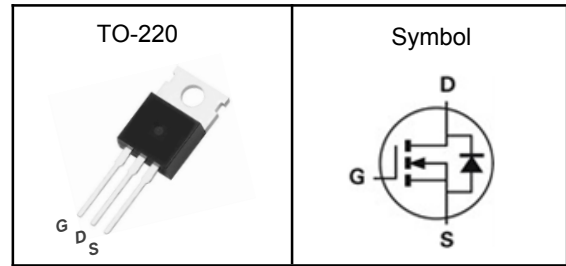


**650V Super Junction Power MOSFET**
**Features**

- Low drain-source on-resistance:  $R_{DS(ON)}=0.23\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode:  $V_{th} = 2.0$  to  $4.0V$
- 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
$R_{DS(ON)-Typ}$	230	m $\Omega$
$I_D$	15	A

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

Symbol	Parameter	N-Channel	Unit
$V_{DSS}$	Drain-Source Voltage	650	V
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	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 <sup>③</sup>	290	mJ
$I_{DM}^{①}$	Pulse Drain Current Tested	45	A
$I_D$	Continuous Drain Current	$T_C=25^\circ C$	A
$P_D$	Maximum Power Dissipation	$T_C=25^\circ C$	W

**Thermal Characteristics**

Symbol	Parameter	Rating	Unit
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>①</sup>	1.6	$^\circ C/W$

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

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

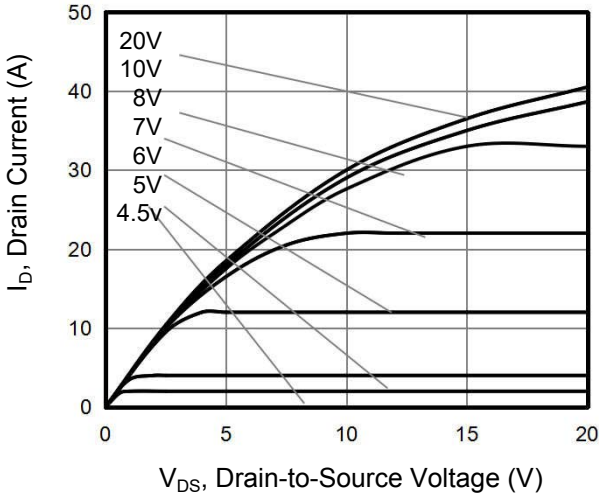
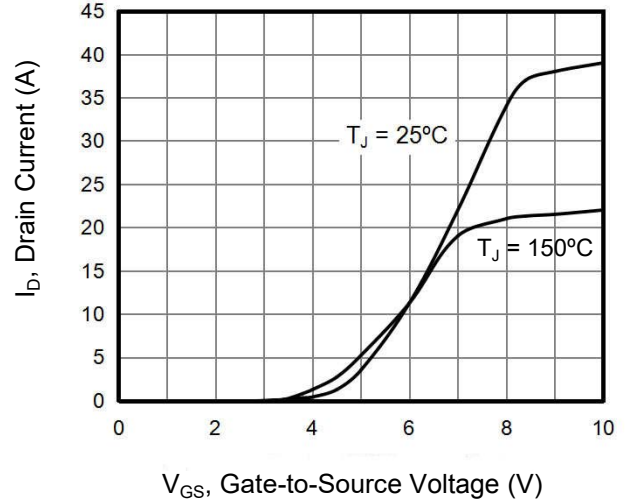
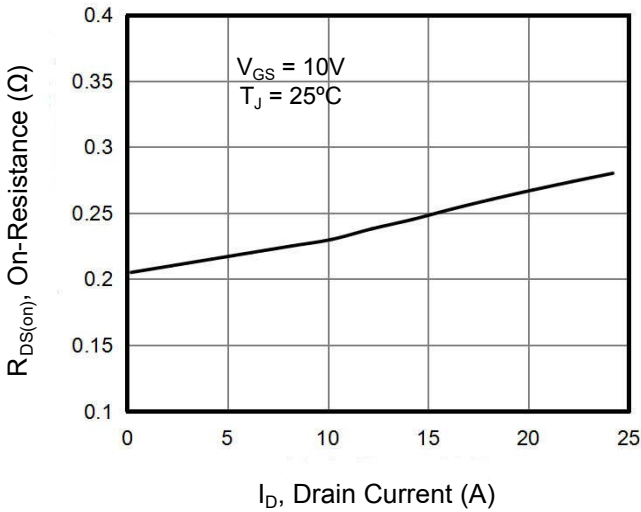
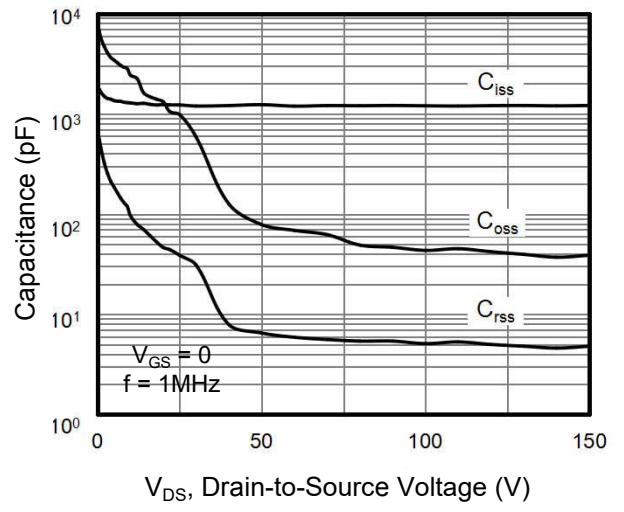
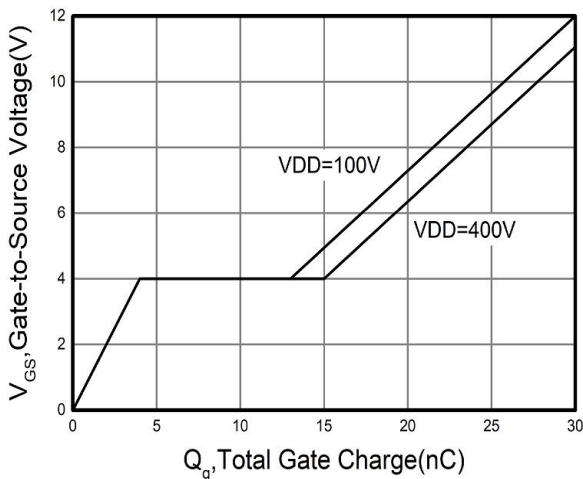
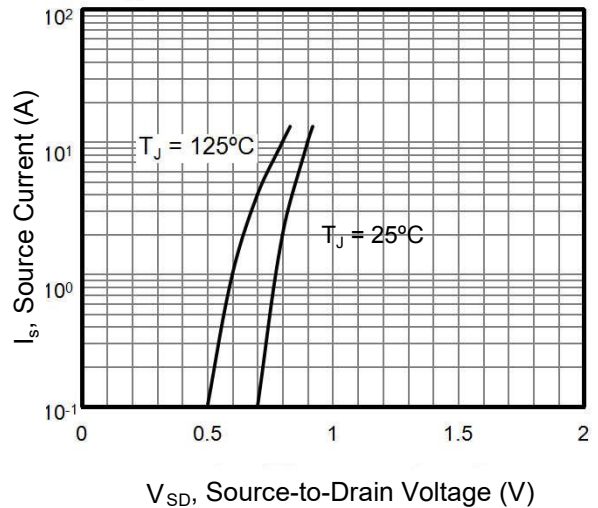
Note ③ : Surface Mounted on  $1in^2$  FR-4 board with 1oz.

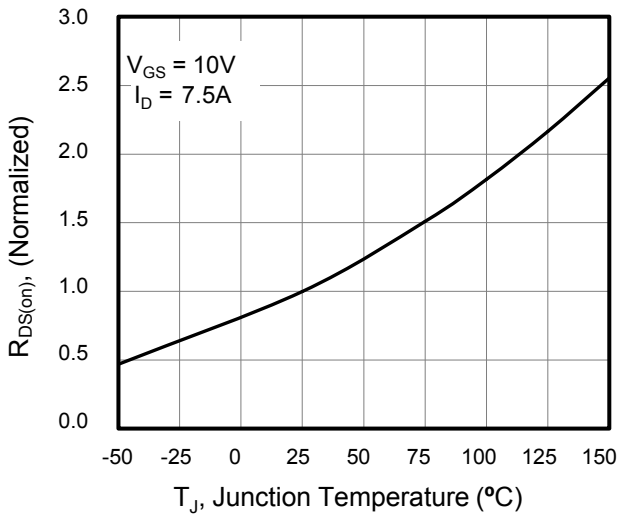
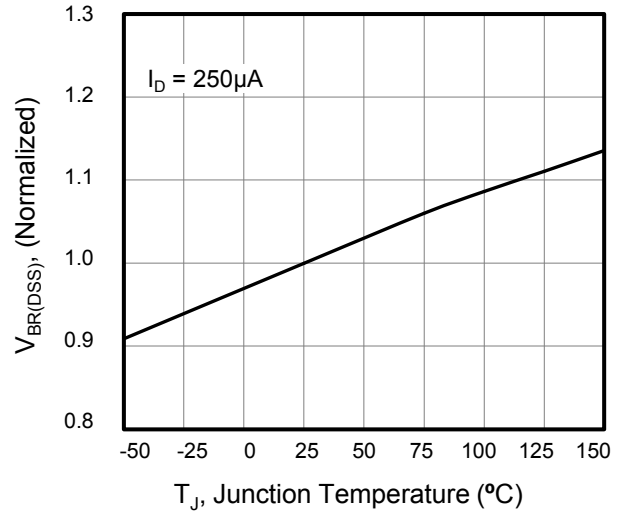
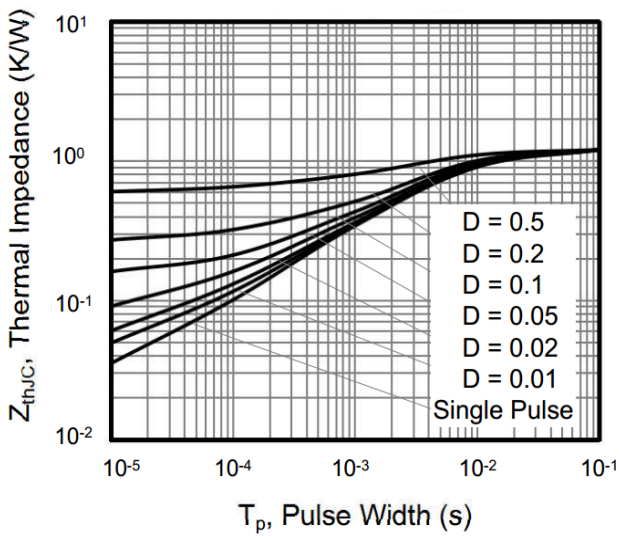
**650V Super Junction Power MOSFET****Electrical Characteristics** ( $T_J=25^\circ\text{C}$ , Unless Otherwise Noted)

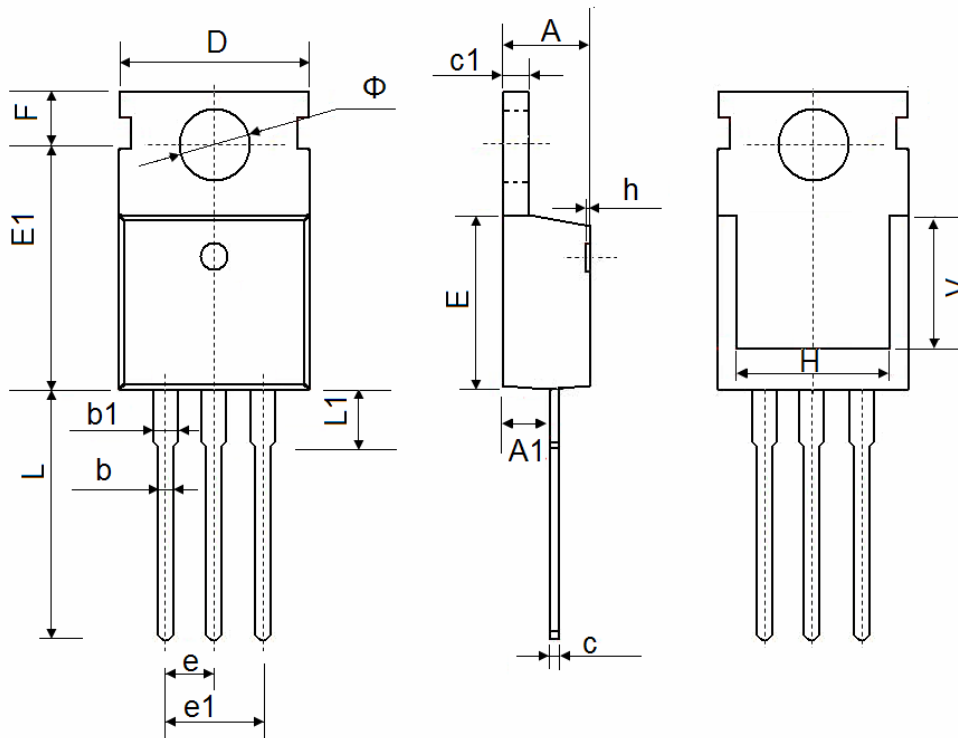
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	---	---	1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	---	4	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=7.5A$	---	230	260	$m\Omega$
<b>Dynamic Characteristics</b> <sup>⑤</sup>						
$C_{iss}$	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	---	$\Omega$
$Q_g$	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	---	
<b>Source-Drain Characteristics</b> ( $T_J=25^\circ\text{C}$ )						
$V_{SD}$ <sup>④</sup>	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**

**Figure 1. Output Characteristics**

**Figure 2. Transfer Characteristics**

**Figure 3. On-Resistance vs. Drain Current**

**Figure 4. Capacitance**

**Figure 5. Gate Charge**

**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**

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


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.350	4.650
A1	2.250	2.550
b	0.710	0.910
b1	1.170	1.400
c	0.330	0.650
c1	1.200	1.400
D	9.910	10.250
E	8.9500	9.750
E1	12.650	12.950
e	2.540 TYP.	
e1	4.980	5.180
F	2.650	2.950
H	7.900	8.100
h	0.000	0.300
L	12.700	13.500
L1	2.850	3.250
V	7.500 REF.	
Φ	3.400	3.800