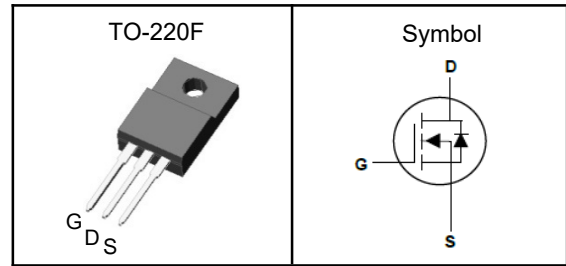


650V Super Junction Power MOSFET
Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.23\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode: $V_{th} = 2$ to $4V$
- 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
$R_{DS(ON)-Typ}$	230	$m\Omega$
I_D	15	A

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

Symbol	Parameter	N-Channel	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate-Source Voltage	± 20	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	290	mJ
$I_{DM}^{①}$	Pulse Drain Current Tested	45	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 to Ambient	80	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	4	$^\circ\text{C}/\text{W}$

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

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

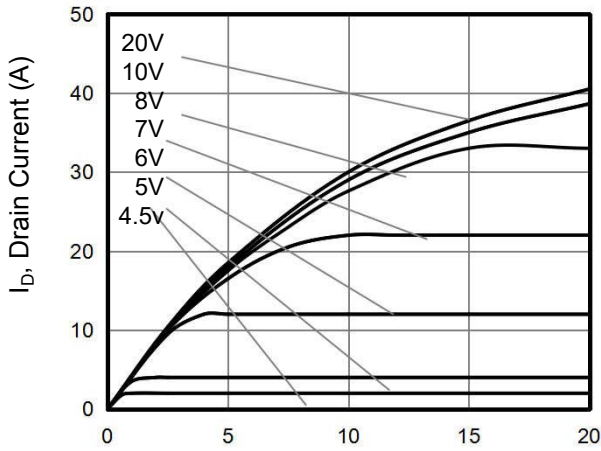
Note ③ : Surface Mounted on 1in^2 FR-4 board with 1oz.

**650V Super Junction Power MOSFET****Electrical Characteristics** ($T_J=25^\circ\text{C}$, Unless Otherwise Noted)

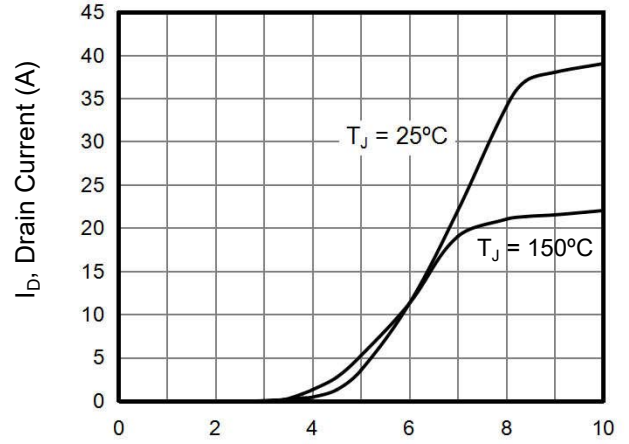
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	---	---	1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	---	4	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=7.5A$	---	230	260	m Ω
Dynamic Characteristics ^⑤						
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=100V,$ Freq.=1MHz	---	1170	---	pF
C_{oss}	Output Capacitance		---	51	---	
C_{rss}	Reverse Transfer Capacitance		---	7	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DD}=400V, V_{GS}=10V,$ $R_G=25\Omega, I_D=15A$	---	25	---	nS
T_r	Turn-on Rise Time		---	65	---	
$T_{d(off)}$	Turn-off Delay Time		---	105	---	
T_f	Turn-off Fall Time		---	50	---	
R_g	Gate Resistance	$f = 1.0\text{MHz}, \text{open drain}$	---	12	---	Ω
Q_g	Total Gate Charge	$V_{DS}=400V, V_{GS}=10V,$ $I_D=15A$	---	27	---	nC
Q_{gs}	Gate-Source Charge		---	5.5	---	
Q_{gd}	Gate-Drain Charge		---	10.5	---	
Source-Drain Characteristics ($T_J=25^\circ\text{C}$)						
V_{SD} ^④	Diode Forward Voltage	$I_S=15A, V_{GS}=0V$	---	0.9	1.2	V
t_{rr}	Reverse Recovery Time	$V_R=400V, I_F=15A,$ $di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	410	---	nS
Q_{rr}	Reverse Recovery Charge		---	4	---	nC

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

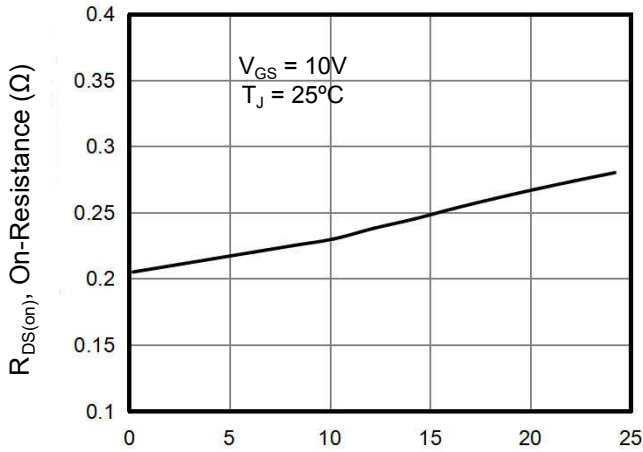
Note ⑤ : Guaranteed by design, not subject to production testing.

650V Super Junction Power MOSFET
Typical Characteristics


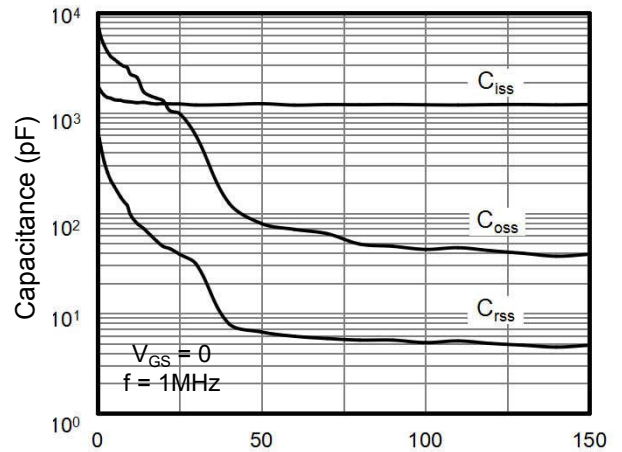
V_{DS} , Drain-to-Source Voltage (V)
Figure 1. Output Characteristics



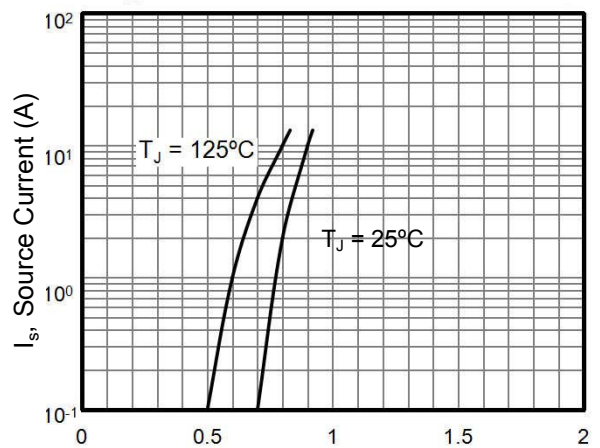
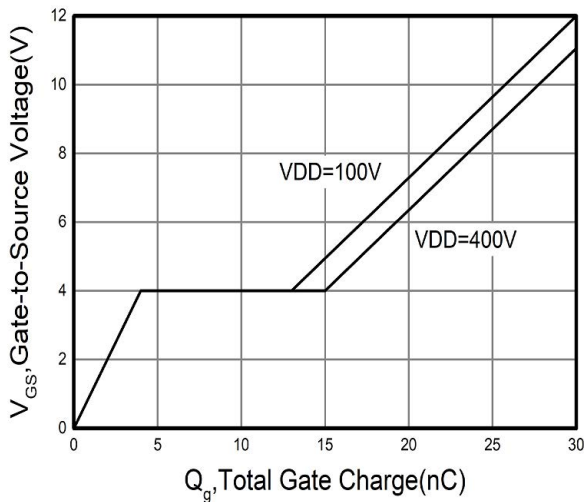
V_{GS} , Gate-to-Source Voltage (V)
Figure 2. Transfer Characteristics



I_D , Drain Current (A)
Figure 3. On-Resistance vs. Drain Current



V_{DS} , Drain-to-Source Voltage (V)
Figure 4. Capacitance



V_{SD} , Source-to-Drain Voltage (V)
Figure 6. Body Diode Forward Voltage

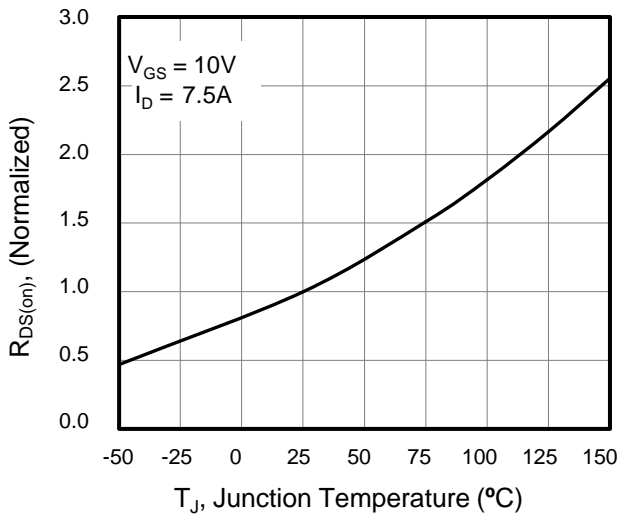
650V Super Junction Power MOSFET


Figure 7. On-Resistance vs. Junction Temperature

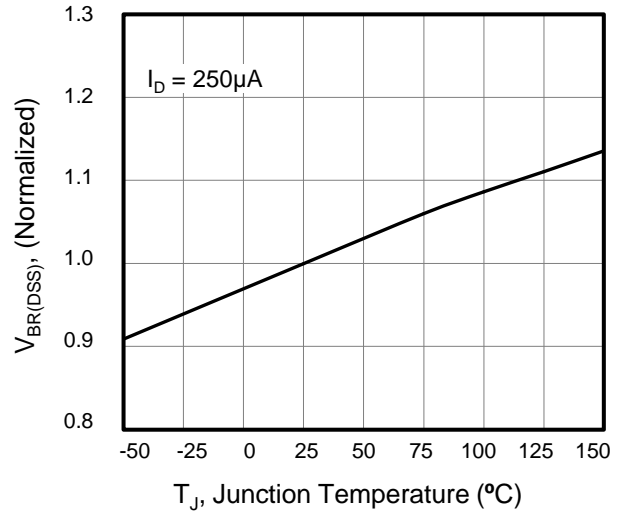


Figure 8. Breakdown voltage vs. Junction Temperature

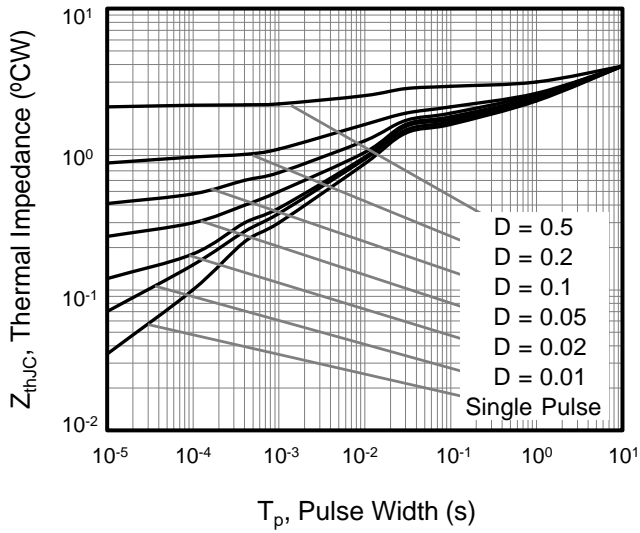


Figure 9. Transient Thermal Impedance TO-220F

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