MT3213

N-Channel Low Qg® MOSFET
30V, 80A, 4.8mΩ

Features

- $R_{DS(ON)}$ = 4.8mΩ, V_{GS} = 10V, I_D = 40A
- High performance trench technology for extremely low $R_{DS(ON)}$
- Low gate charge
- High power and current handling capability

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(ON)}$ and fast switching speed.

Applications

- DC-DC primary bridge
- DC-DC Synchronous rectification
- Hot swap

MT Semiconductor®

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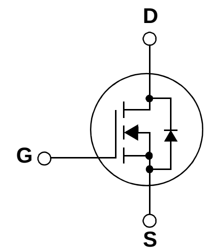
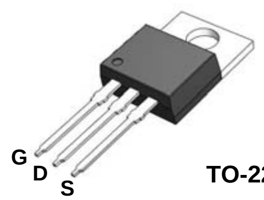
Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



TO-220

MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current Continuous (T_C = 25°C, V_{GS} = 10V) (Note 1)	80	A
	Continuous (T_C = 25°C, V_{GS} = 4.5V) (Note 1)	65	A
	Continuous (T_{amb} = 25°C, V_{GS} = 10V, with $R_{\theta JA}$ = 62°C/W)	15	A
	Pulsed	Figure 4	A
E_{AS}	Single Pulse Avalanche Energy (Note 2)	190	mJ
P_D	Power dissipation	36	W
	Derate above 25°C	0.73	W/°C
T_J, T_{STG}	Operating and Storage Temperature	-55 to 150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case TO-220	3	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-220 (Note 3)	62.5	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3213	MT3213	TO-220AB	Tube	N/A	50 units

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250µA, V_{GS} = 0V	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V	-	-	1	µA
		V_{DS} = 24V, V_{GS} = 0V, T_C = 150°C	-	-	250	µA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(TH)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA	1.3	1.8	2.5	V
$r_{DS(ON)}$	Drain to Source On Resistance	I_D = 40A, V_{GS} = 10V	-	0.0048	-	Ω
		I_D = 40A, V_{GS} = 10V, T_J = 175°C	-	0.0082	0.0090	Ω
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz	-	2139	-	pF
C_{OSS}	Output Capacitance		-	464	-	pF
C_{RSS}	Reverse Transfer Capacitance		-	199	-	pF
R_G	Gate Resistance	V_{GS} = 0.5V, f = 1MHz	-	1.9	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V; V_{DD} = 15V, I_D = 40A, I_g = 1.0mA	-	56	72	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0V to 5V	-	30	38	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0V to 1V	-	3.0	4.0	nC
Q_{gs}	Gate to Source Gate Charge		-	9.0	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	6.0	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	11	-	nC
Switching Characteristics (V_{GS} = 10V)						
t_{ON}	Turn-On Time	V_{DD} = 15V, I_D = 40A, V_{GS} = 4.5V, R_{GS} = 4.7Ω	-	-	207	ns
$t_{d(ON)}$	Turn-On Delay Time		-	10	-	ns
t_r	Rise Time		-	128	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	44	-	ns
t_f	Fall Time		-	31	-	ns
t_{OFF}	Turn-Off Time		-	-	112	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 40A	-	-	1.25	V
		I_{SD} = 20A	-	-	1.0	V
t_{rr}	Reverse Recovery Time	I_{SD} = 40A, dI_{SD}/dt = 100A/µs	-	-	32	ns
Q_{RR}	Reverse Recovered Charge	I_{SD} = 40A, dI_{SD}/dt = 100A/µs	-	-	18	nC

Notes:
1: Package current limitation is 80A.
2: Starting T_J = 25°C, L = 51uH, I_{AS} = 64A, V_{DD} = 27V, V_{GS} = 10V.
3: Pulse width = 100s.

Typical Characteristics T_C = 25°C unless otherwise noted

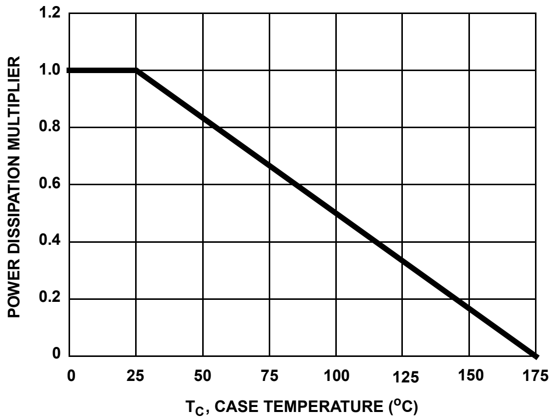


Figure 1. Normalized Power Dissipation vs Case Temperature

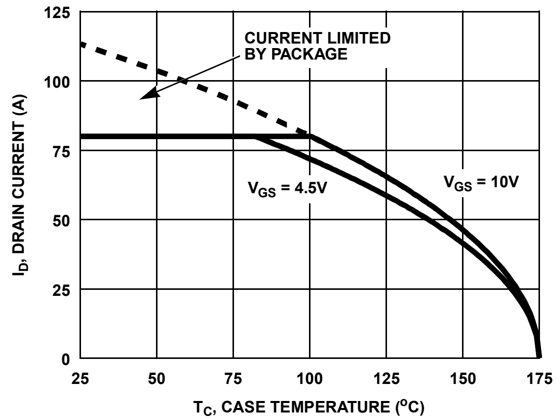


Figure 2. Maximum Continuous Drain Current vs Case Temperature

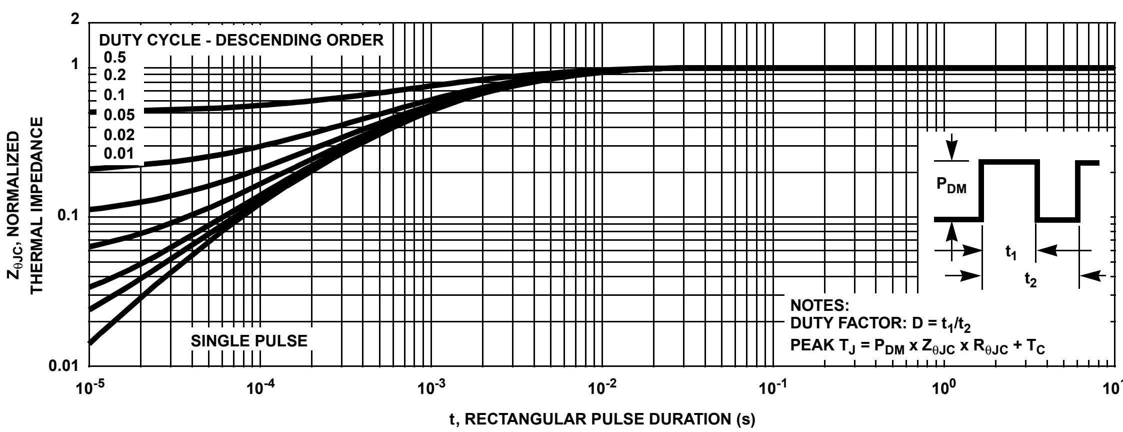


Figure 3. Normalized Maximum Transient Thermal Impedance

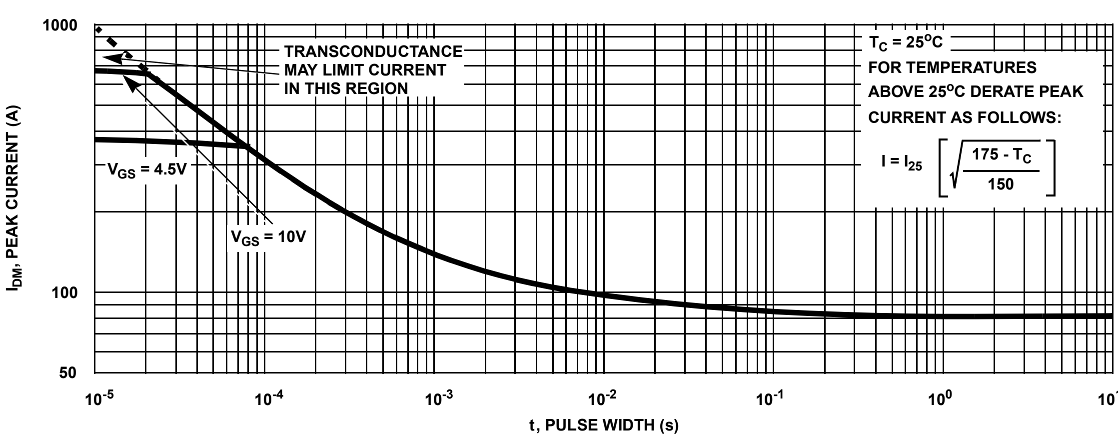


Figure 4. Peak Current Capability

Typical Characteristics T_C = 25°C unless otherwise noted

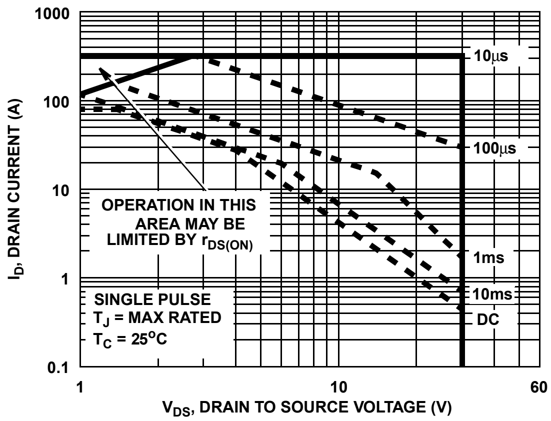
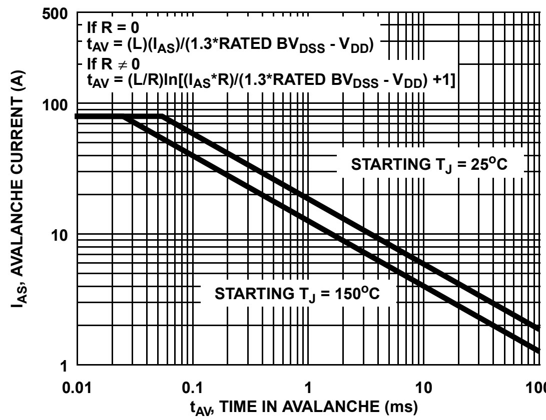


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

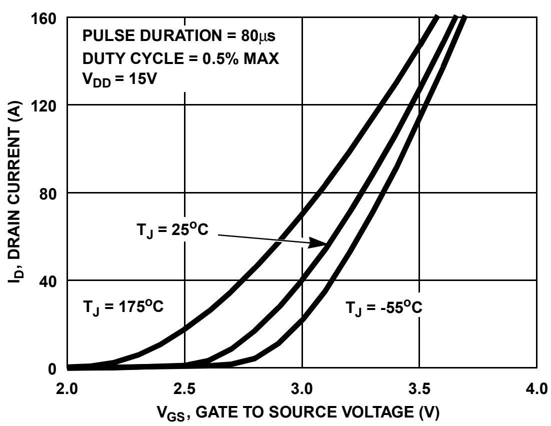


Figure 7. Transfer Characteristics

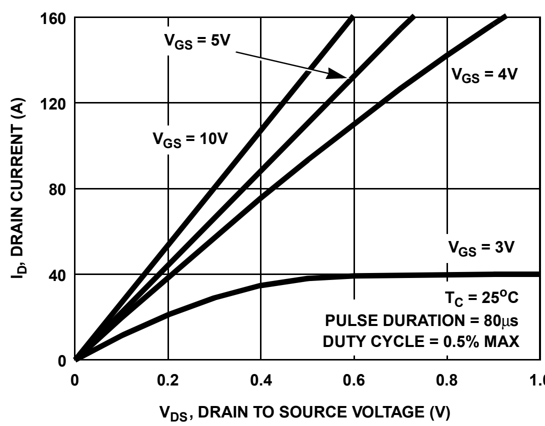


Figure 8. Saturation Characteristics

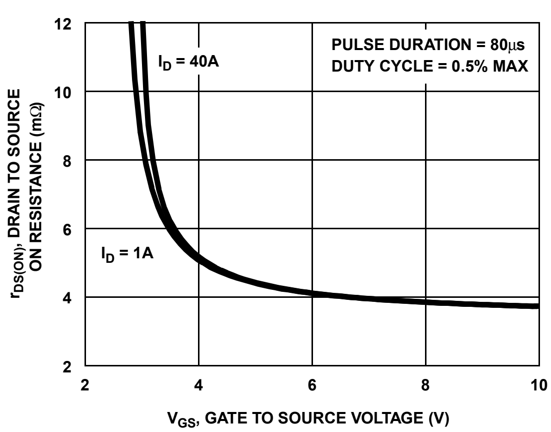


Figure 9. Drain to Source On Resistance vs Gate Voltage and Drain Current

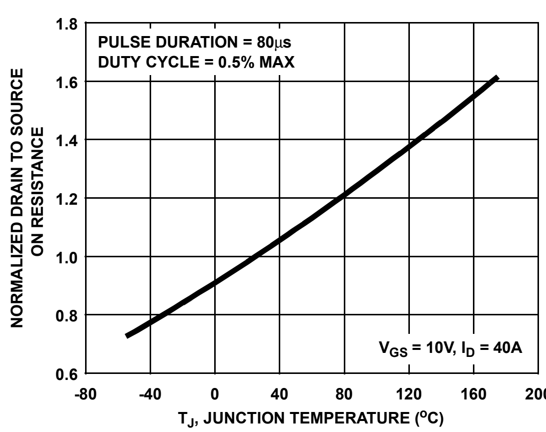


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics T_C = 25°C unless otherwise noted

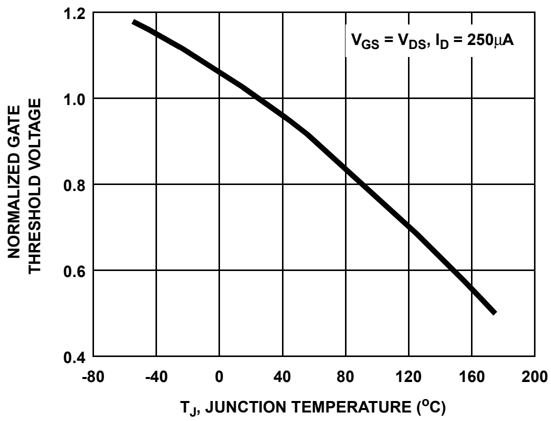


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

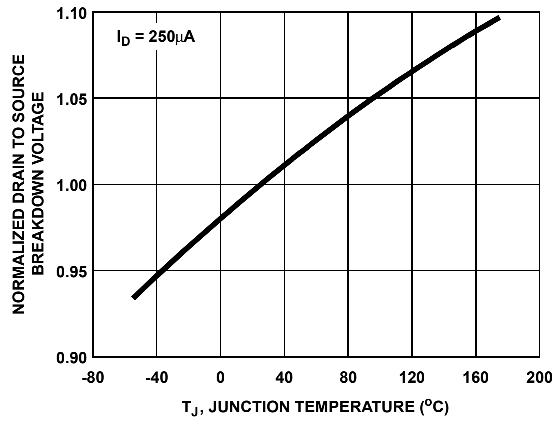


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

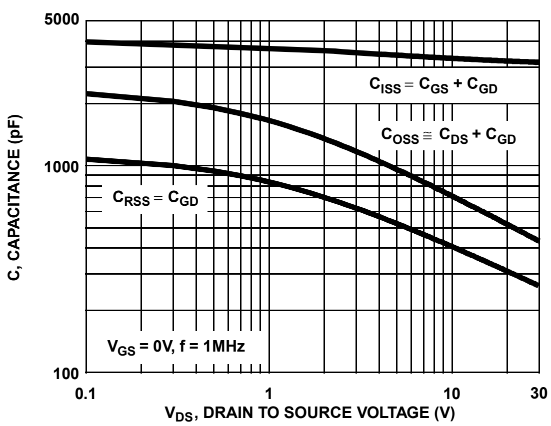


Figure 13. Capacitance vs Drain to Source Voltage

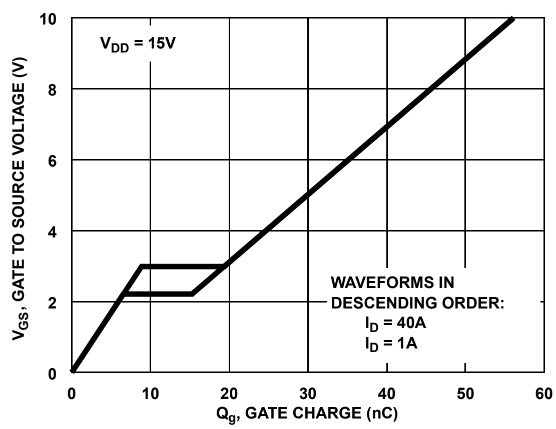


Figure 14. Gate Charge Waveforms for Constant Gate Current

Test Circuits and Waveforms

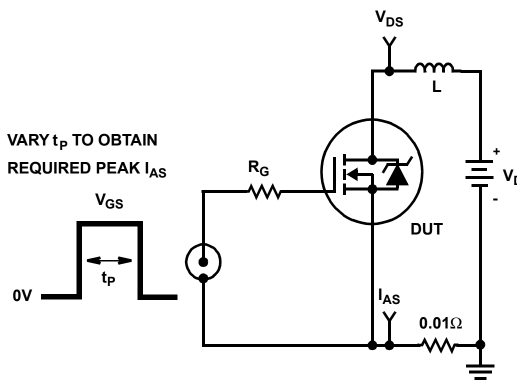


Figure 15. Unclamped Energy Test Circuit

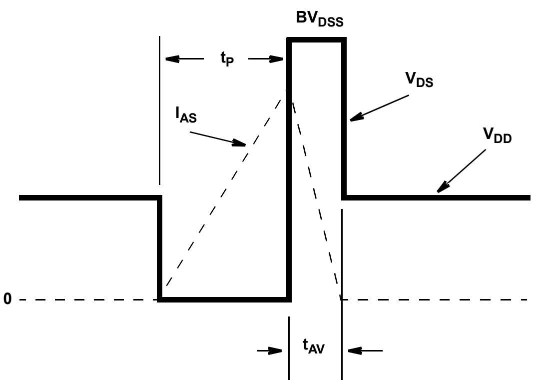


Figure 16. Unclamped Energy Waveforms

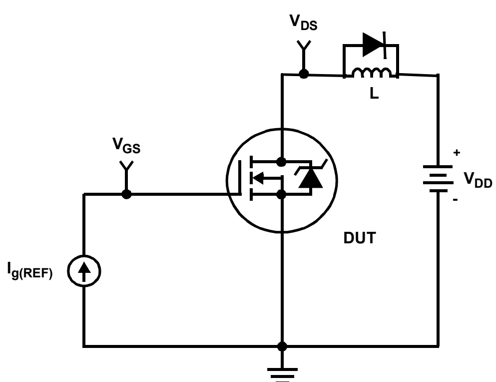


Figure 17. Gate Charge Test Circuit

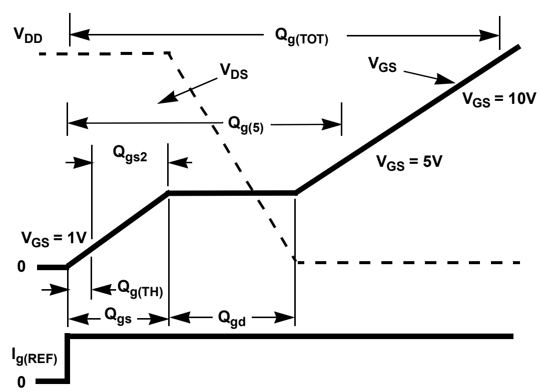


Figure 18. Gate Charge Waveforms

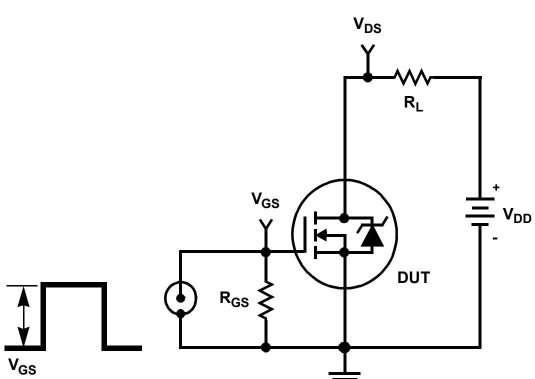


Figure 19. Switching Time Test Circuit

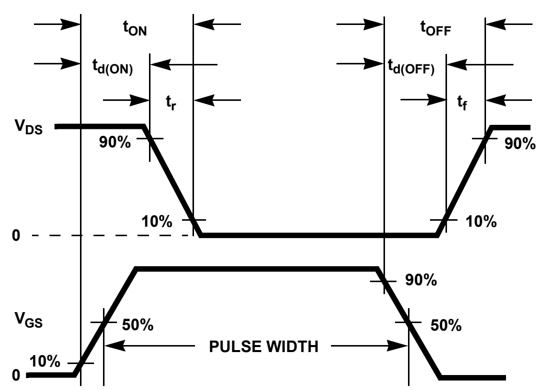


Figure 20. Switching Time Waveforms

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