



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

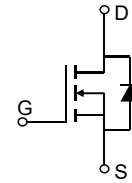
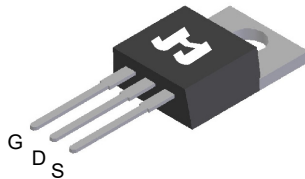
Product Summary

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	m Ω
$E_{oss@400V}$	5.2	μJ

Applications

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

TO-220-3L Top View

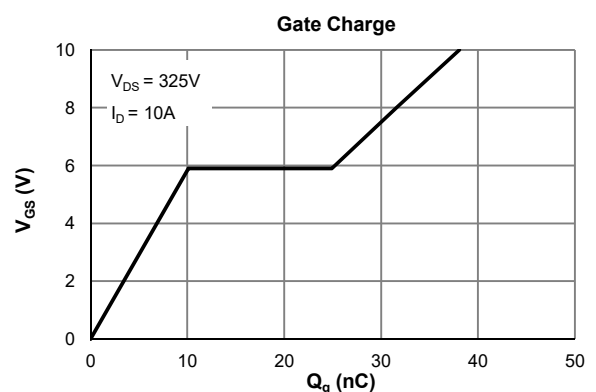
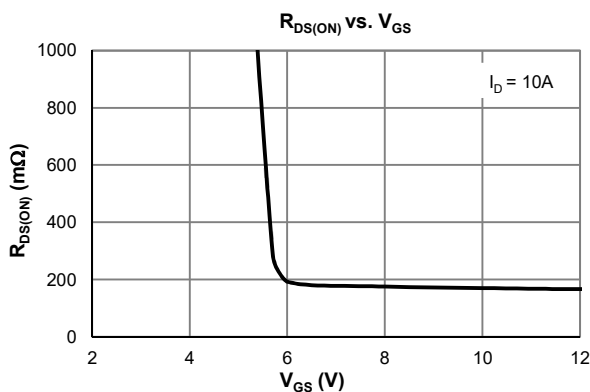


Ordering Information

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 (@ $T_A = 25^\circ C$ 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⁾	I_D	$T_C = 25^\circ C$	20
		$T_C = 100^\circ C$	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⁾	P_D	$T_C = 25^\circ C$	189
		$T_C = 100^\circ C$	76
Junction & Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$





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 _{riss}			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

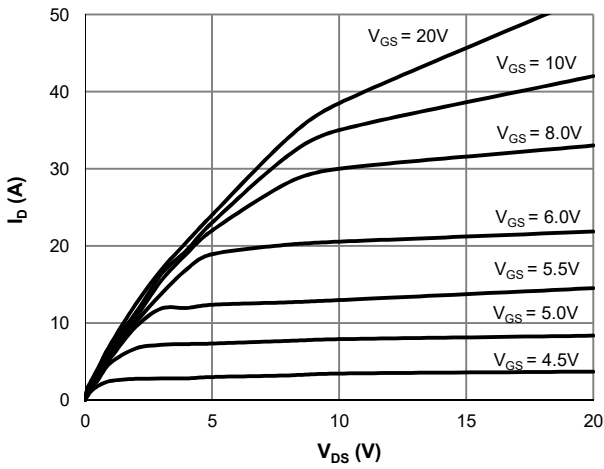
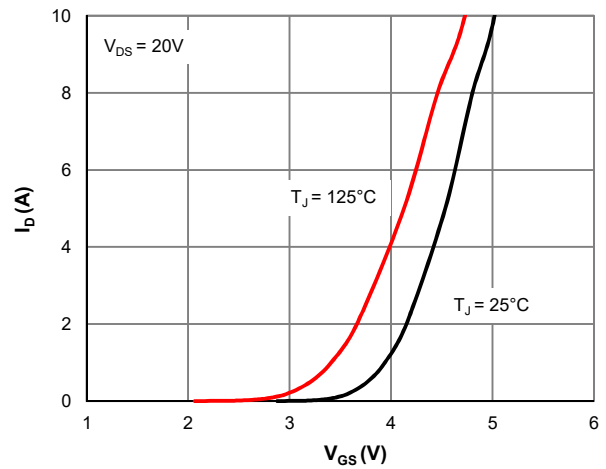
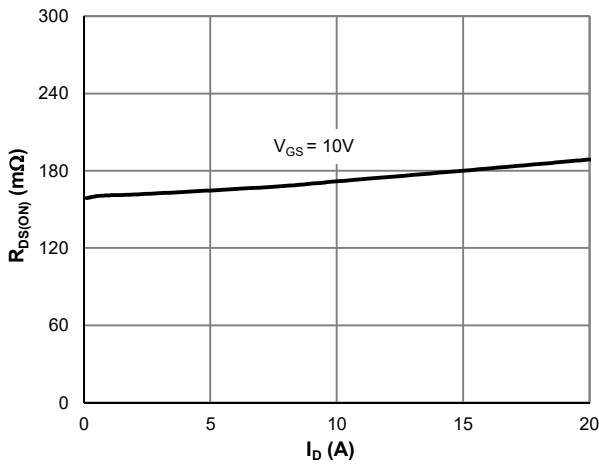
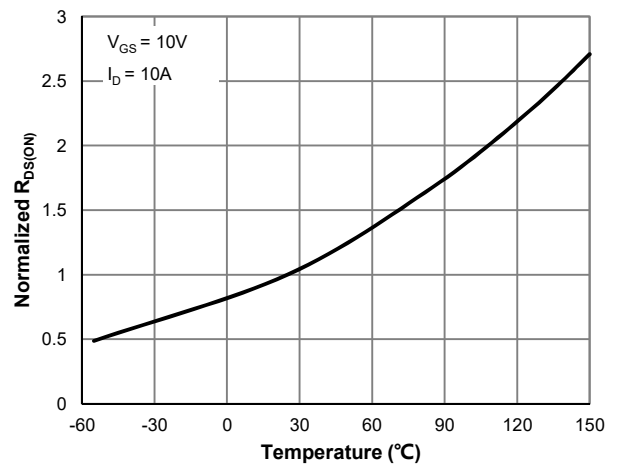
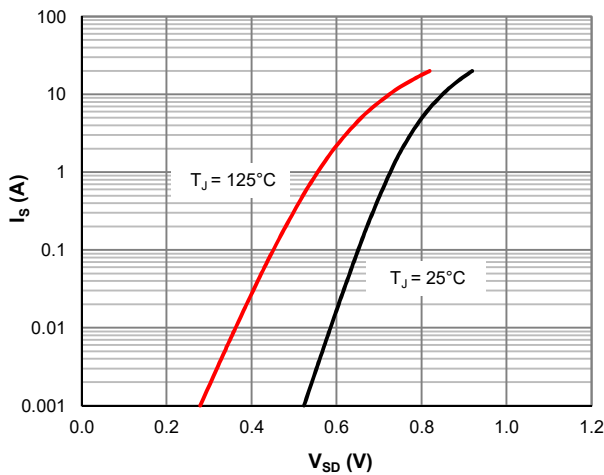
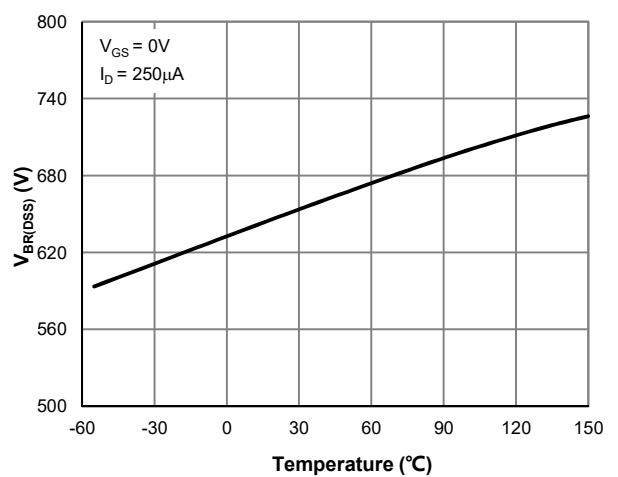
SWITCHING PARAMETERS ⁽⁵⁾						
Total Gate Charge (@ V _{GS} = 10V)	Q _g	V _{GS} = 0 to 10V V _{DS} = 325V, I _D = 10A		38		nC
Gate Source Charge	Q _{gs}			10.1		nC
Gate Drain Charge	Q _{gd}			14.8		nC
Turn-On DelayTime	t _{D(on)}	V _{GS} = 10V, V _{DS} = 325V R _L = 3.25Ω, R _{GEN} = 6Ω		17.8		ns
Turn-On 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	
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 _F /dt = 200A/us, V _{DS} = 400V		50		V/ns
MOSFET dv/dt Ruggedness	dv/dt	V _{DS} = 0...400V		50		V/ns

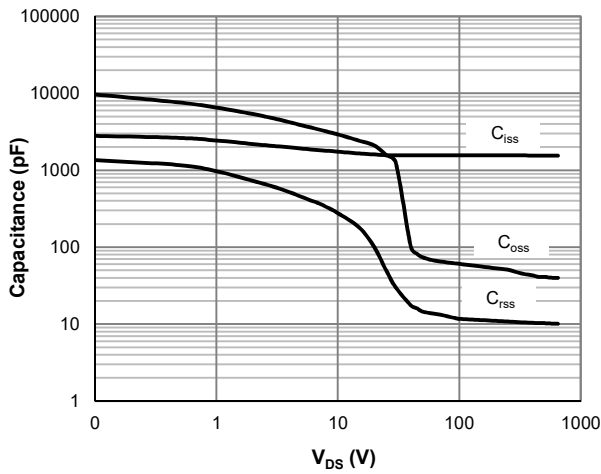
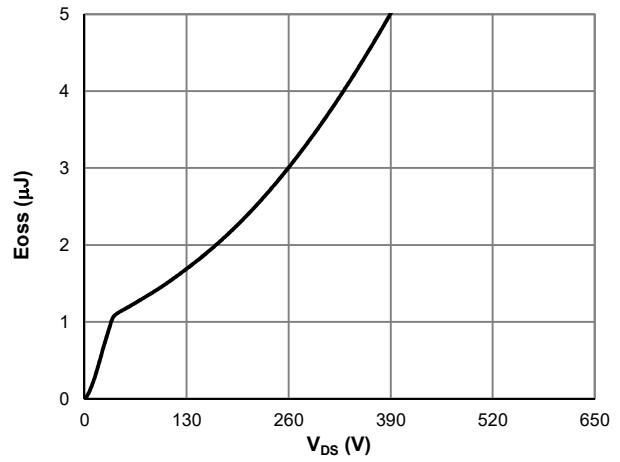
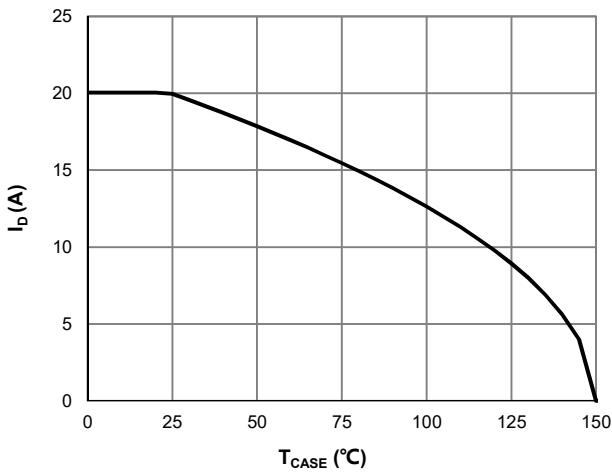
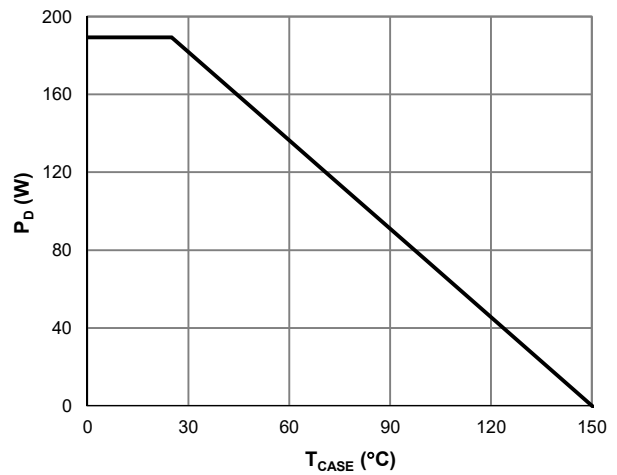
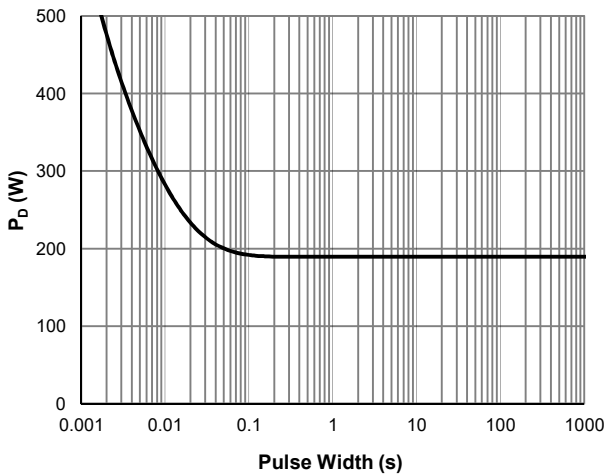
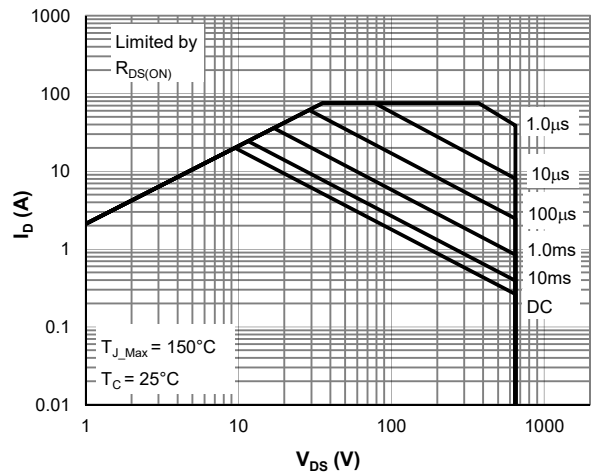
Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	R _{θJA}	42	50	°C/W
Thermal Resistance, Junction-to-Case	R _{θJC}	0.66	0.80	°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_{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

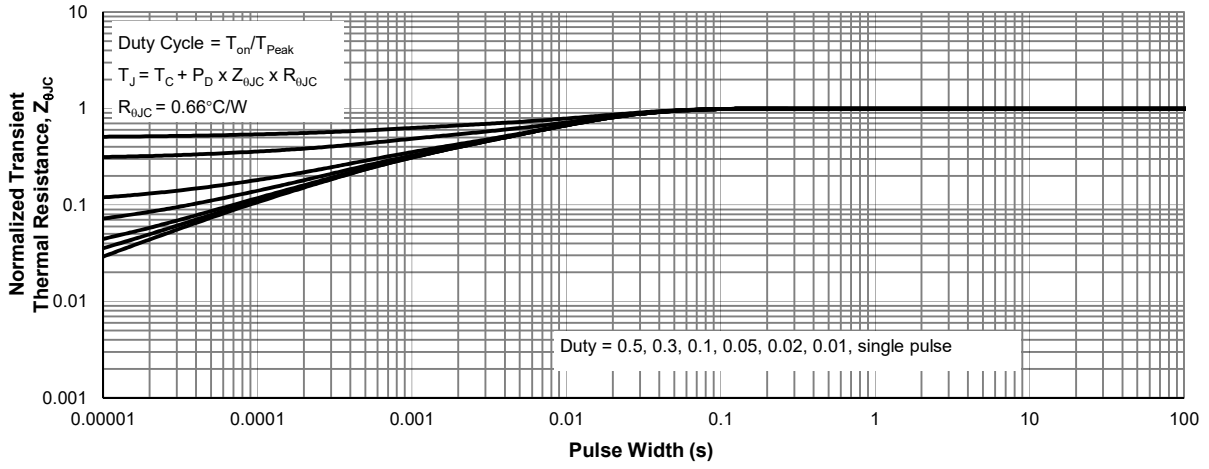
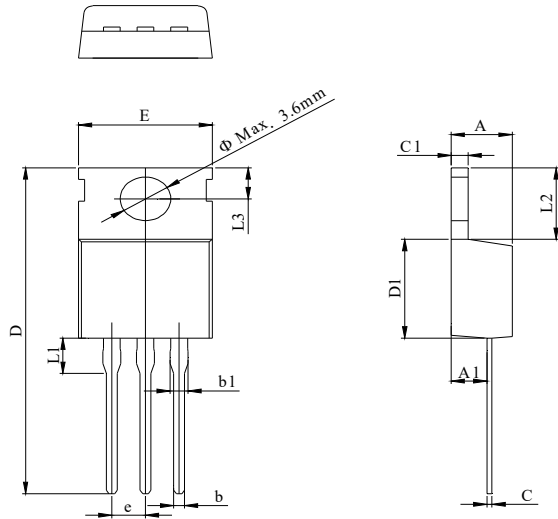


Figure 13: Normalized Maximum Transient Thermal Impedance

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	