

650V Super Junction Power MOSFET

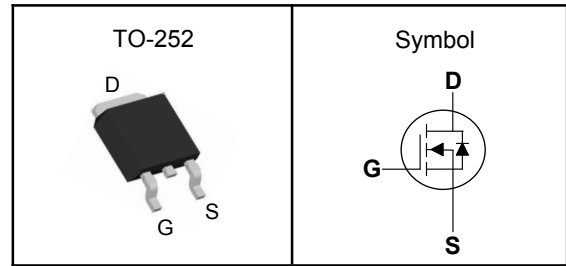
Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.86\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode: $V_{th} = 2.5$ to $4.5V$
- 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
$R_{DS(ON)-Typ}$	860	m Ω
I_D	4.5	A

Absolute Maximum Ratings ($T_C=25^\circ C$, Unless Otherwise Noted)

Symbol	Parameter	N-Channel	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate-Source Voltage	± 30	V
T_J	Maximum Junction Temperature	-55 to 150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
E_{AS}	Single Pulse Avalanche Energy ³	120	mJ
$I_{DM}^{①}$	300 μs Pulse Drain Current Tested	8	A
I_D	Continuous Drain Current	4.5	A
P_D	Maximum Power Dissipation	28	W
I_{AS}	Avalanche Current	2	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400V$	50	V/ns
	Reverse diode dv/dt ³ $V_{DS}=0 \dots 400V, I_{SD} \leq I_D$	50	

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}^{③}$	Thermal Resistance Junction-Ambient ¹ (Max)	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹ (Max)	4.4	$^\circ C/W$

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

Note ② : UIS tested and pulse width are limited by maximum junction temperature $150^\circ C$.

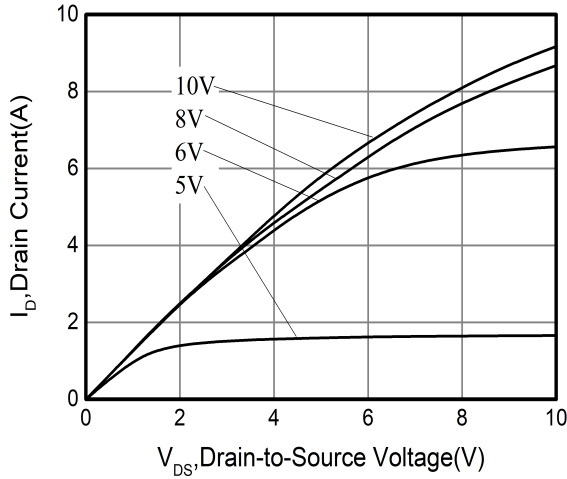
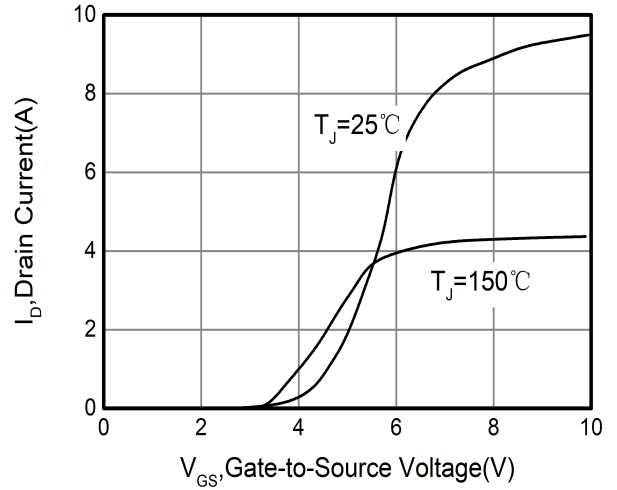
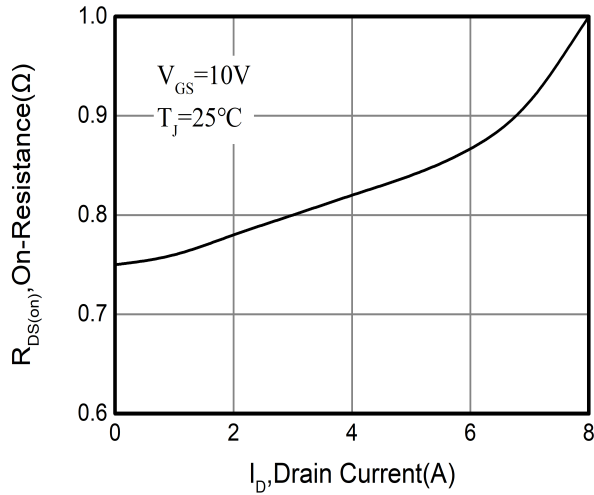
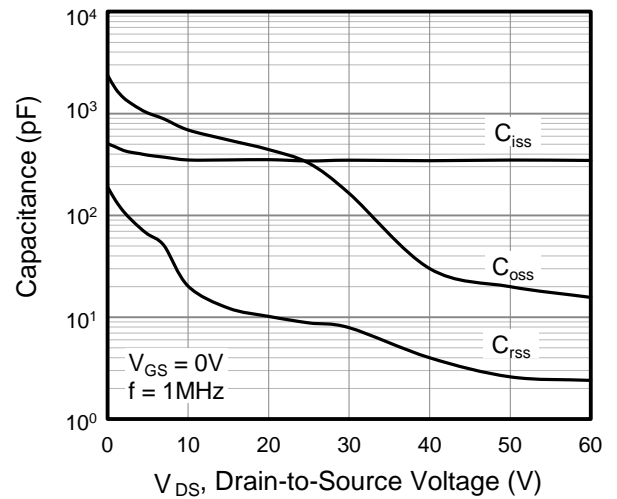
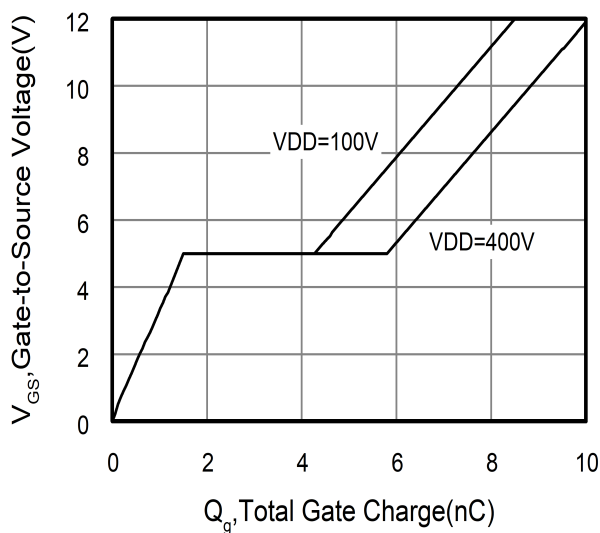
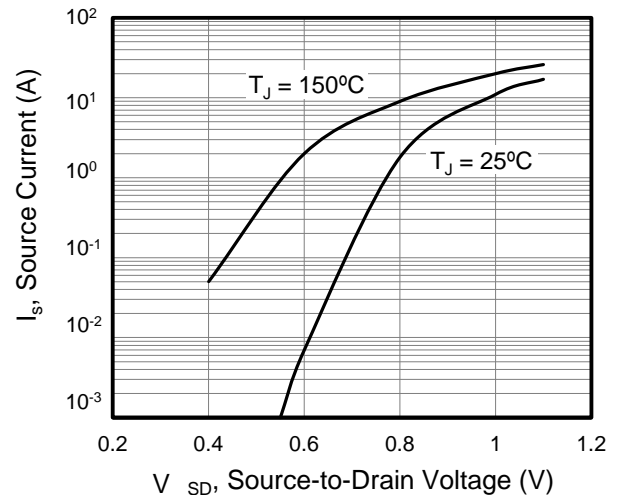
Note ③ : Surface Mounted on $1in^2$ FR-4 board with 1oz.

**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	$V_{DS}=650V, V_{GS}=0V$	---	---	1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	---	4.5	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	± 100	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=2A$	---	860	950	m Ω
Dynamic Characteristics ^⑤						
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=100V,$ Freq.=1MHz	---	286	---	pF
C_{oss}	Output Capacitance		---	12	---	
C_{rss}	Reverse Transfer Capacitance		---	2	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DD}=400V, V_{GS}=10V,$ $R_G=25\Omega, I_D=4A$	---	36	---	nS
T_r	Turn-on Rise Time		---	27	---	
$T_{d(off)}$	Turn-off Delay Time		---	80	---	
T_f	Turn-off Fall Time		---	25	---	
Q_g	Total Gate Charge	$V_{DD}=400V, V_{GS}=10V,$ $I_D=4A$	---	8.6	---	nC
Q_{gs}	Gate-Source Charge		---	1.5	---	
Q_{gd}	Gate-Drain Charge		---	4.2	---	
Source-Drain Characteristics ($T_J=25^\circ\text{C}$)						
V_{SD} ^④	Diode Forward Voltage	$V_G=0V, I_S=4A, T_J=25^\circ\text{C}$	---	0.9	1.2	V
t_{rr}	Reverse Recovery Time	$V_R=400V, I_F=4A,$ $di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	240	---	nS
Q_{rr}	Reverse Recovery Charge		---	1.1	---	nC

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

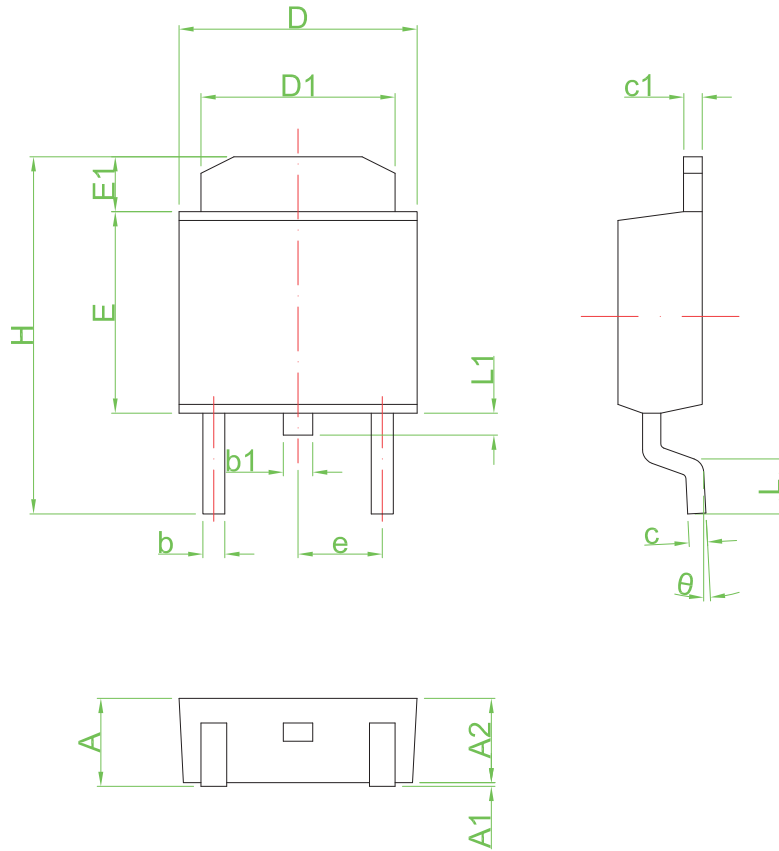
Note ⑤ : Guaranteed by design, not subject to production testing.

650V Super Junction Power MOSFET
Typical Characteristics
Figure 1. Output Characteristics ($T_J=25^\circ\text{C}$)

Figure 2. Transfer Characteristics

Figure 3. On-Resistance vs Drain Current

Figure 4. Capacitance

Figure 5. Gate Charge

Figure 6. Body Diode Forward Voltage




FS65R950D

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TO-252 Package Outline Dimensions


Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	2.25	2.65	0.089	0.104
A1	0.00	0.15	0.000	0.006
A2	2.20	2.40	0.087	0.094
b	0.50	0.70	0.020	0.028
b1	0.70	0.90	0.028	0.035
c	0.46	0.66	0.018	0.026
c1	0.46	0.66	0.018	0.026
D	6.30	6.70	0.248	0.264
D1	5.20	5.40	0.205	0.213
E	5.30	5.70	0.209	0.224
E1	1.40	1.60	0.055	0.063
H	9.40	9.90	0.370	0.390
e	2.30 TYP		0.09 TYP	
L	1.40	1.77	0.055	0.070
L1	0.50	0.70	0.020	0.028
theta	0°	8°	0°	8°