650V SuperJunction Power MOSFET

Features

- Extremely Low Gate Charge
- Excellent Output Capacitance (C_{oss}) Profile
- Fast Switching Capability
- Ultra Fast Body Diode
- 100% UIS Tested, 100% R_g Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant
- AEC-Q101 Qualified for Automotive Applications

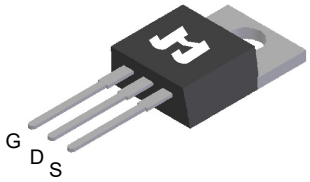
Product Summary

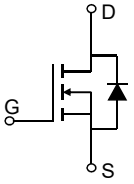
Parameter	Value	Unit
V_{DS}	650	V
$V_{GS(th)\_Typ}$	3.5	V
I_D (@ V_{GS} = 10V) (1)	20	A
$R_{DS(ON)\_Typ}$ (@ V_{GS} = 10V)	170	mΩ
E_{oss}@400V	5.2	μJ

Applications

- Unidirectional and bidirectional DC-DC converters
- On-Board battery Chargers

TO-220-3L Top View



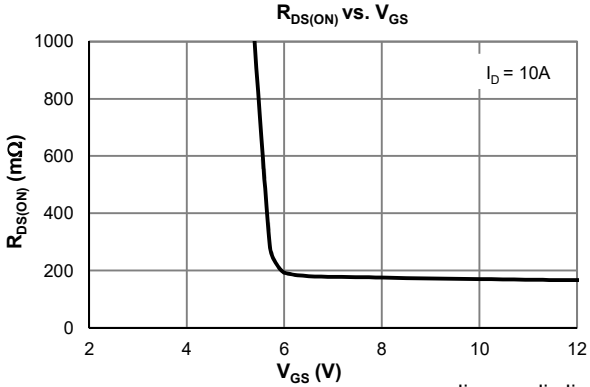


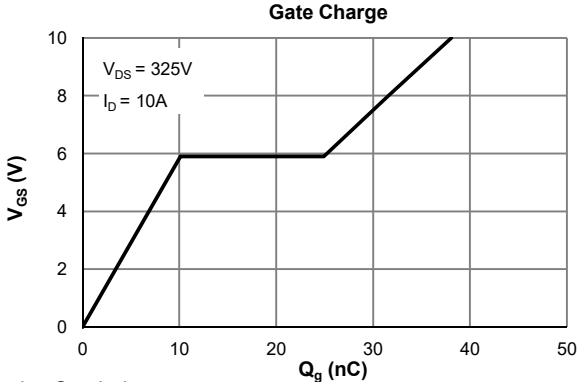
Ordering Information

Device	Package	# of Pins	Marking	MSL	T_J (°C)	Media	Quantity (pcs)
JMH65R190ACFDQ-U	TO-220-3L	3	65R190AFQ	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}	±30	V
Continuous Drain Current (1)	T_C = 25°C	I_D	20	A
	T_C = 100°C		12.1	
Pulsed Drain Current (2)		I_{DM}	75	A
Avalanche Current (3)		I_{AS}	9.0	A
Avalanche Energy (3)		E_{AS}	405	mJ
Power Dissipation (4)	T_C = 25°C	P_D	189	W
	T_C = 100°C		76	
Junction & Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C





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} = ±30V			±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 = 10A		170	190	mΩ
Diode Forward Voltage	V_{SD}	I_S = 1A, V_{GS} = 0V		0.75	1.0	V
Diode Continuous Current	I_S	T_C = 25°C			189	A
DYNAMIC PARAMETERS (5)						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 100V, f = 1MHz		1560		pF
Output Capacitance	C_{oss}			61		pF
Reverse Transfer Capacitance	C_{rss}			11.7		pF
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V, V_{DS} = 0 to 400V		65		pF
Effective output capacitance, time related	$C_{o(tr)}$			274		pF
Gate Resistance	R_g	V_{GS} = 0V, V_{DS}= 0V, f = 1MHz		8.9		Ω
SWITCHING PARAMETERS (5)						
Total Gate Charge (@ V_{GS} = 10V)	Q_g	V_{GS} = 0 to 10V V_{DS} = 325V, I_D = 10A		38		nC
Gate Source Charge	Q_{gs}			10.1		nC
Gate Drain Charge	Q_{gd}			14.8		nC
Turn-On DelayTime	$t_{D(on)}$	V_{GS} = 10V, V_{DS} = 325V R_L = 3.25Ω, R_{GEN} = 6Ω		17.8		ns
Turn-On Rise Time	t_r			22		ns
Turn-Off DelayTime	$t_{D(off)}$			257		ns
Turn-Off Fall Time	t_f			20		ns
Body Diode Reverse Recovery Time	t_{rr}	I_F = 10A, dI_F/dt = 100A/μs		122		ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_F = 10A, dI_F/dt = 100A/μs		715		nC
Peak Diode Recovery Voltage Slope	dv/dt	I_F≤10A, di/dt = 200A/us, V_{DS} = 400V		50		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	$R_{\theta JA}$	42	50	°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.66	0.80	°C/W

Notes:

1. Computed continuous current assumes the condition of TJ_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_{DD} = 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

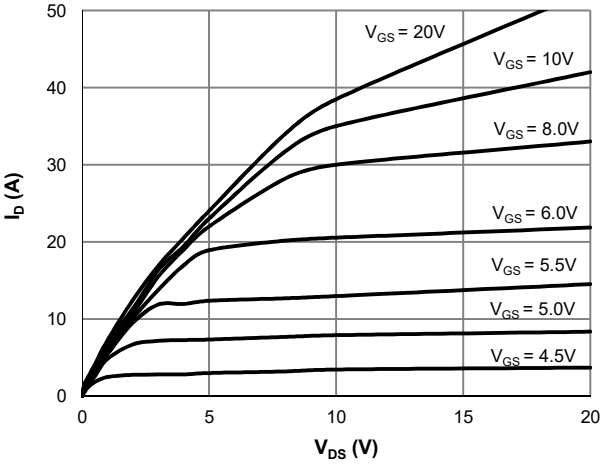


Figure 1: Saturation Characteristics

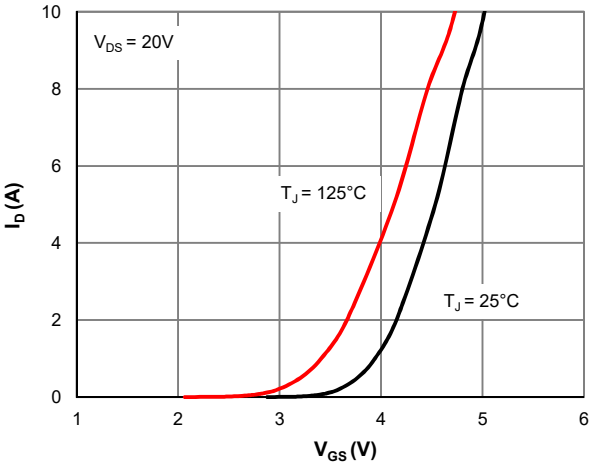


Figure 2: Transfer Characteristics

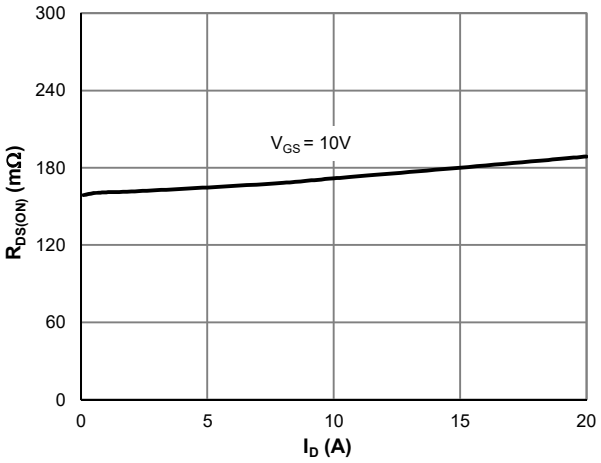


Figure 3: $R_{DS(ON)}$ vs. Drain Current

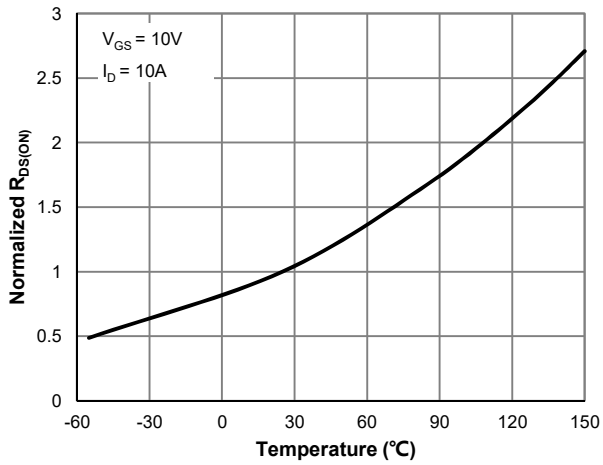


Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

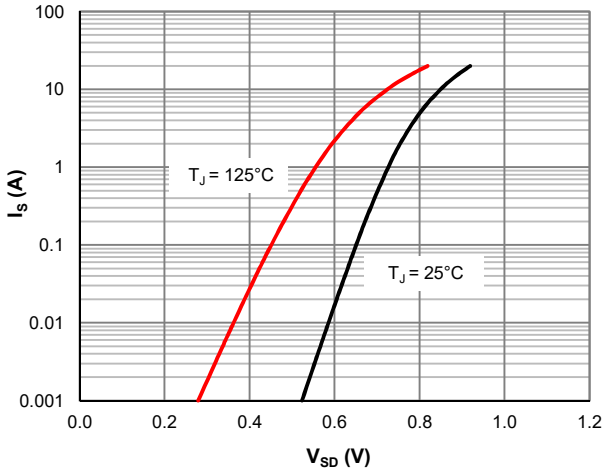


Figure 5: Body-Diode Characteristics

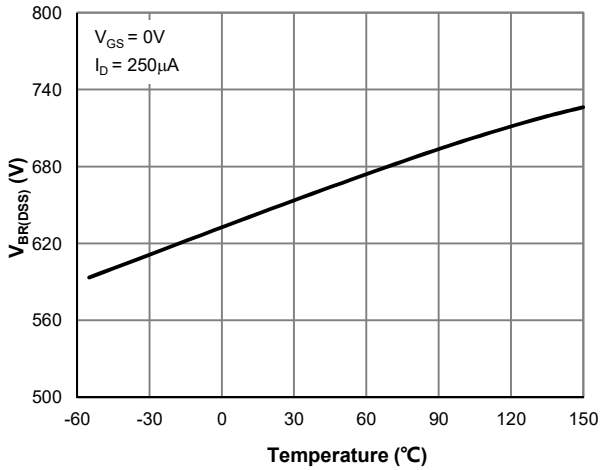


Figure 6: $V_{BR(DSS)}$ vs. Junction Temperature

Typical Electrical & Thermal Characteristics

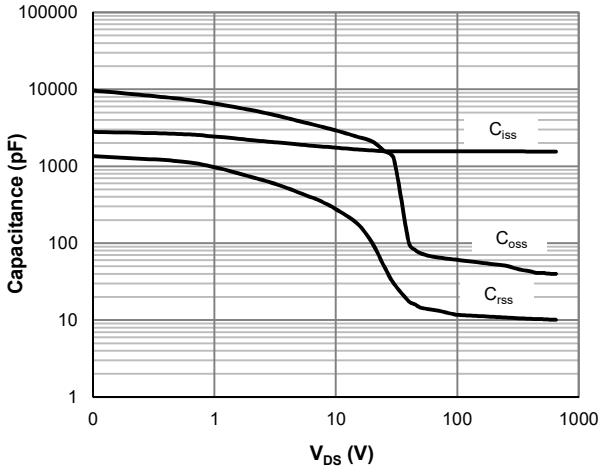


Figure 7: Capacitance Characteristics

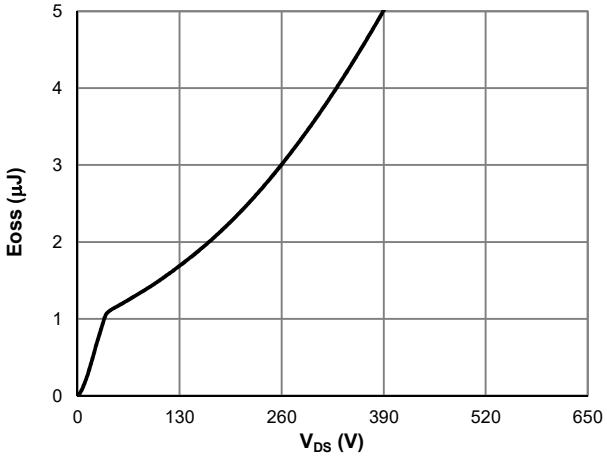


Figure 8: Coss Stored Energy

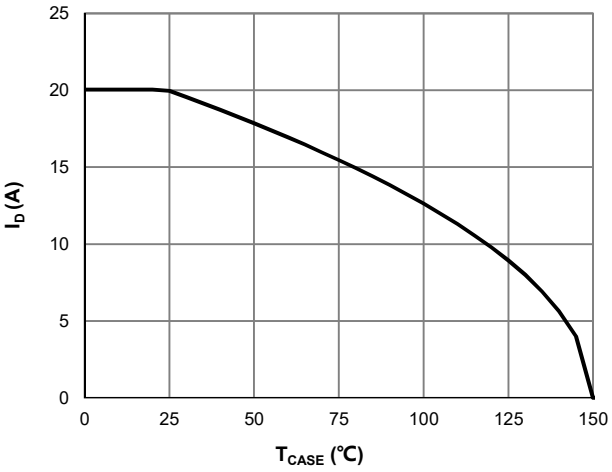


Figure 9: Current De-rating

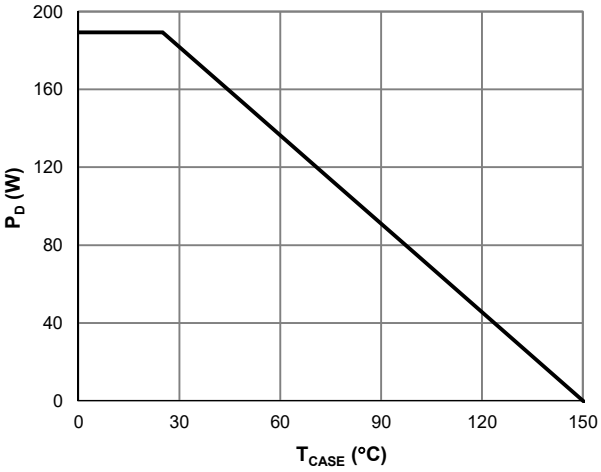


Figure 10: Power De-rating

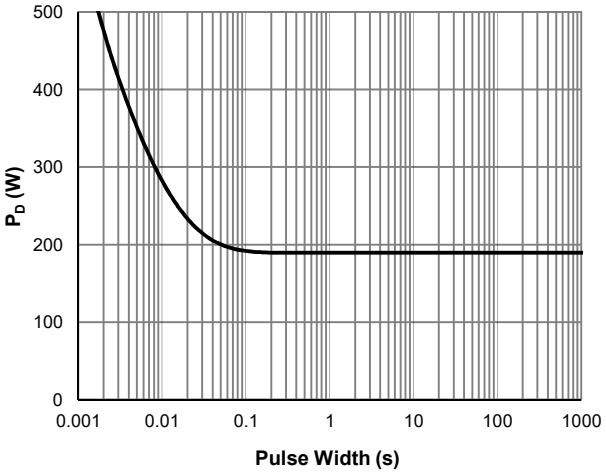


Figure 11: Single Pulse Power Rating, Junction-to-Case

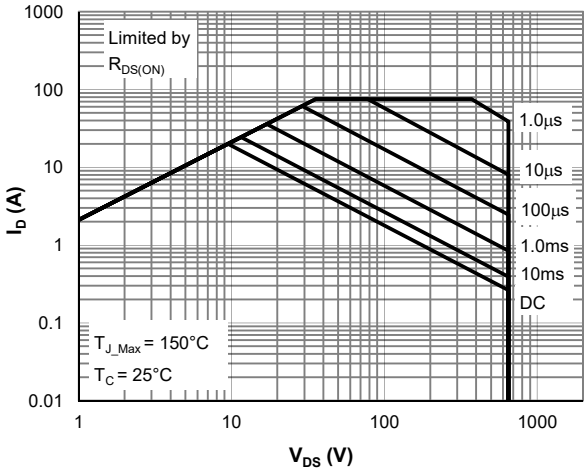


Figure 12: Maximum Safe Operating Area

Typical Electrical & Thermal Characteristics

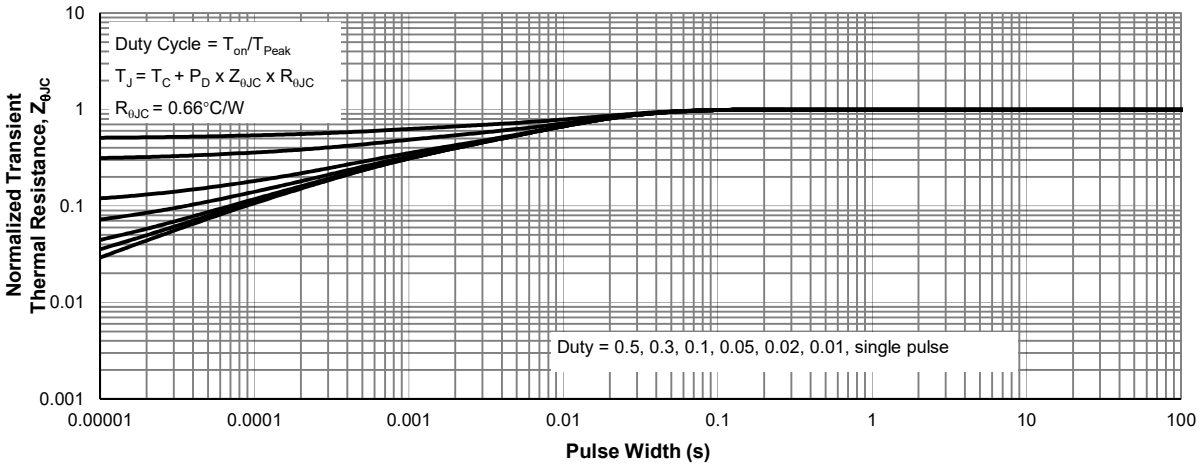
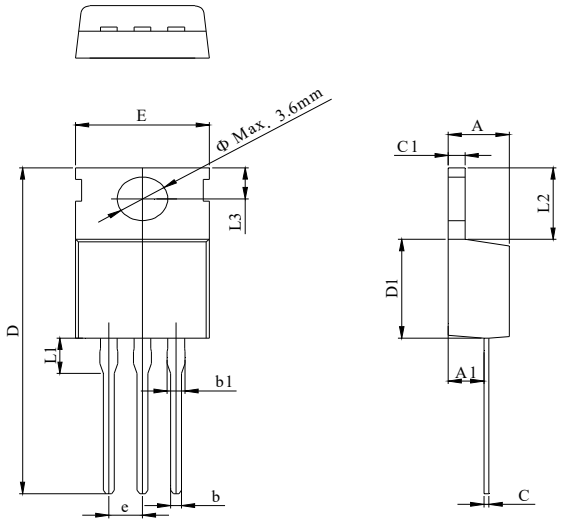


Figure 13: Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information

Package Outline



DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.24		4.70
A1	2.20		3.00
b	0.70		0.95
b1	1.14		1.70
C	0.40		0.60
C1	1.15		1.40
D	28.00		29.80
D1	8.80		9.90
E	9.70		10.50
L1			3.80
L2	6.25		6.90
L3	2.40		3.00
e		2.54 BSC	