characteristics

Figure6. Static drain-source on resistance


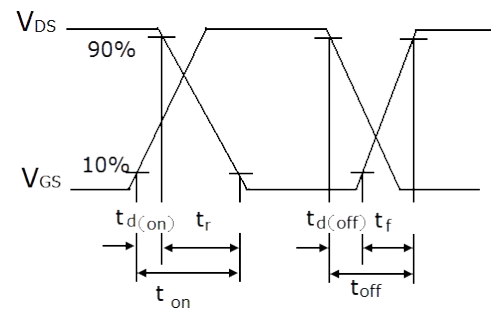
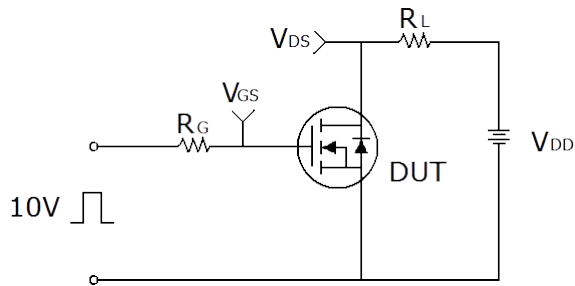
Figure7. $R_{DS(ON)}$ vs Junction Temperature

Figure8. BV_{DSS} vs Junction Temperature

Figure9. Maximum I_D vs Junction Temperature

Figure10. Gate charge waveforms


Test circuit

1) Gate charge test circuit & Waveform



2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms

