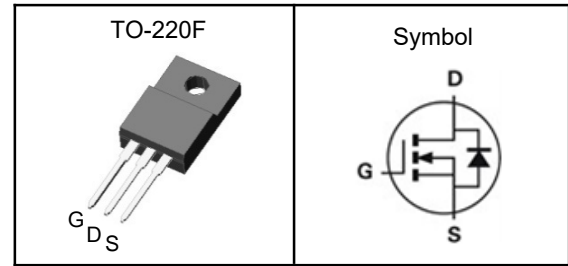


650V Super Junction Power MOSFET
Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.14\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode: $V_{th} = 3.0$ to $5.0V$
- 100% avalanche tested
- RoHS compliant

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Charger, Lighting.

Pin Description


V_{DSS}	650	V
$R_{DS(ON)-Typ}$	140	m Ω
I_D	28	A

Absolute Maximum Ratings ($T_J=25^\circ\text{C}$, Unless Otherwise Noted)

Symbol	Parameter	Rating	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate-Source Voltage	± 30	V
T_J	Maximum Junction Temperature	-55 to 150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
E_{AS}	Single Pulse Avalanche Energy ³	898	mJ
$I_{DM}^{①}$	300 μs Pulse Drain Current Tested	84	A
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	A
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	W

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹ (Max)	80	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	3.7	$^\circ\text{C}/\text{W}$

Note ① : Max. current is limited by bonding wire.

Note ② : UIS tested and pulse width are limited by maximum junction temperature 150°C .

Note ③ : Surface Mounted on 1in^2 FR-4 board with 1oz.



650V Super Junction Power MOSFET

Electrical Characteristics ($T_J=25^{\circ}\text{C}$, Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=600V, V_{GS}=0V$	---	---	1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0	---	5.0	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	± 100	nA
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=10A$	---	140	180	m Ω
Dynamic Characteristics ^⑤						
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=50V,$ Freq.=1.0MHz	---	2380	---	pF
C_{oss}	Output Capacitance		---	218	---	
C_{rss}	Reverse Transfer Capacitance		---	5.1	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{GS}=10V, V_{DD}=400V,$ $I_D=11.3A, R_G=1.7\Omega$	---	12.4	---	nS
T_r	Turn-on Rise Time		---	21.6	---	
$T_{d(off)}$	Turn-off Delay Time		---	50	---	
T_f	Turn-off Fall Time		---	18.4	---	
Q_g	Total Gate Charge	$V_{GS}=10V, V_{DD}=400V, I_D=11.3A$	---	48	---	nC
Q_{gs}	Gate-Source Charge		---	8.5	---	
Q_{gd}	Gate-Drain Charge		---	8.3	---	
Source-Drain Characteristics						
V_{SD}	Diode Forward Voltage	$I_F=1A, V_{GS}=0V$	---	0.7	---	V
t_{rr}	Reverse recovery time	$I_F=11.3A, V_R=400V$ $diF/dt=100A/\mu s$	---	110	---	ns
Q_{rr}	Reverse recovery charge		---	0.6	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	11.3	---	A

Note ④ : Pulse test (pulse width \leq 300us, duty cycle \leq 2%).

Note ⑤ : Guaranteed by design, not subject to production testing.

650V Super Junction Power MOSFET

Handwritten text: Hnd]WU 7 \ UfUWYf]gh]Vg

Diagram 1: Typ. Output characteristics

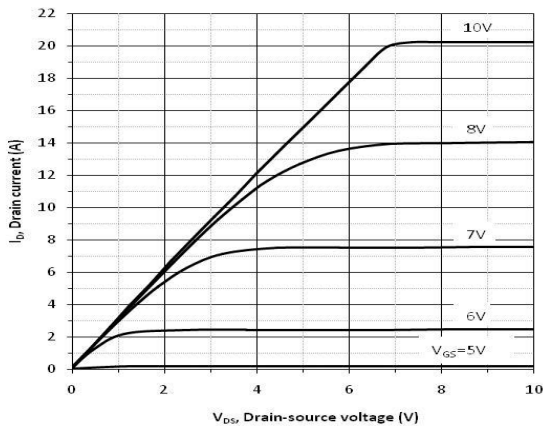


Diagram 2: Typ. Coss stored energy

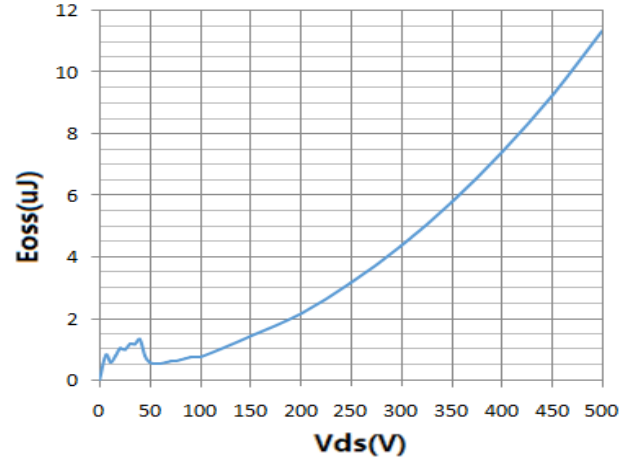


Diagram 3: Typ. Transfer characteristics

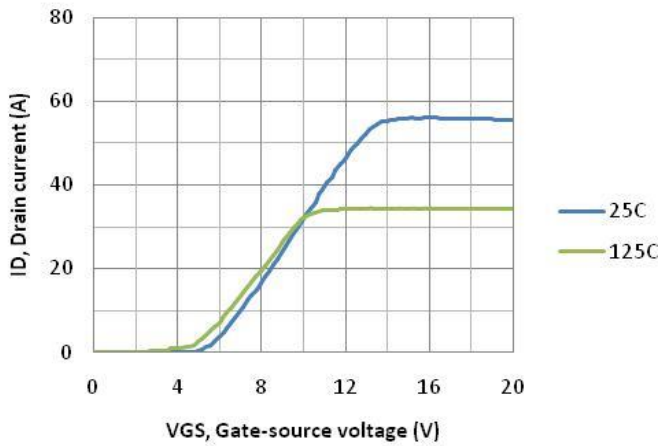


Diagram 4: Typ. Gate charge

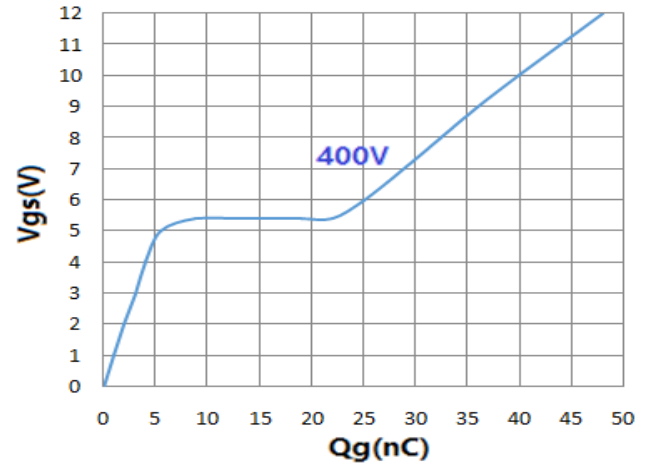


Diagram 5: Drain-source breakdown voltage

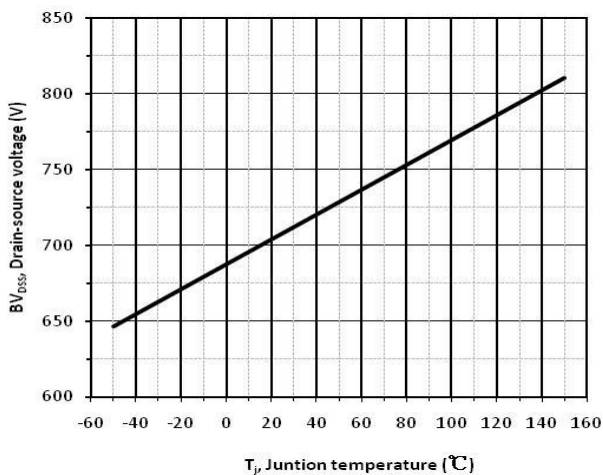
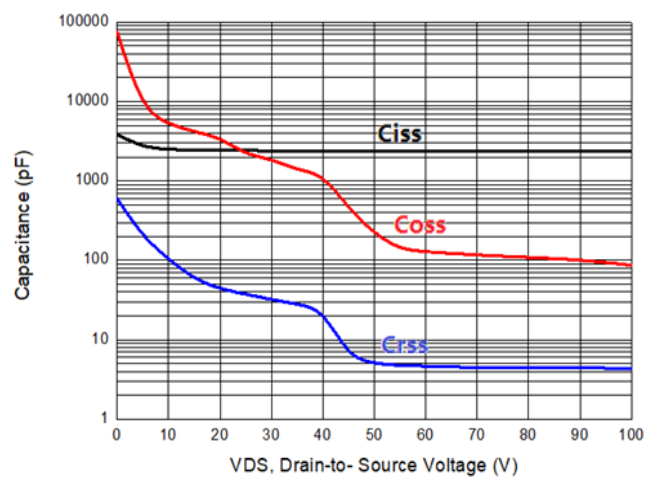
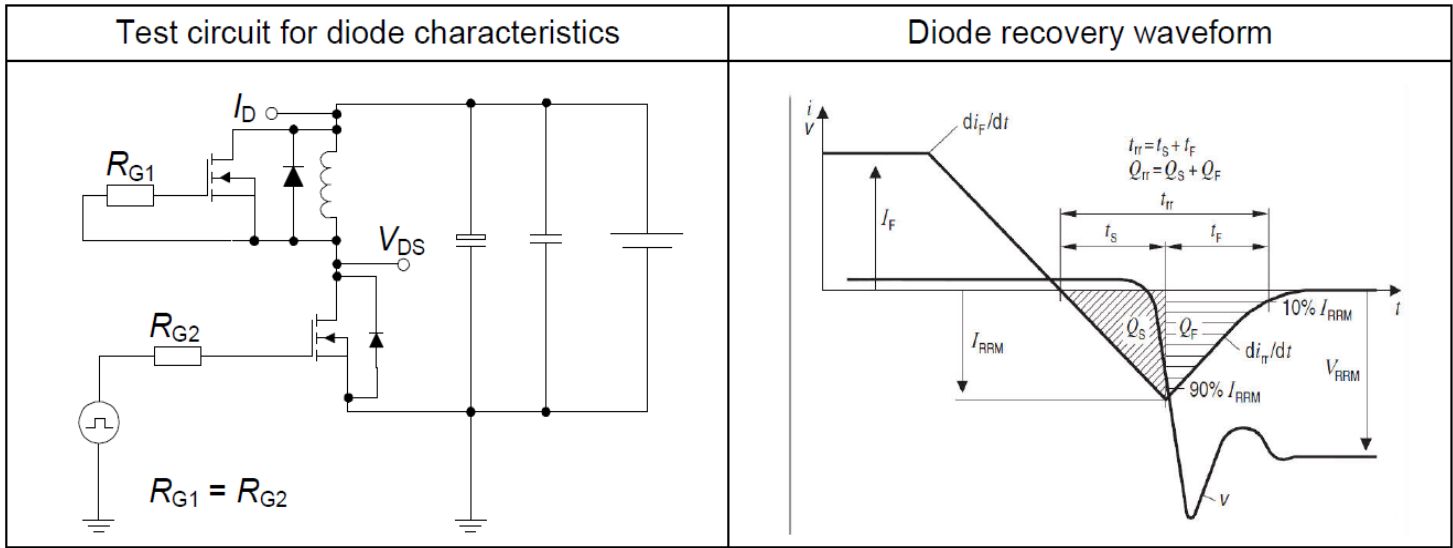
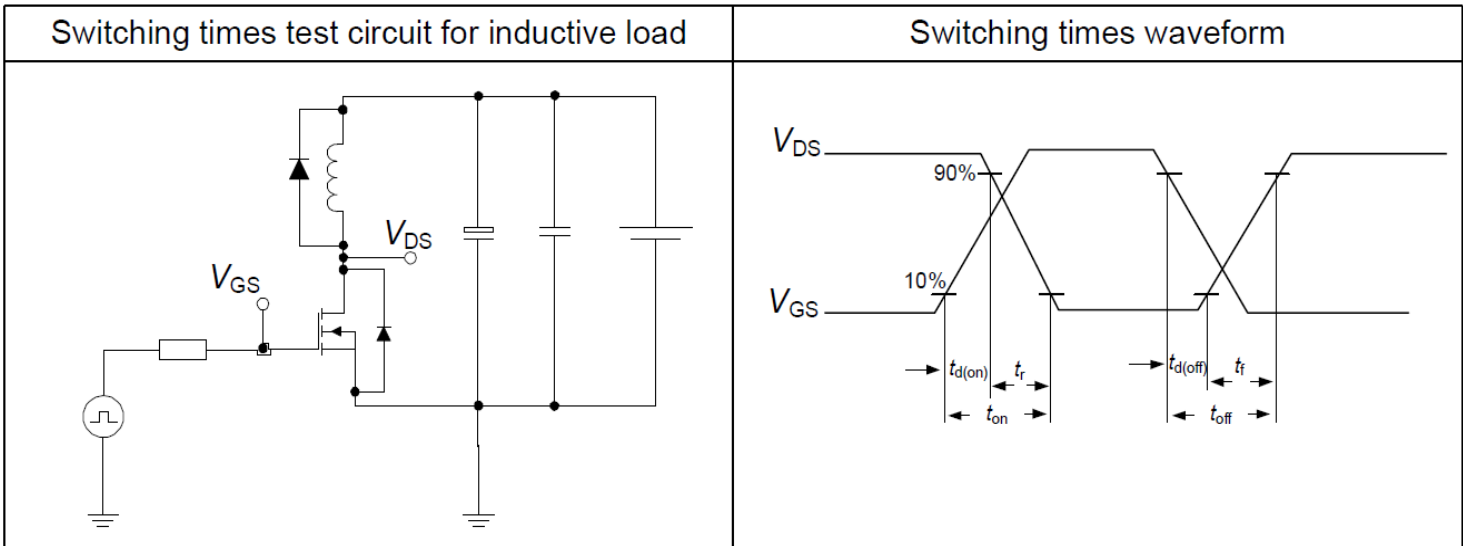
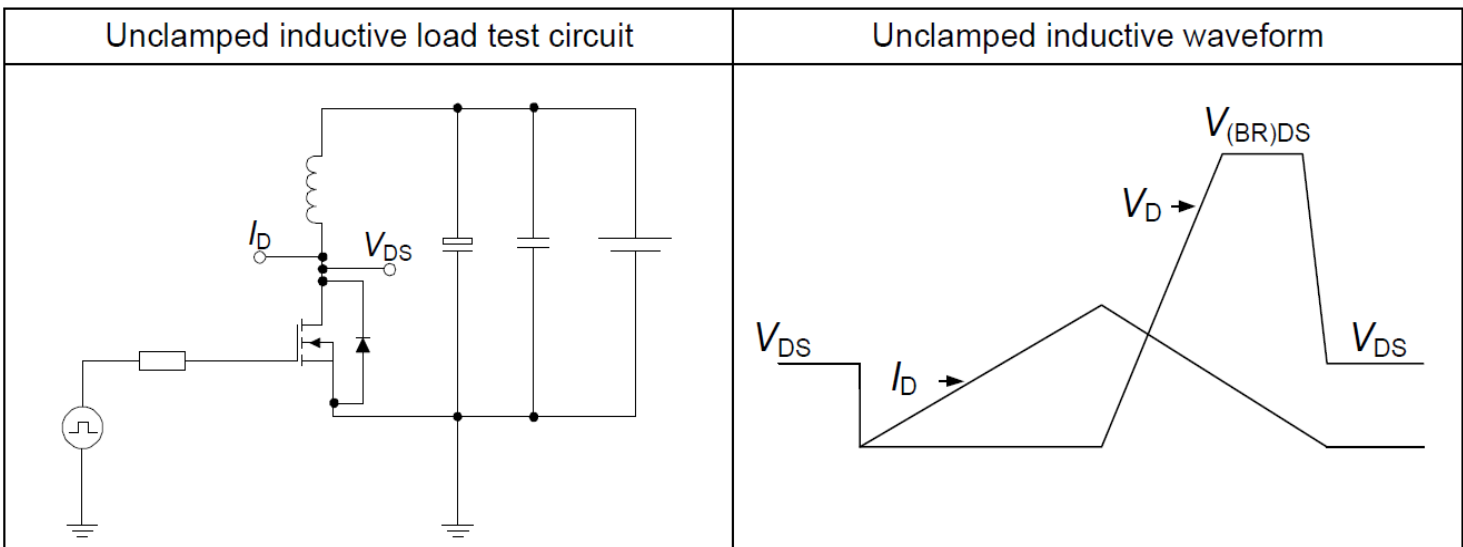
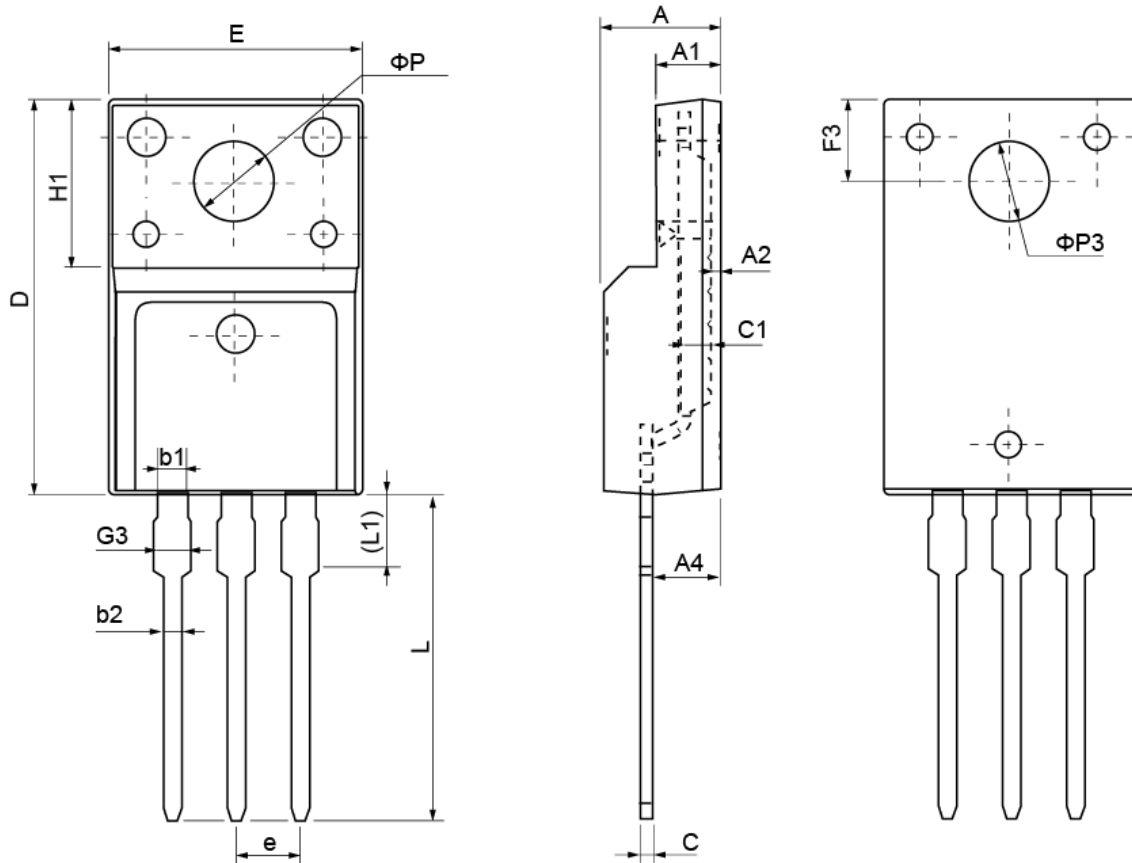


Diagram 6: Typ. Capacitances



650V Super Junction Power MOSFET
Table 7 Diode characteristics

Table 8 Switching times

Table 9 Unclamped inductive load


650V Super Junction Power MOSFET
TO-220F Package Outline Dimensions


Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
A	4.40	4.70	5.00	H1	6.70 REF		
A1	2.30	2.55	2.80	L	12.30	12.98	13.30
A2	0.30	0.50	0.70	L1	2.95	3.10	3.50
A4	2.45	2.80	3.05	phi P	3.03	3.20	3.50
c	0.30	0.50	0.70	phi P3	3.15	3.45	3.65
c1	1.20	1.30	1.40	b1	1.10	1.30	1.45
D	15.40	15.90	16.40	b2	0.60	0.80	1.00
E	9.86	10.16	10.46	F3	3.05	3.30	3.55
e	2.54 BSC			G3	1.15	1.35	1.55