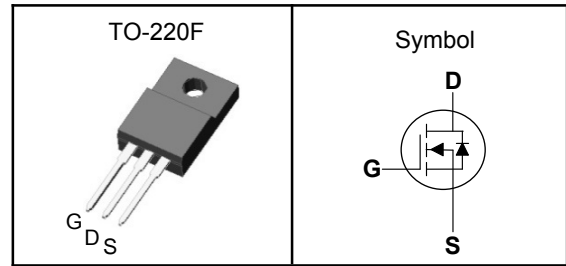


650V Super Junction Power MOSFET
Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.58\Omega(\text{typ})$
- 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
$R_{DS(ON)-Typ}$	580	m Ω
I_D	8	A

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$, 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	106	mJ
$I_{DM}^{①}$	300 μs Pulse Drain Current Tested	31.2	A
I_D	Continuous Drain Current	8	A
P_D	Maximum Power Dissipation	30	W
I_{AS}	Avalanche Current	2.7	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400V$	50	V/ns
	Reverse diode dv/dt ³ $V_{DS}=0 \dots 400V, I_{SD} \leq I_D$	15	

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}^{③}$	Thermal Resistance Junction-Ambient ¹	80	$^\circ\text{C}/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	4.2	$^\circ\text{C}/W$

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

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

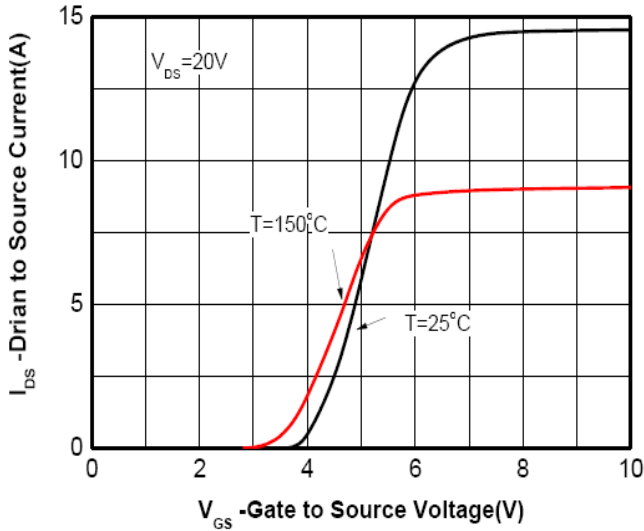
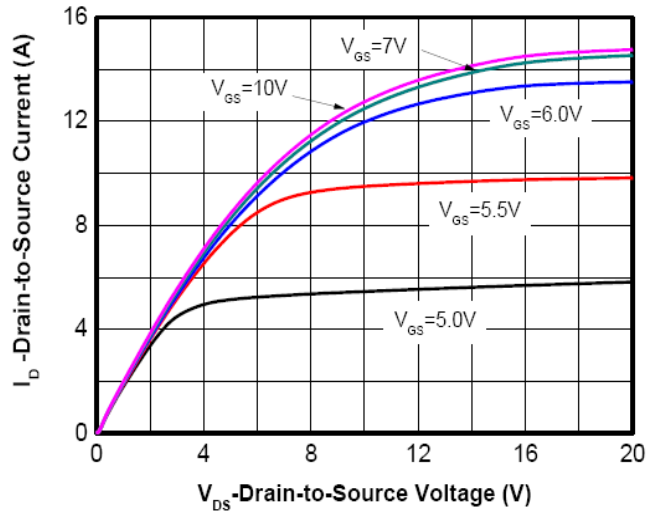
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	---	---	1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	---	4.0	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	± 100	nA
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=3.5A$	---	580	650	m Ω
Dynamic Characteristics ^⑤						
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=100V,$ Freq.=1.0MHz	---	480	---	pF
C_{oss}	Output Capacitance		---	22	---	
C_{rss}	Reverse Transfer Capacitance		---	1.1	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{GS}=10V, V_{DD}=400V,$ $I_D=3.9A, R_G=10\Omega$	---	11	---	nS
T_r	Turn-on Rise Time		---	21	---	
$T_{d(off)}$	Turn-off Delay Time		---	40	---	
T_f	Turn-off Fall Time		---	31	---	
Q_g	Total Gate Charge	$V_{GS}=10V, V_{DD}=400V, I_D=7.8A$	---	14	---	nC
Q_{gs}	Gate-Source Charge		---	3.2	---	
Q_{gd}	Gate-Drain Charge		---	5.6	---	
R_g	Gate resistance	f=1 MHz, open drain	---	9.6	---	Ω
Source-Drain Characteristics						
I_S	Continuous Source Current		---	---	7.8	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		---	---	31.2	A
V_{SD}	Diode Forward Voltage	$I_S=7.8A, V_{GS}=0V$	---	---	1.4	V
t_{rr}	Reverse recovery time	$I_S=3.9A, V_{GS}=0V$ $diF/dt=100A/\mu s$	---	205	---	ns
Q_{rr}	Reverse recovery charge		---	1.4	---	nC
I_{rrm}	Peak Reverse Recovery Current		---	12	---	A

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

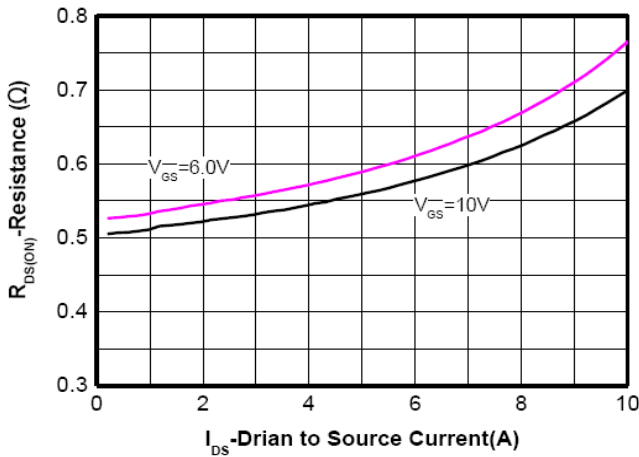
Note ⑤: Guaranteed by design, not subject to production testing.

650V Super Junction Power MOSFET
Typical Characteristics

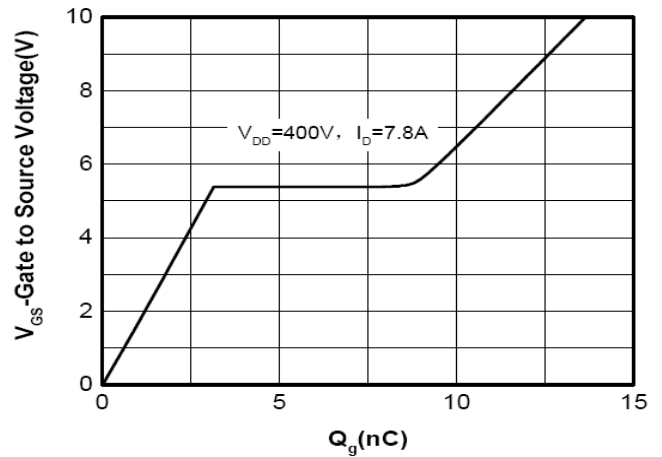
Typ. transfer characteristics


 Typ. output characteristics $T_j = 25^\circ C$


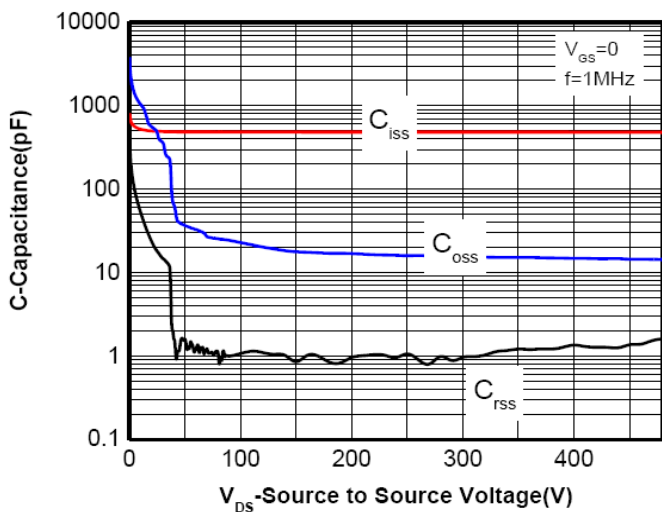
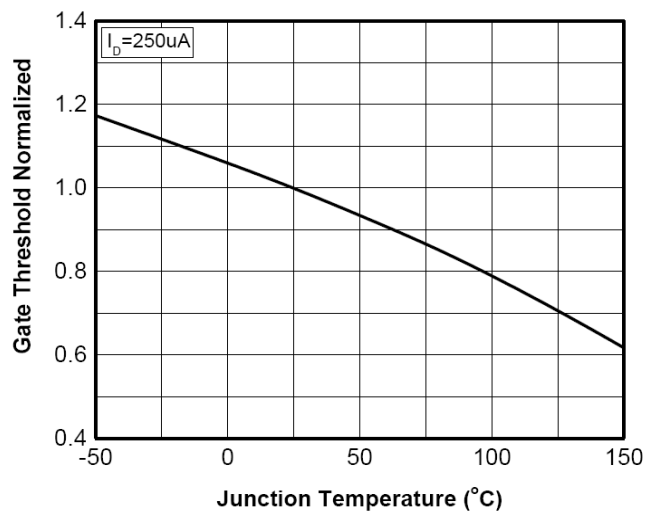
Typ. drain-source on-state resistance



Typ. gate charge characteristics



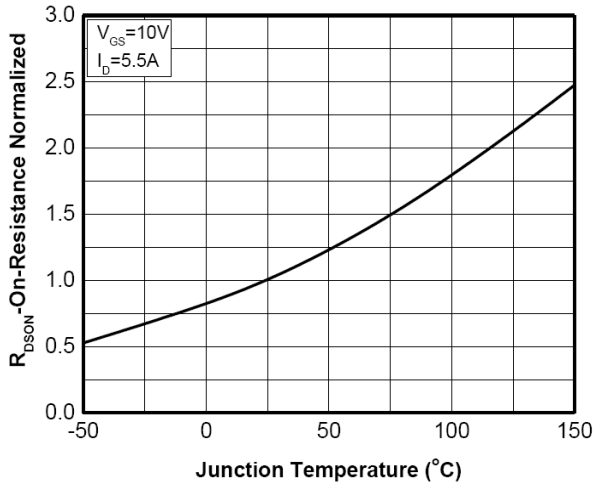
Typ. capacitances


 Normalized $V_{GS(th)}$ characteristics


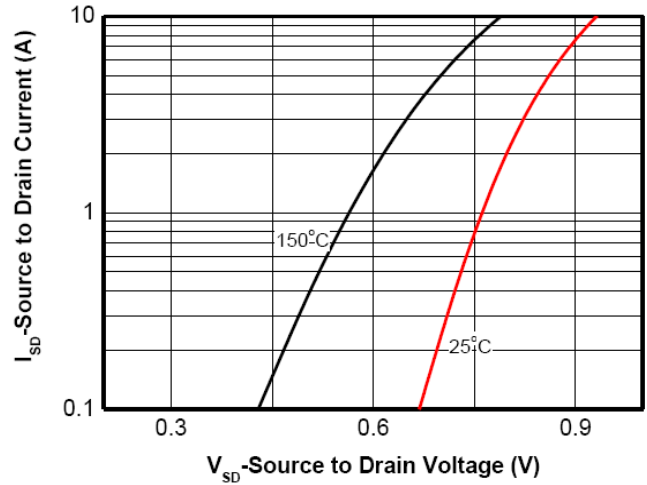


650V Super Junction Power MOSFET

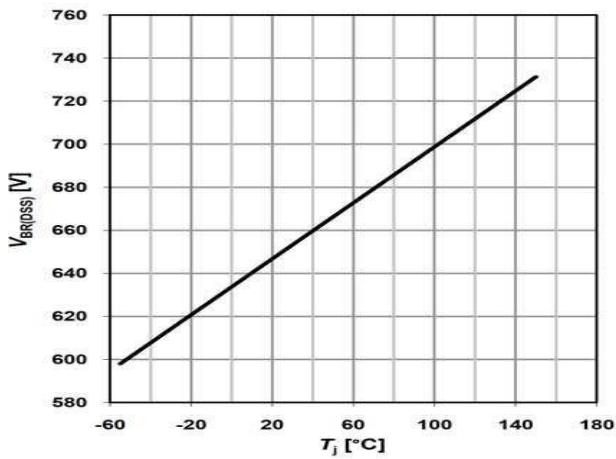
Normalized on-resistance vs temperature



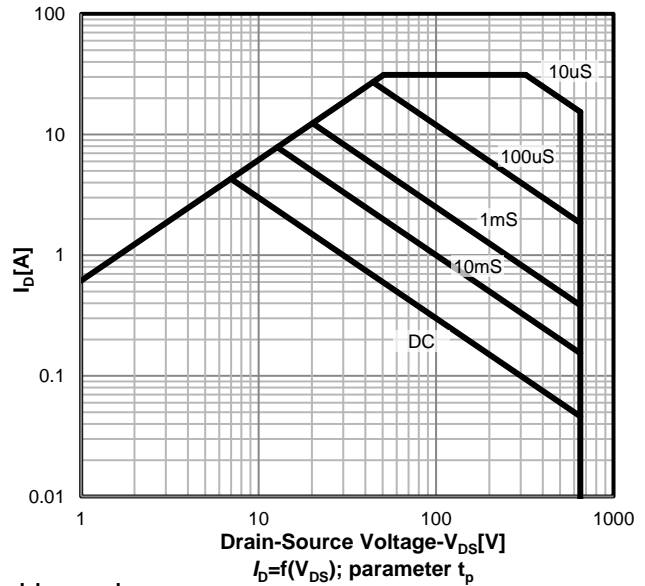
Forward characteristics of reverse diode



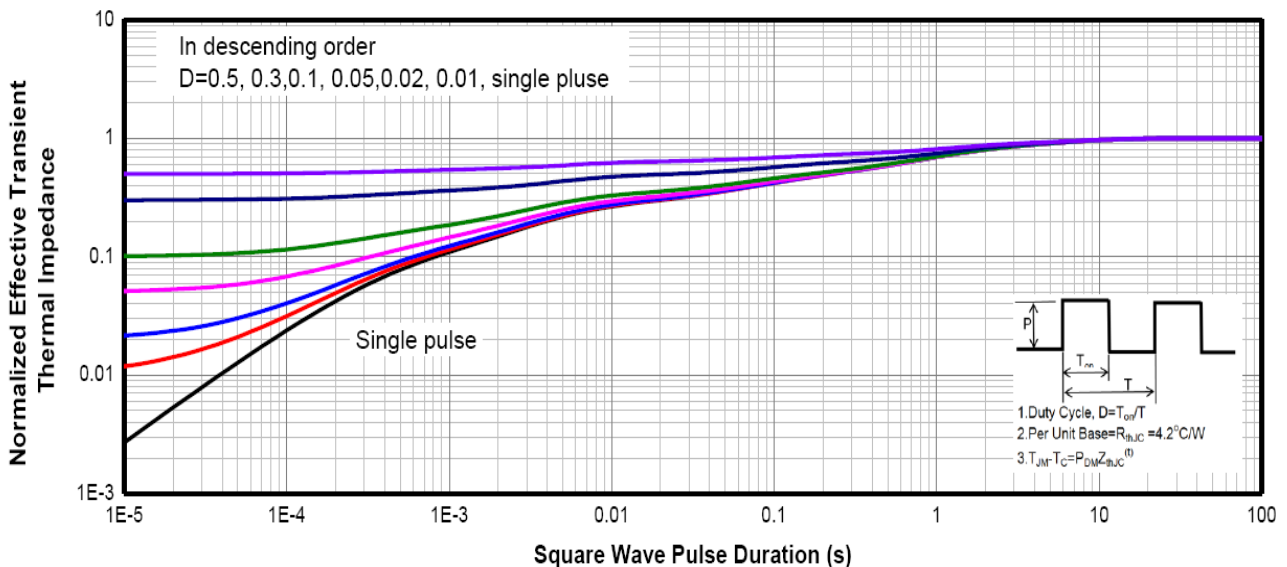
Drain-source breakdown voltage



Safe operating area TC=25 °C



Max. transient thermal impedance



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