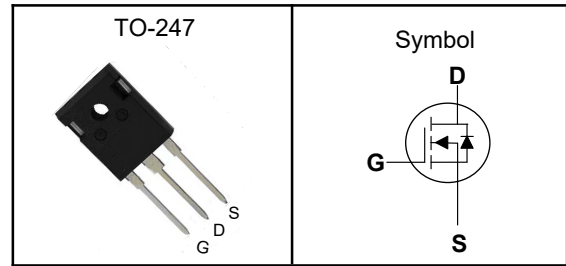


650V Super Junction Power MOSFET
Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.060\Omega(\text{typ})$
- 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
$R_{DS(ON)-Typ}$	60	m Ω
I_D	54	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	793	mJ
$I_{DM}^{①}$	Pulse Drain Current Tested	162	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	62	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ^①	0.73	$^\circ\text{C}/\text{W}$

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

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

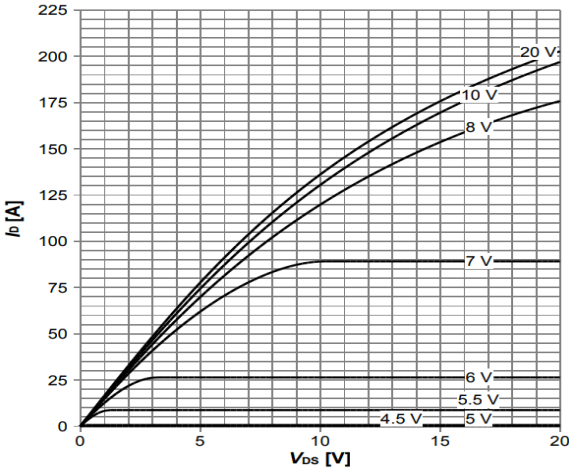
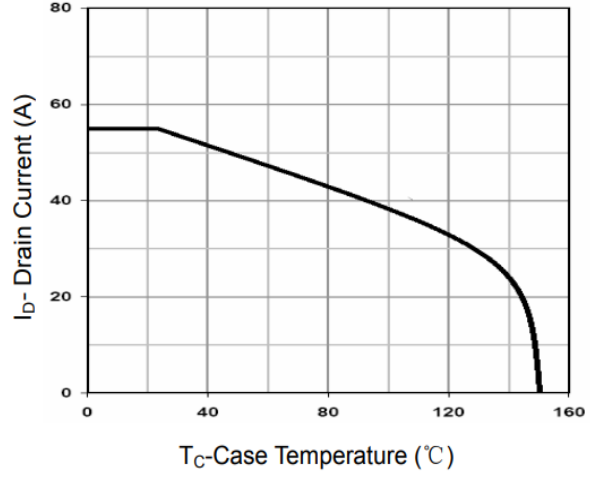
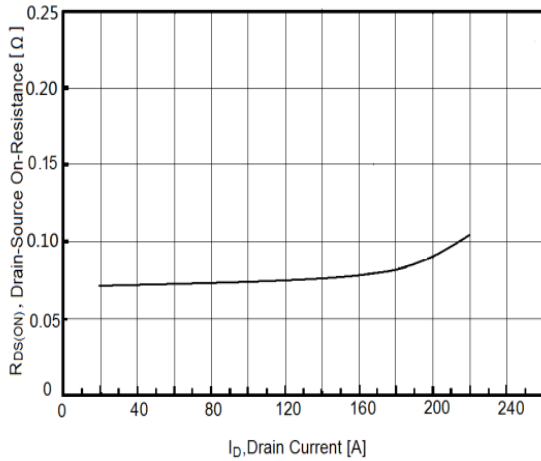
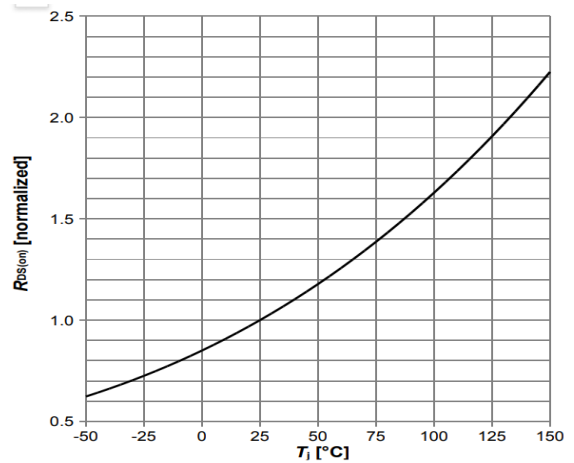
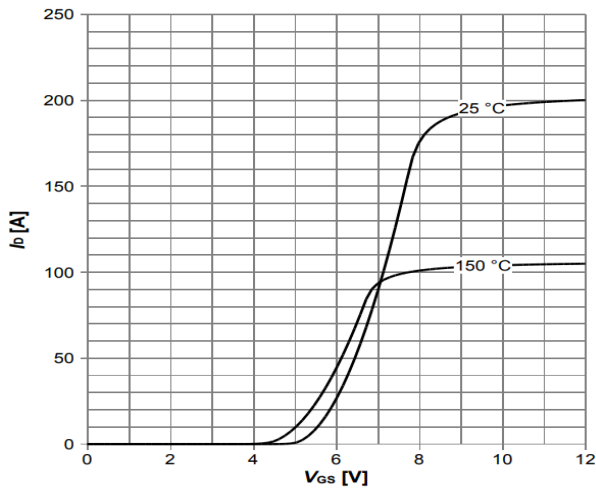
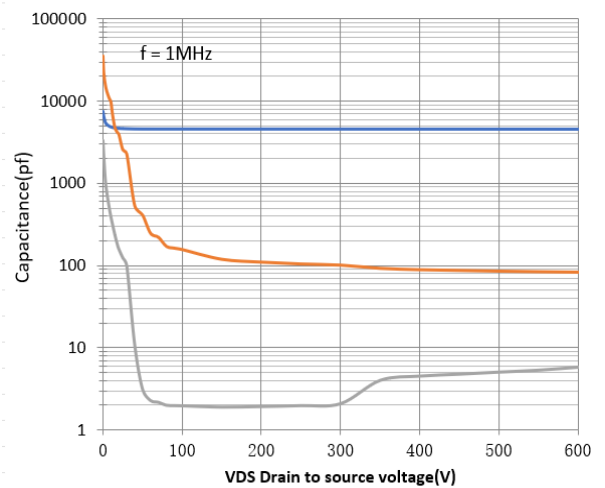
Note ③ : Surface Mounted on 1in^2 FR-4 board with 1oz.

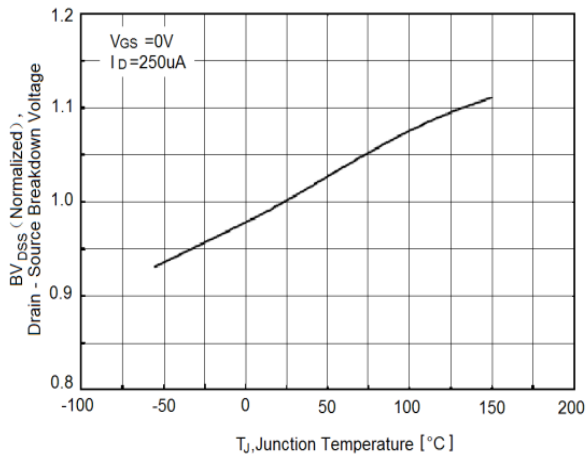
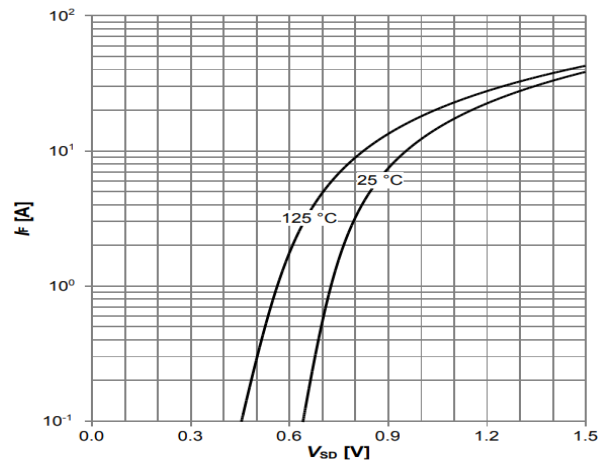
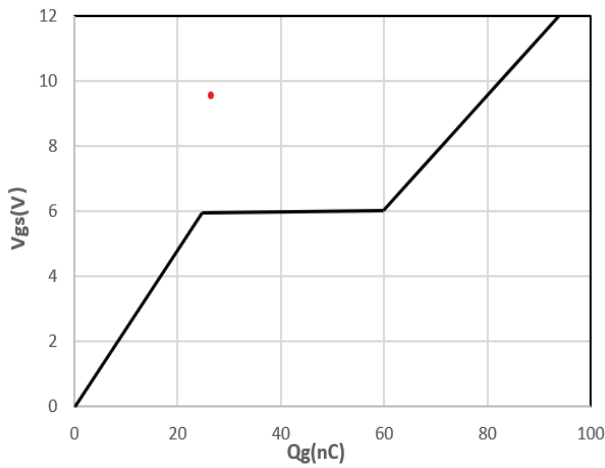
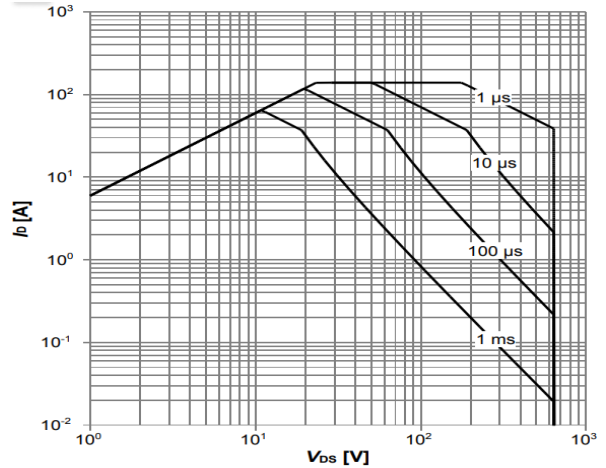
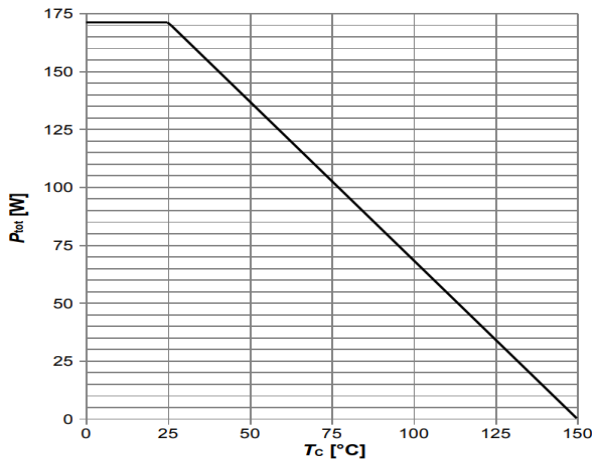
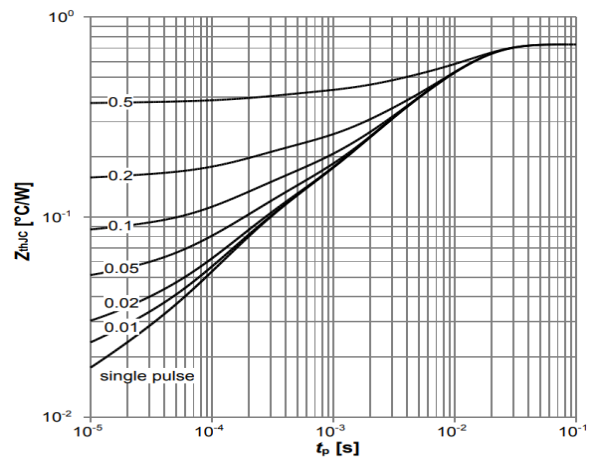
**650V Super Junction Power MOSFET****Electrical Characteristics** ($T_J=25^\circ\text{C}$, Unless Otherwise Noted)

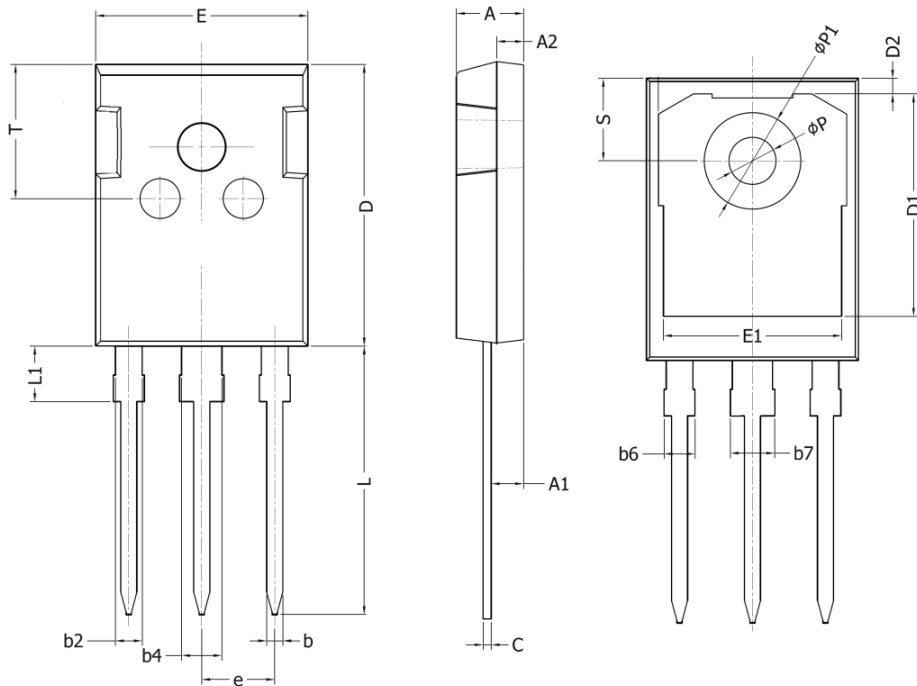
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	---	---	1	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	3	---	5	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	± 100	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=14A$	---	60	72	m Ω
Dynamic Characteristics ^⑤						
C_{iss}	Input Capacitance	$V_{DS}=50V, V_{GS}=0V, \text{Freq.}=1\text{MHz}$	---	4530	---	pF
C_{oss}	Output Capacitance		---	414.3	---	
C_{riss}	Reverse Transfer Capacitance		---	3.08	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DS}=400V, V_{GS}=13V, I_D=17.1A, R_G=5.3\Omega$	---	21.6	---	nS
T_r	Turn-on Rise Time		---	10.7	---	
$T_{d(off)}$	Turn-off Delay Time		---	86.6	---	
T_f	Turn-off Fall Time		---	8.6	---	
Q_g	Total Gate Charge	$V_{DS}=400V, V_{GS}=10V, I_D=17.1A$	---	94	---	nC
Q_{gs}	Gate-Source Charge		---	24.7	---	
Q_{gd}	Gate-Drain Charge		---	34.9	---	
Source-Drain Characteristics						
V_{SD}	Diode Forward Voltage	$I_f=1A, V_{GS}=0V$	---	0.64	---	V
t_{rr}	Reverse Recovery Time	$I_f=33A, V_{GS}=0V, di_f/dt=60A/\mu s$	---	224.4	---	nS
Q_{rr}	Reverse Recovery Charge		---	1.09	---	nC
I_{rrm}	Peak reverse recovery current		---	8.89	---	A

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
Diagram 1: Typ. Output characteristics

Diagram 2: Typ. Drain Current De-rating

Diagram 3: Typ. Rdson vs. Drain Current

Diagram 4: Typ. Rdson – Junction Temperature

Diagram 5: Typ. transfer characteristics

Diagram 6: Typ. Capacitance vs. Vds


650V Super Junction Power MOSFET
Diagram 7: Typ. BVDSS voltage vs. Temperature

Diagram 8: Typ. Source-Drain Diode Forward

Diagram 9: Typ. Gate charge

Diagram 10: Typ. Maximum Safe Operating Area

Diagram 11: Typ. Power Dissipation

Diagram 12: Normalized Transient Impedance


650V Super Junction Power MOSFET
TO-247 Package Outline Dimensions


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.90	5.20
A1	2.31	2.51
A2	1.9	2.1
b	1.16	1.26
b2	1.96	2.06
b4	2.96	3.06
b6	-	2.25
b7	-	3.25
C	0.59	0.66
D	20.90	21.20
D1	16.25	16.85
D2	1.05	1.35
E	15.75	16.10
E1	13.00	13.60
e	5.436 BSC	
L	19.80	20.20
L1	-	4.30
P	3.40	3.60
P1	7.00	7.40
S	6.05	6.25
T	9.80	10.20