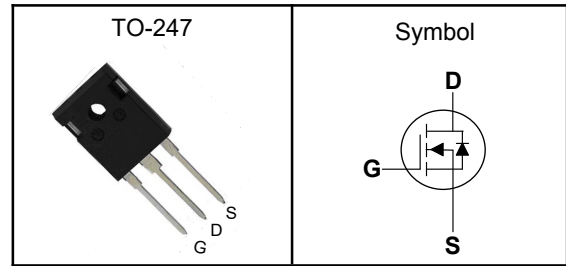


**650V Super Junction Power MOSFET**
**Features**

- Low drain-source on-resistance:  $R_{DS(ON)}=88m\Omega$ (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
$R_{DS(ON)-Typ}$	88	m $\Omega$
$I_D$	38	A

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

Symbol	Parameter	Rating	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>	180	mJ
$I_{DM}^{①}$	300 $\mu s$ Pulse Drain Current Tested	140	A
$I_D$	Continuous Drain Current	38	A
$P_D$	Maximum Power Dissipation	265	W
$I_{AS}$	Avalanche Current	5.2	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400V$	50	V/ns
	Reverse diode dv/dt <sup>3</sup> $V_{DS}=0 \dots 400V, I_{SD} \leq I_D$	50	

**Thermal Characteristics**

Symbol	Parameter	Rating	Unit
$R_{\theta JA}^{③}$	Thermal Resistance Junction-Ambient <sup>1</sup>	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	0.47	$^\circ C/W$

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

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

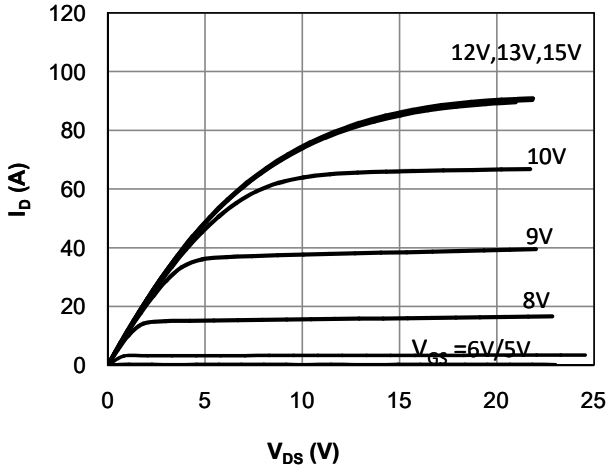
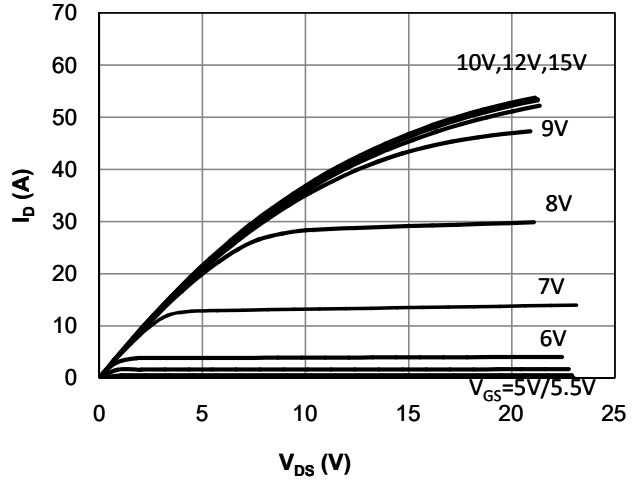
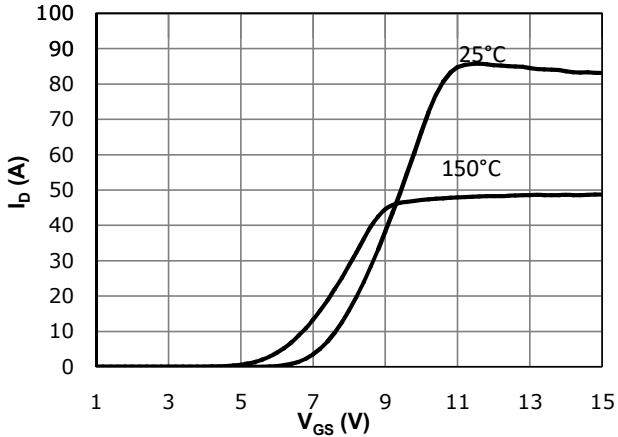
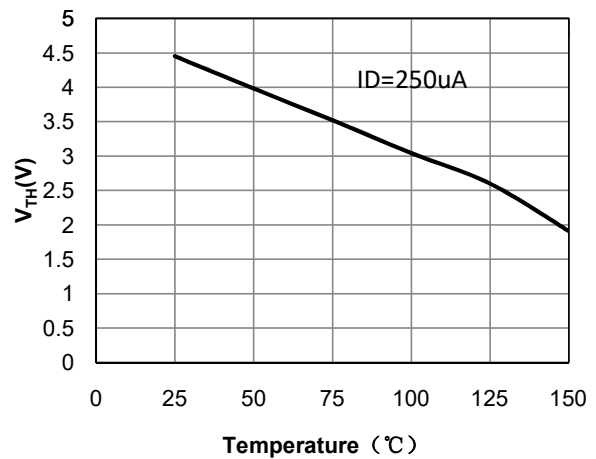
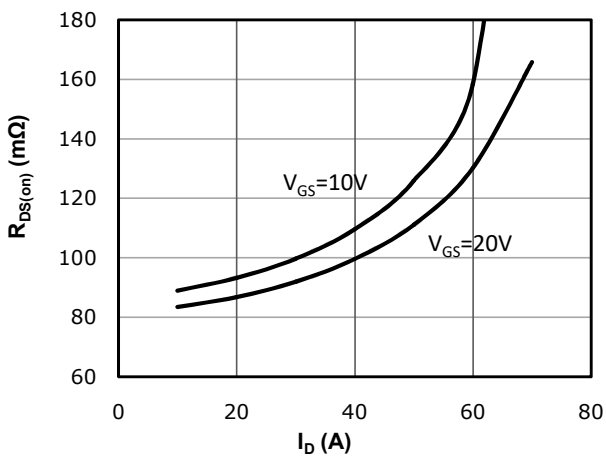
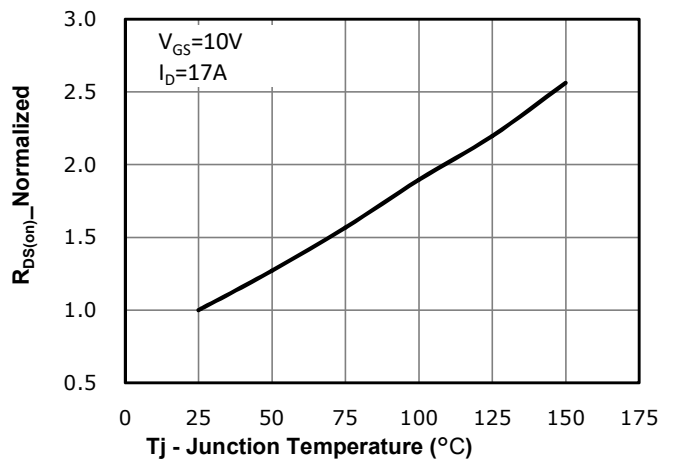
Note ③ : Surface Mounted on  $1in^2$  FR-4 board with 1oz.

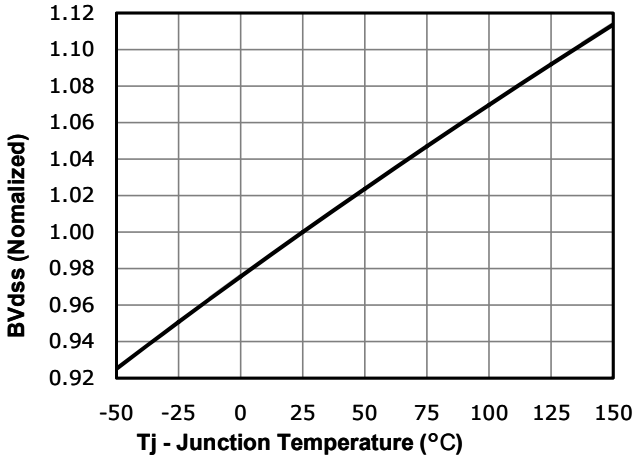
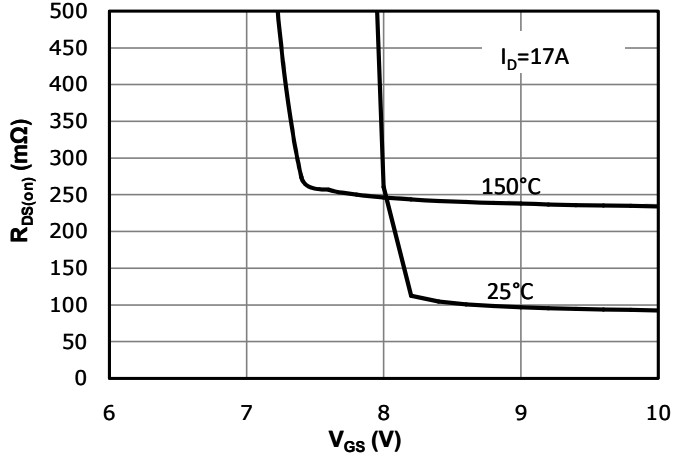
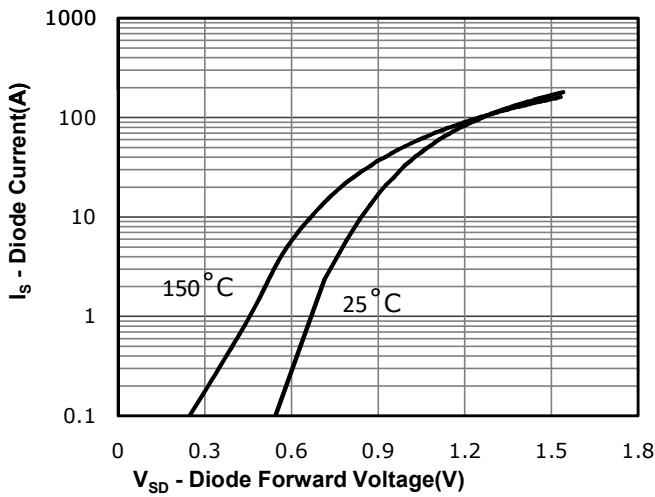
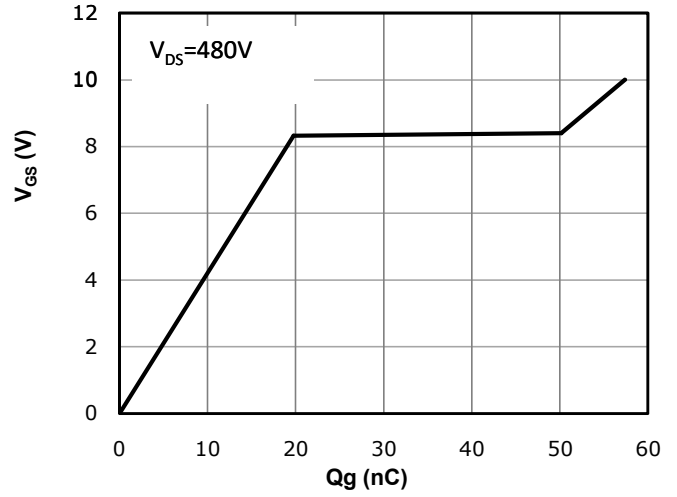
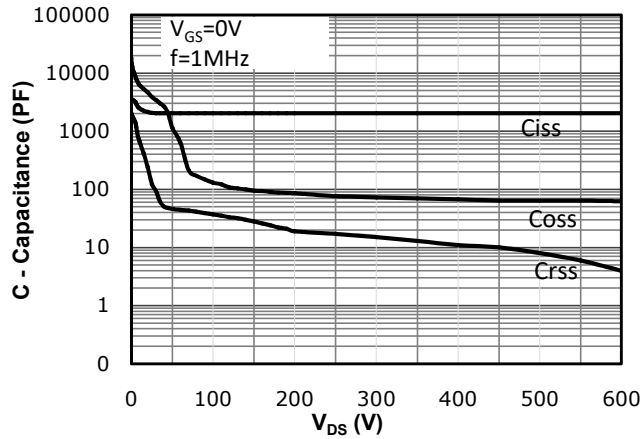
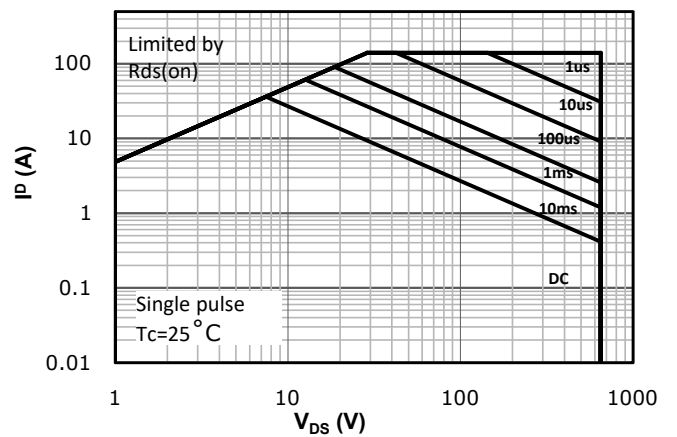
**650V Super Junction Power MOSFET****Electrical Characteristics** ( $T_J=25^\circ\text{C}$ , Unless Otherwise Noted)

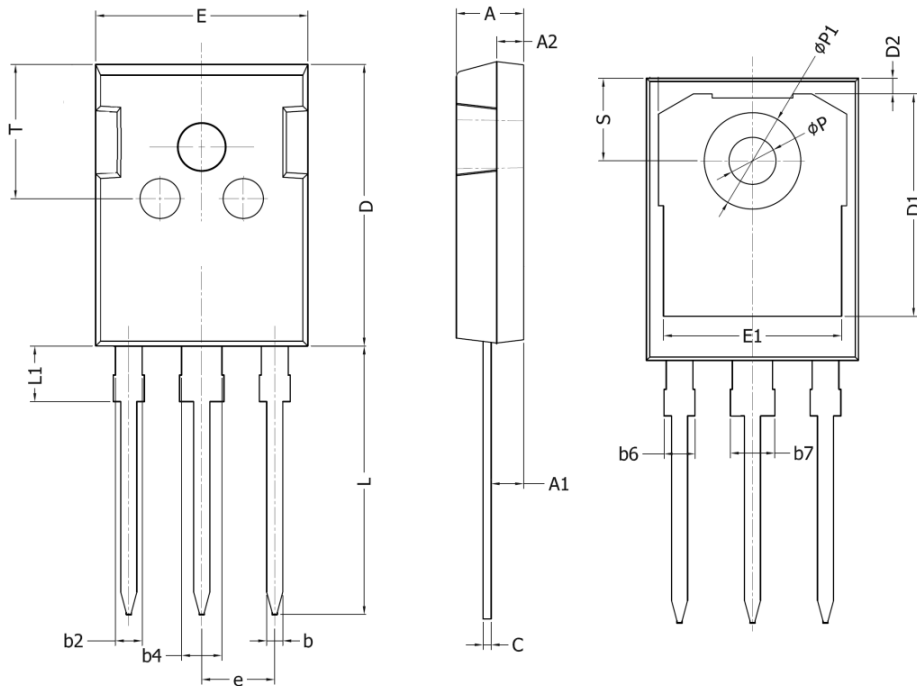
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	650	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=600V, V_{GS}=0V$	---	---	10	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0	---	5.0	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=17A$	---	88	99	$m\Omega$
<b>Dynamic Characteristics</b> <sup>⑤</sup>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=400V,$ Freq.=1MHz	---	2215	---	pF
$C_{oss}$	Output Capacitance		---	95	---	
$C_{rss}$	Reverse Transfer Capacitance		---	8	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DS}=400V, V_{GS}=10V,$ $R_G=10\Omega, I_D=17A$	---	23	---	nS
$T_r$	Turn-on Rise Time		---	12	---	
$T_{d(off)}$	Turn-off Delay Time		---	80	---	
$T_f$	Turn-off Fall Time		---	9	---	
$R_g$	Gate Resistance	$f = 1.0MHz, \text{open drain}$	---	1.2	---	$\Omega$
$Q_g$	Total Gate Charge	$V_{DS}=480V,$ $V_{GS}=10V, I_D=17A$	---	56	---	nC
$Q_{gs}$	Gate-Source Charge		---	18	---	
$Q_{gd}$	Gate-Drain Charge		---	28	---	
<b>Source-Drain Characteristics</b> ( $T_J=25^\circ\text{C}$ )						
$V_{SD}$ <sup>④</sup>	Diode Forward Voltage	$I_S=17A, V_{GS}=0V$	---	0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS}=0V, I_F=17A,$ $di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	135	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	0.94	---	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**
**Fig 1. Output Characteristics (Tj=25°C)**

**Fig 2. Output Characteristics (Tj=150°C)**

**Fig 3: Transfer Characteristics**

**Fig 4: V<sub>TH</sub> Vs Tj Temperature Characteristics**

**Fig 5: R<sub>DS(on)</sub> Vs Ids Characteristics (Tc=25°C)**

**Fig 6: R<sub>DS(on)</sub> vs. Temperature**


**650V Super Junction Power MOSFET**
**Fig 7: BVDSS vs. Temperature**

**Fig 8: Rds(on) vs Gate Voltage**

**Fig 9: Body-diode Forward Characteristics**

**Fig 10: Gate Charge Characteristics**

**Fig 11: Capacitance Characteristics**

**Fig 12: Safe Operating Area**


**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