650V SuperJunction Power MOSFET

Features

- Extremely Low Gate Charge
- Excellent Output Capacitance (C_{oss}) Profile
- Fast Switching Capability
- 100% UIS Tested, 100% R_g Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

Product Summary

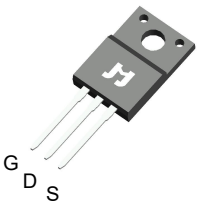
Parameter	Value	Unit
V_{DS}	650	V
$V_{GS(th)\_Typ}$	3.5	V
I_D (@ V_{GS} = 10V) (1)	12.0	A
$R_{DS(ON)\_Typ}$ (@ V_{GS} = 10V)	260	mΩ
E_{oss}@400V	4.59	μJ

Applications

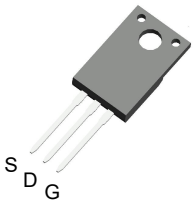
- Telecom / Server Power Supplies
- Industrial Power Supplies
- UPS / Solar
- Lighting / Charger / Adapter

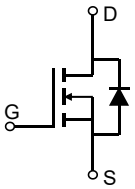
TO-220FP-3L

Top View



Bottom View





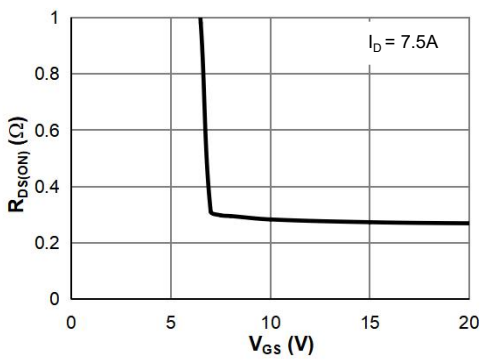
Ordering Information

Device	Package	# of Pins	Marking	MSL	T_J (°C)	Media	Quantity (pcs)
JMH65R290AF-U	TO-220FP-3L	3	H65R290A	NA	-55 to 150	Tube	50

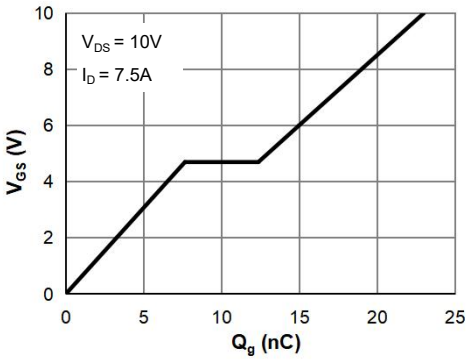
Absolute Maximum Ratings (@ T_A = 25°C unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DS}	650	V
Gate-to-Source Voltage		V_{GS}	±25	V
Continuous Drain Current (1)	T_C = 25°C	I_D	12.0	A
	T_C = 100°C		8.0	
Pulsed Drain Current (2)		I_{DM}	48	A
Avalanche Current (3)		I_{AS}	5.2	A
Avalanche Energy (3)		E_{AS}	135	mJ
Power Dissipation (4)	T_C = 25°C	P_D	31	W
	T_C = 100°C		13	
Junction & Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

$R_{DS(ON)}$ vs. V_{GS}



Gate Charge



Electrical Characteristics (@ T_J = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = 250μA, V_{GS} = 0V	650			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0V			1.0	μA
Gate-Body Leakage Current	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V			±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	3.5	4.5	V
Static Drain-Source ON-Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 7.5A		260	290	mΩ
Diode Forward Voltage	V_{SD}	I_S = 1A, V_{GS} = 0V		0.75		V
Diode Continuous Current	I_S	T_C = 25°C			10	A
DYNAMIC PARAMETERS (5)						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 325V, f = 1MHz		1056		pF
Output Capacitance	C_{oss}			31		pF
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0...400V		57		pF
Effective output capacitance, time related	$C_{o(tr)}$	ID=constant, V_{GS}=0V, V_{DS}=0...400V		182		pF
Reverse Transfer Capacitance	C_{rss}	V_{GS} = 0V, V_{DS} = 325V, f = 1MHz		10.0		pF
Gate Resistance	R_g	f = 1MHz		9.3		Ω
SWITCHING PARAMETERS (5)						
Total Gate Charge (@ V_{GS} = 10V)	Q_g	V_{GS} = 0 to 10V V_{DS} = 325V, I_D = 7.5A		22		nC
Gate Source Charge	Q_{gs}			7.8		nC
Gate Drain Charge	Q_{gd}			7.2		nC
Turn-On DelayTime	$t_{D(on)}$	V_{GS} = 10V, V_{DS} = 325V R_L = 43Ω, R_{GEN} = 6Ω		15.4		ns
Turn-On Rise Time	t_r			12.0		ns
Turn-Off DelayTime	$t_{D(off)}$			58		ns
Turn-Off Fall Time	t_f			55		ns
Body Diode Reverse Recovery Time	t_{rr}	I_F = 7.5A, dI_F/dt = 100A/μs		280		ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_F = 7.5A, dI_F/dt = 100A/μs		3.42		μC
Peak Diode Recovery Voltage Slope	dv/dt	I_F≤8A, di/dt = 200A/us, V_{DS} = 400V		15		V/ns
MOSFET dv/dt Ruggedness	dv/dt	V_{DS} = 0...400V		50		V/ns

Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	55	68	°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.5	4.0	°C/W

Notes:

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under T_{J_Max} = 150°C.
3. This single-pulse measurement was taken under the following condition [L = 10mH, V_{GS} = 10V, V_{DS} = 50V] while its value is limited by T_{J_Max} = 150°C.
4. The power dissipation P_D is based on T_{J_Max} = 150°C.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Electrical & Thermal Characteristics

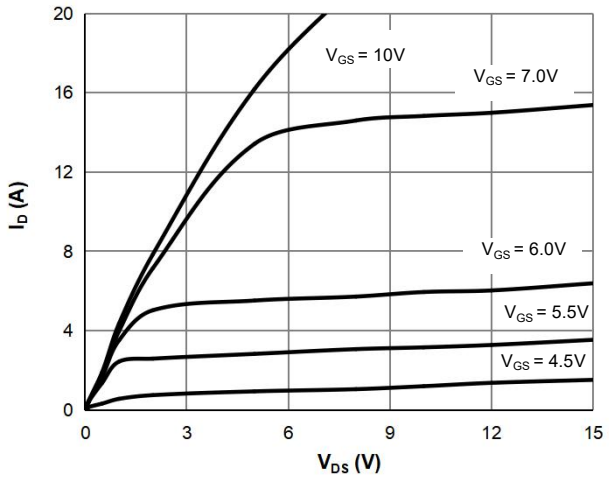


Figure 1: Saturation Characteristics

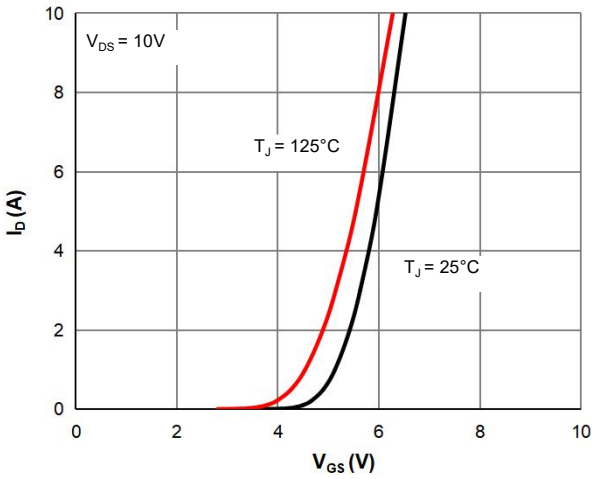


Figure 2: Transfer Characteristics

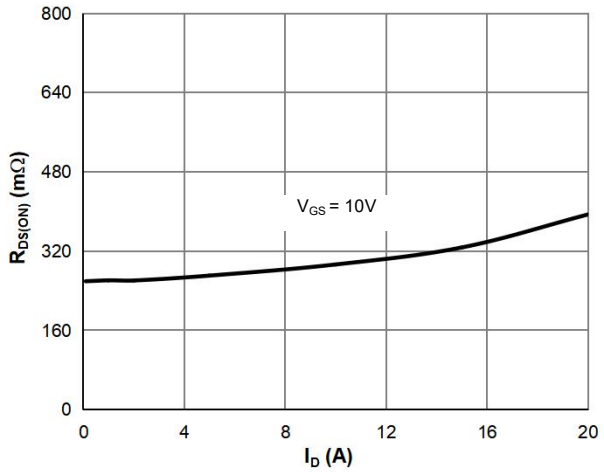


Figure 3: $R_{DS(ON)}$ vs. Drain Current

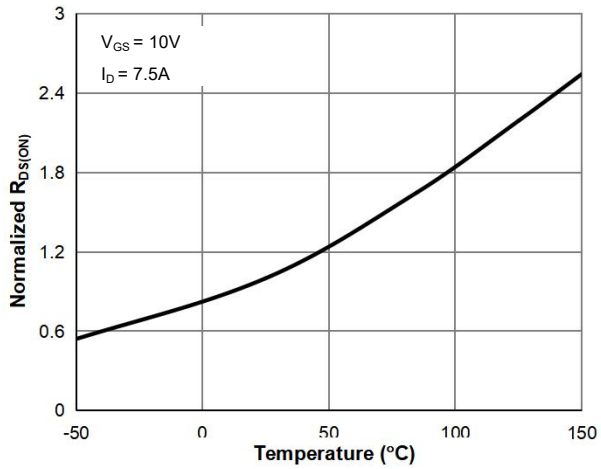


Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

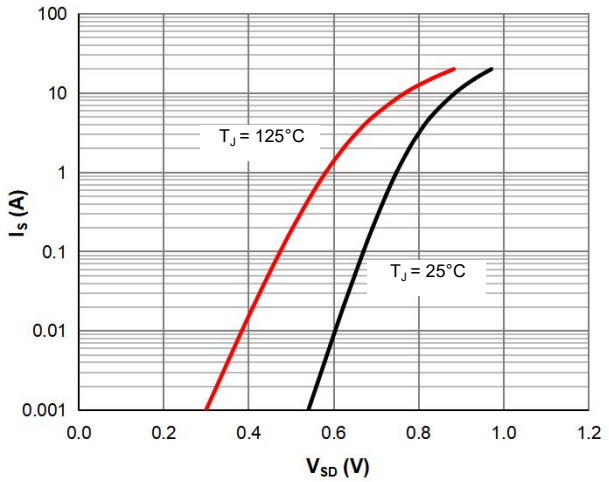


Figure 5: Body-Diode Characteristics

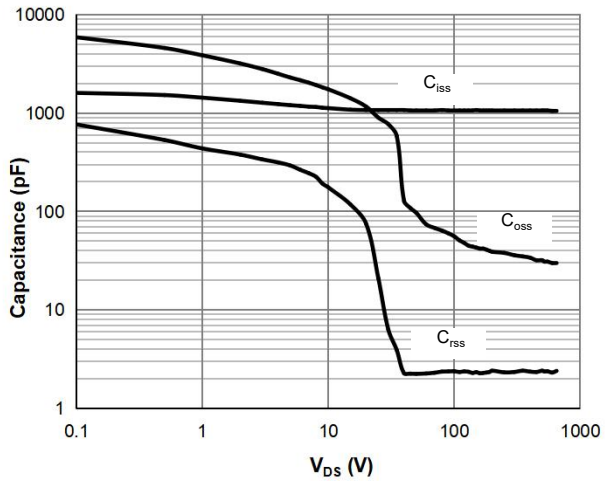


Figure 6: Capacitance Characteristics

Typical Electrical & Thermal Characteristics

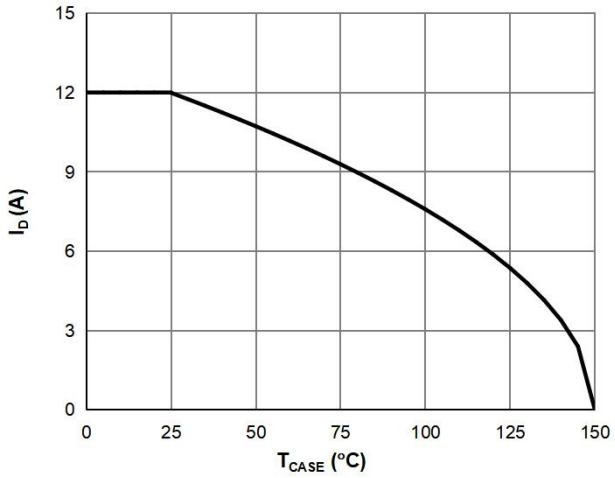


Figure 7: Current De-rating

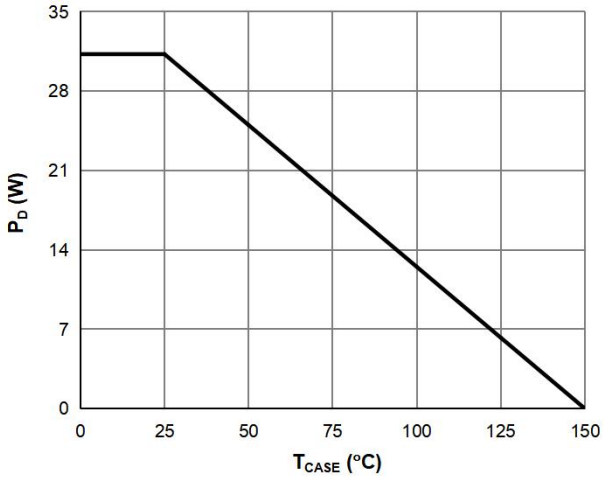


Figure 8: Power De-rating

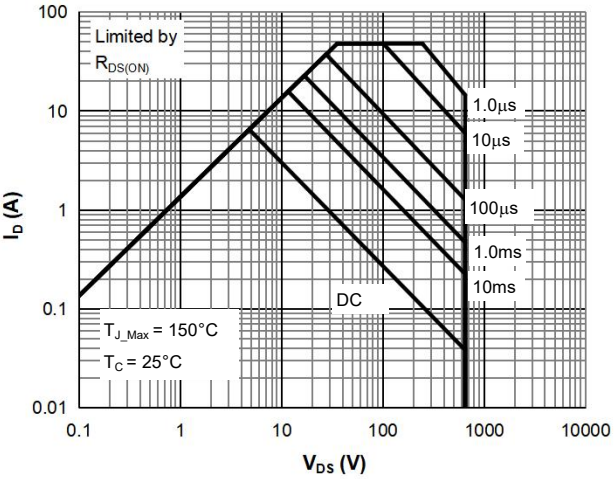


Figure 9: Maximum Safe Operating Area

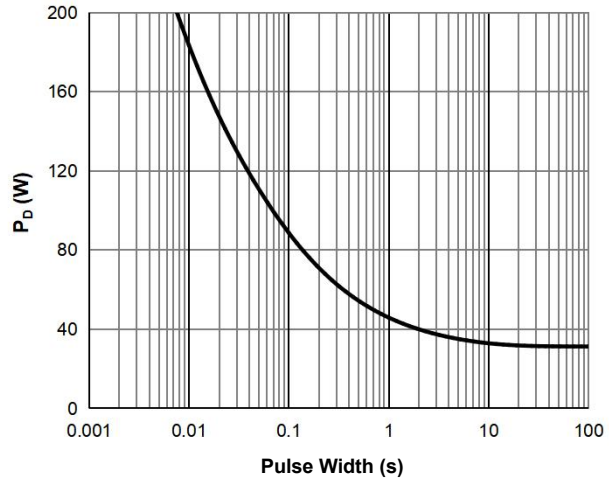


Figure 10: Single Pulse Power Rating, Junction-to-Case

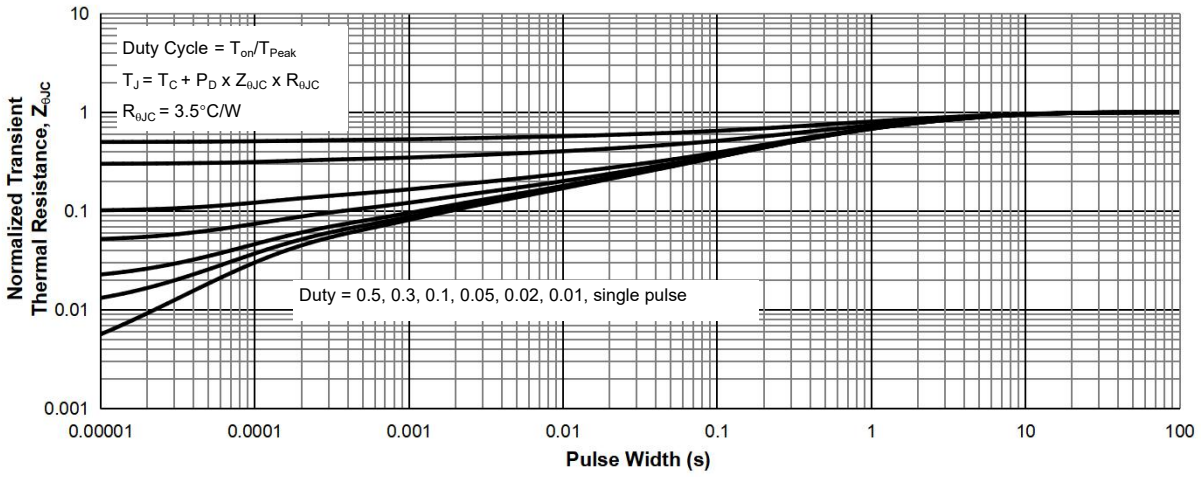
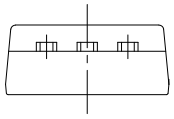


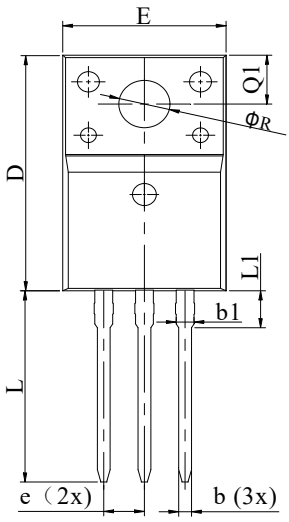
Figure 11: Normalized Maximum Transient Thermal Impedance

TO-220FP-3L Package Information

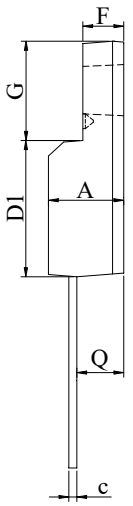
Package Outline



Front View



Top View



Side View

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.50	4.70	4.90
D	15.20	15.87	16.10
D1	8.80	--	9.50
E	9.70	10.10	10.40
F	2.44	--	2.75
b	0.70	0.80	0.91
b1	1.10	1.35	1.55
c	0.45	0.50	0.65
e	2.54 BSC		
G	6.40	6.70	6.90
L	12.00	13.10	14.50
L1	3.13	--	3.57
Q	2.60	2.75	2.85
Q1	3.20	3.30	3.40
R	3.05	--	3.28