650V Super-junction Power MOSFET

V_{DSS}	650V
I_D	11A
$R_{DS(ON)_Typ.}$@V_{GS}=10V	300mΩ

DESCRIPTION：

·Lowest FOM $R_{DS(on)}$ *Qg and $R_{DS(on)}$ *E_{oss}

·100% avalanche tested

·Very High Commutation Ruggedness

·Easy to use/drive

·Extremely Stability and Uniformity



TO-220FW

TYPICAL APPLICATIONS：

·LED Lighting

·Telecom and UPS

·TV Power

·Server Power

·Switched Mode Power Supplies

MAXIMUM RATINGS (at T_C = 25 °C, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	Tc=25℃ Tc=100℃	I_D	11 7	A
Pulsed Drain Current (2)		$I_{D\ pulse}$	33	A
Avalanche Current, Single Pulse(3)		I_{AR}	3.3	A
Avalanche Energy, Single Pulse (3)		E_{AS}	54	mJ
Avalanche Energy, Repetitive(2)		E_{AR}	0.6	mJ
Power Dissipation		Ptot	50	W
Continuous Diode Forward Current		I_S	11	A
Diode Pulsed Current (1)		$I_{S\ pulse}$	33	A
Reverse Diode dv/dt		dv/dt	50	V/ns
Maximum Temperature for Soldering		T_L	260	℃
Junction & Storage temperature Range		T_J, T_{STG}	-55~+150	℃
Thermal resistance,	Junction to Ambient Junction to Case	$R_{\theta JA}$ $R_{\theta JC}$	41 2.5	℃/W

Notes： 1. Calculated continuous current based on maximum allowable junction temperature.

2. Repetitive rating; pulse width limited by max. junction temperature

3. L=10mH, VDD=50V, RG=10Ω, Tj=25°C

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage VGS = 0V, ID = 250uA	$V_{(BR)DSS}$	650			V
Drain-Source On-State Resistance VGS = 10V, ID = 5.5A, Tj=25°C VGS = 10V, ID = 5.5A, Tj=150°C	$R_{DS(on)}$		300 680	360	mΩ
Gate-Source threshold voltage VDS = VGS, ID = 250uA	$V_{GS(th)}$	2.50	3.60	4.50	V
Zero Gate Voltage Drain Current VDS = 650 V, VGS = 0 V ,Tj=25℃ VDS = 650 V, VGS = 0 V ,Tj=150℃	I_{DSS}			1 100	uA
Gate-Source Leakage Current VGS = 30V, VDS = 0V	I_{GSS}			100	nA
Gate Resistance f=1MHz	R_G		3.0		Ω
Trans conductance VDS=10V, ID=5.5A	gfs		10		S
Input capacitance f=100KHz, VDS=50 V, VGS=0 V	C_{iss}		810		pF
Output capacitance f=100KHz, VDS=50 V, VGS=0 V	C_{oss}		45		pF
Reverse transfer capacitance f=100KHz, VDS=50 V, VGS=0 V	C_{rss}		1.25		pF
Effective Output Capacitance, Energy Related VGS=0V, VDS=0 to 400V	$C_{O(er)}$		32.8		pF
Effective Output Capacitance, Time Related VGS=0V, VDS=0 to 400V, ID=Constant	$C_{O(tr)}$		167.6		pF
Total Gate Charge VDS= 480V, ID= 5.5A,VGS= 0 to 10V	Q_G		16		nC
Gate to Source Charge VDS= 480V, ID= 5.5A,VGS= 0 to 10V	Q_{GS}		4		nC
Gate to Drain Charge VDS= 480V, ID= 5.5A,VGS= 0 to 10V	Q_{GD}		5		nC
Gate Plateau Voltage VDS= 480V, ID= 5.5A,VGS= 0 to 10V	$V_{plateau}$		5		V
Turn-on delay time VDD=400 V, ID=5.5A, VGS=10V, R_{GEN}=4.7Ω	td (ON)		28		ns
Rise time VDD=400 V, ID=5.5A, VGS=10V, R_{GEN}=4.7Ω	tr		8		ns
Turn-off delay time VDD=400 V, ID=5.5A, VGS=10V, R_{GEN}=4.7Ω	td (OFF)		32		ns
Fall time VDD=400 V, ID=5.5A, VGS=10V, R_{GEN}=4.7Ω	tf		6		ns
Diode Forward Voltage VGS = 0V, I_S =5.5A	V_{SD}		0.85	1.2	V
Revers Recovery Time V_R=100V,I_F=5.5A, di_F/dt = 100A/us	Trr		190		ns
Revers Recovery Charge V_R=100V,I_F=5.5A, di_F/dt = 100A/us	Qrr		1.6		nC
Peak Reverse Recovery Current V_R=100V,I_F=5.5A, di_F/dt = 100A/us	Irrm		15		A

Typical Performance Characteristics

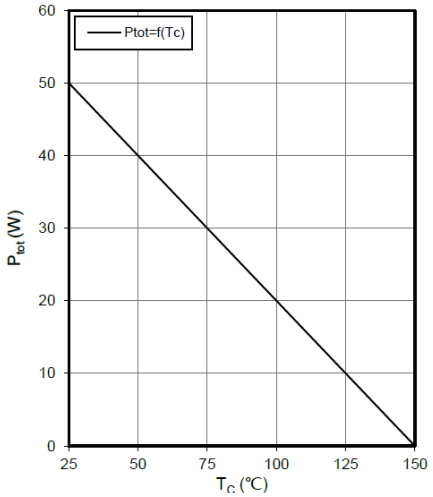


Figure 1. Power Dissipation
Ptot=f(TC); Tj≤150°C;

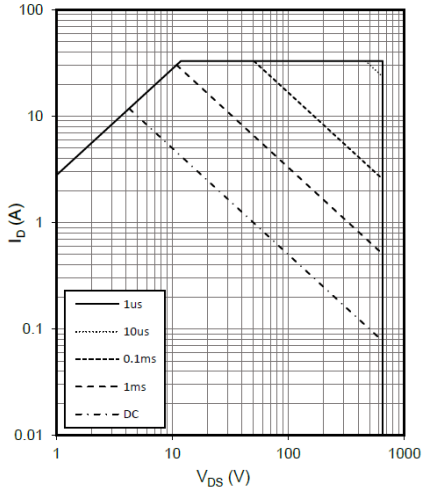


Figure 2. Safe Operating Area
ID=f(VDS); TC=25°C; Parameter: tp

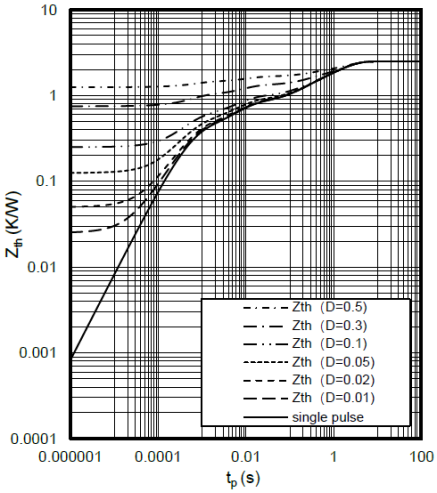


Figure 3. Max. Transient Thermal Impedance
Zthjc=f(tp); Parameter: D=tp/T

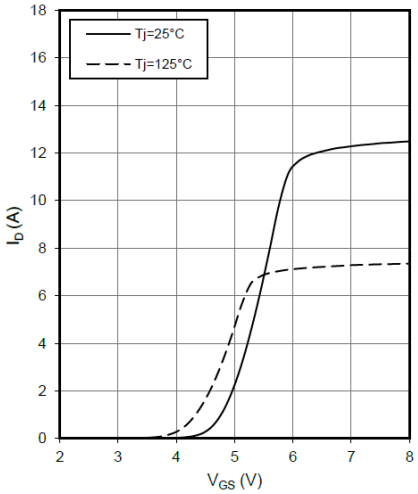


Figure 4. Typ. Transfer Characteristics
ID=f(VGS); VDS=6V; Parameter: Tj

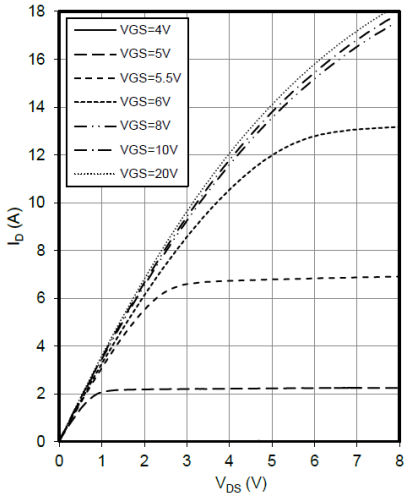


Figure 5. Typ. Output Characteristics
ID=f(VDS); Tj=25°C; Parameter: VGS

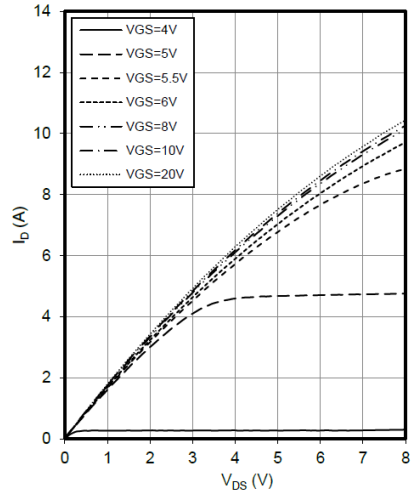


Figure 6. Body Diode Forward Voltage
ID=f(VDS); Tj=125°C; Parameter: VGS

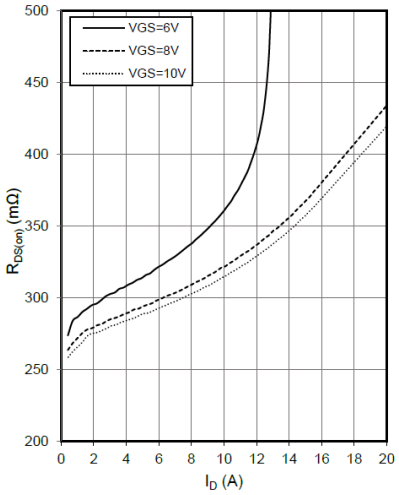


Figure 7. RDS(on) vs. Drain Current
RDS(on)=f(ID); Tj=25°C; Parameter: VGS

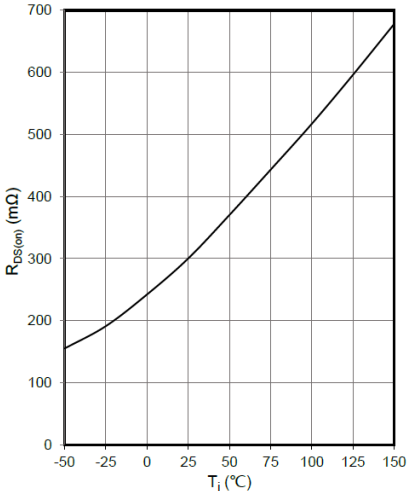


Figure8. RDS(on) vs. Case Temperature
RDS(on)=f(Tj); VGS=10V; ID=5.5A;

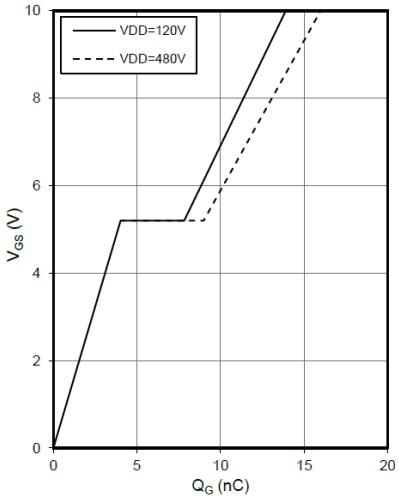


Figure 9. Typ. Gate Charge
VGS=f(Qg); ID=5.5A pulsed; Parameter: VDD

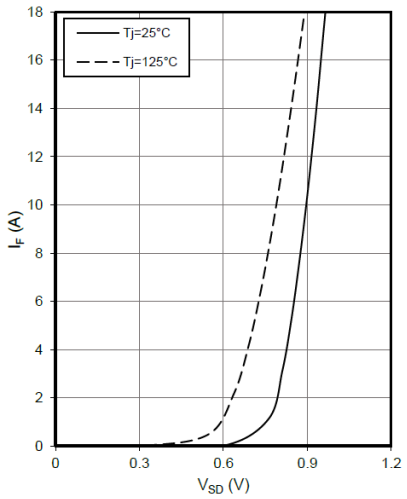


Figure 10. Typ. Body Diode Current vs. Voltage
IF=f(VSD); Parameter: Tj

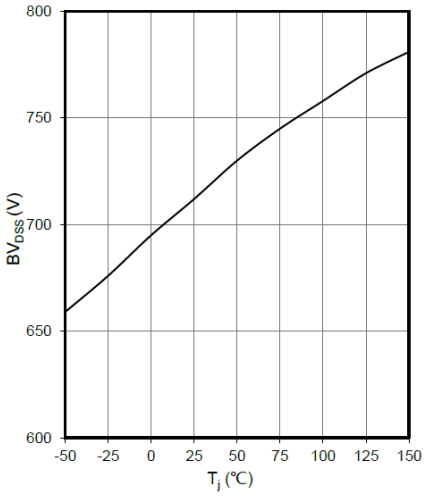


Figure 11. Typ. Drain-Source Breakdown Voltage vs. Case Temperature
VDS=f(Tj); ID=250μA;

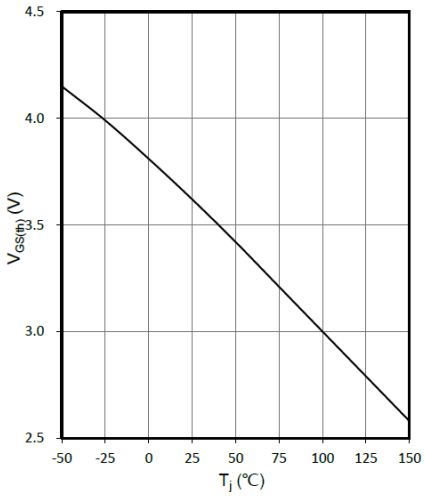


Figure 12. Gate Threshold Voltage vs. Case Temperature
VGS=f(Tj); ID=250μA;

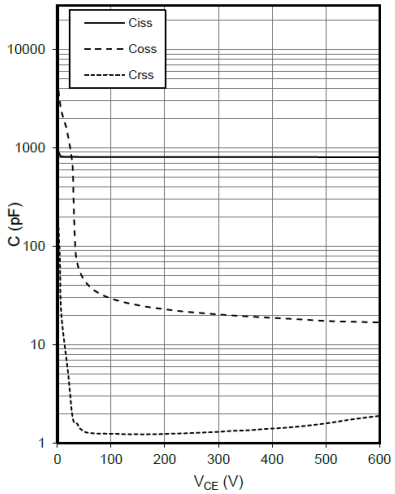


Figure 13. Typ. Capacitances
C=f(VDS); VGS=0V, f=100kHz;

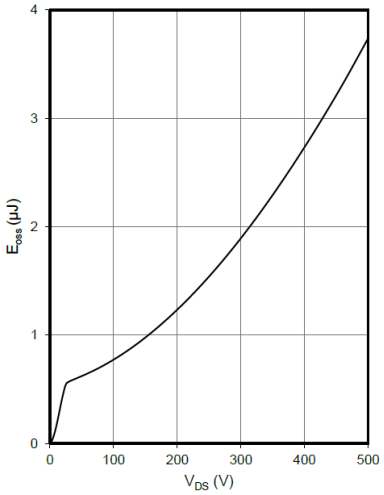
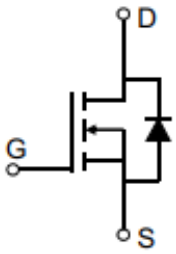
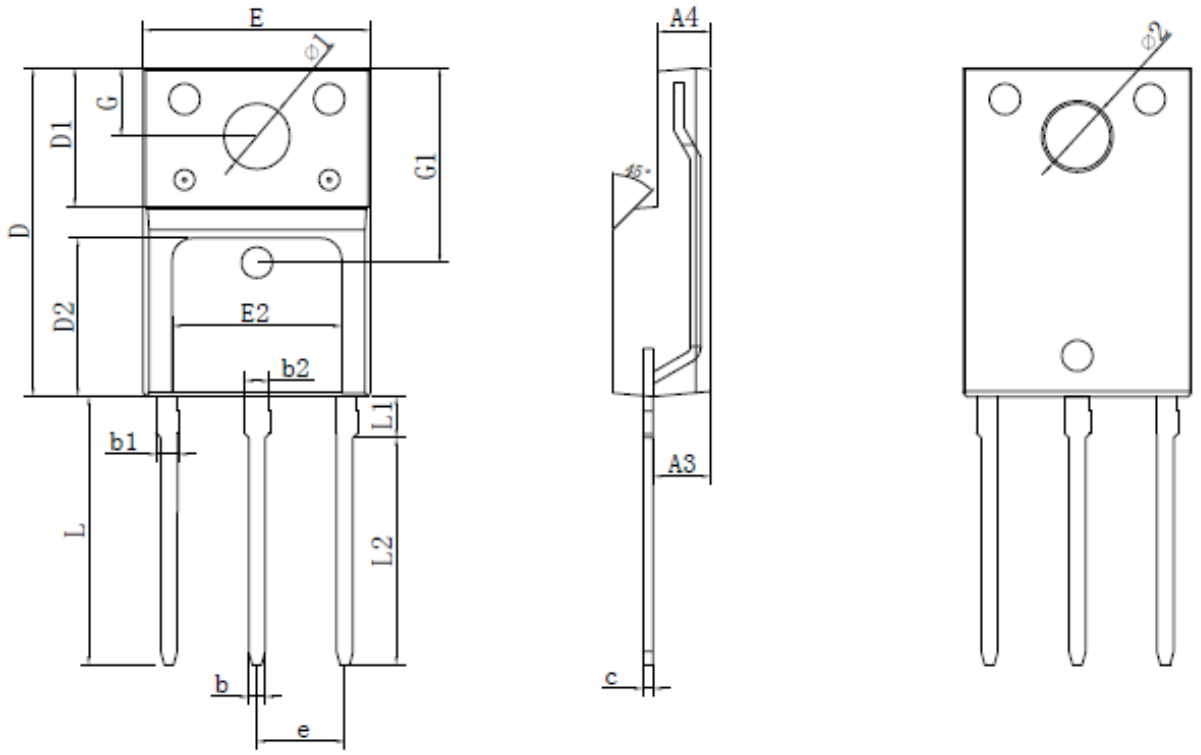


Figure 14. Typ. Coss Stored Energy
EOSS=f(VDS);

·Circuit diagram



·Package outlines : Dimensions in (mm)





symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
E	10.70	11.00	11.30	0.421	0.433	0.445
D	15.57	15.87	16.17	0.613	0.625	0.637
D1	6.40	6.70	7.00	0.252	0.264	0.276
D2	7.40	7.65	7.90	0.291	0.301	0.311
G	3.10	3.30	3.50	0.122	0.130	0.138
G1		9.35 BSC			0.368 BSC	
E2	7.90	8.20	8.50	0.311	0.323	0.335
L	12.68	12.98	13.28	0.499	0.511	0.523
L1	1.75	2.00	2.25	0.069	0.079	0.089
L2	10.68	10.98	11.28	0.420	0.432	0.444
b	0.75	0.80	0.90	0.030	0.031	0.035
b1	0.98	1.08	1.26	0.039	0.043	0.050
b2		1.25			0.049	
A2	4.50	4.70	4.90	0.177	0.185	0.193
A3	2.65	2.76	2.95	0.104	0.109	0.116
A4	2.34	2.54	2.74	0.092	0.100	0.108
e		4.25 BSC			0.167 BSC	
c	0.40	0.50	0.60	0.016	0.020	0.024
Ø1	2.95	3.15	3.35	0.116	0.124	0.132
Ø2	3.20	3.40	3.60	0.126	0.134	0.142

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