MOS-TECH Semiconductor Co.,LTD
臺灣茂鈿半導體股份有限公司

MT3116

N-Channel Power MOSFET

100V, 176A, 3.5mΩ

Features

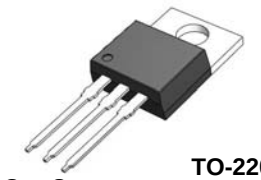
- Max $R_{DS(on)}$ = 3.5mΩ at V_{GS} = 10V, I_D = 75A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extr emely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

General Description

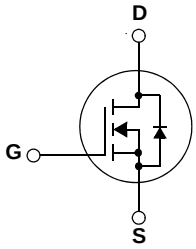
This N-Channel MOSFET is produced using MOS-TECH Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Applications

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



TO-220



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DSS}	Drain to Source Voltage			100	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Curren	- Continuous (Silicon Limited)	T_C = 25°C	176	A
		- Continuous(Package Limited)	T_C = 25°C	120	
		- Continuous	T_C = 25°C(Note 1a)	75	
		- Pulsed		704	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 3)	1500	mJ
P_D	Power Dissipation	- T_C = 25°C	(Note 1a)	380	W
		- T_A = 25°C	(Note 1b)	2.4	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +175	°C

Thermal Characteristics

Symbol	Parameter		Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	0.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	62.5	

Package Marking and Ordering Information

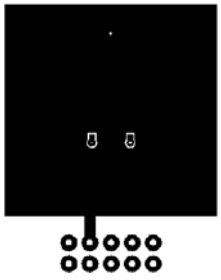
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3116	MT3116	TO-220	-	-	50

Electrical Characteristics T_C = 25°C unless otherwise noted

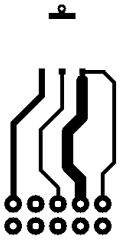
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, T_C = 25°C	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.07	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80V, V_{GS} = 0V	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 75A	-	3.5	4.5	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 75A	-	167	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V f = 1MHz	-	5485	8295	pF
C_{oss}	Output Capacitance		-	780	830	pF
C_{rss}	Reverse Transfer Capacitance		-	210	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 80V, I_D = 75A V_{GS} = 10V	-	89	116	nC
Q_{gs}	Gate to Source Gate Charge		-	24	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	8	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	25	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50V, I_D = 75A V_{GS} = 10V, R_{GEN} = 4.7Ω	-	22	54	ns
t_r	Turn-On Rise Time		-	54	118	ns
$t_{d(off)}$	Turn-Off Delay Time		-	37	84	ns
t_f	Turn-Off Fall Time		-	11	32	ns
Drain-Source Diode Characteristics						
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 75A (Note 2)	-	-	1.25	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 75A, V_{DD} = 80V dI_F/dt = 100A/μs	-	72	-	ns
Q_{rr}	Reverse Recovery Charge		-	129	-	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 40 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 62.5 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0 %.
3. Starting T_J = 25 °C, L = 1 mH, I_{AS} = 36.3 A, V_{DD} = 100 V, V_{GS} = 10 V.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

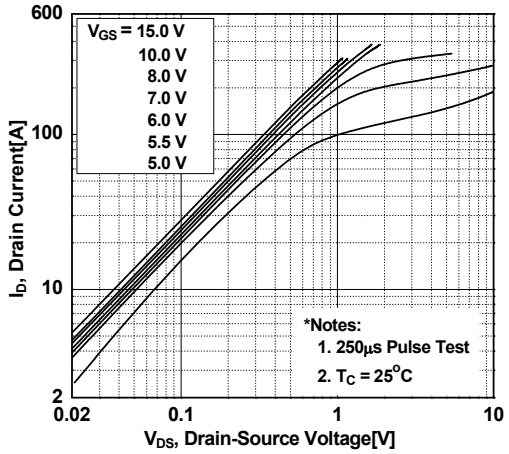


Figure 2. Transfer Characteristics

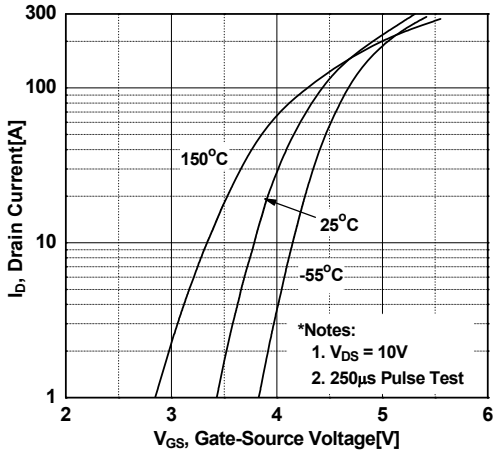


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

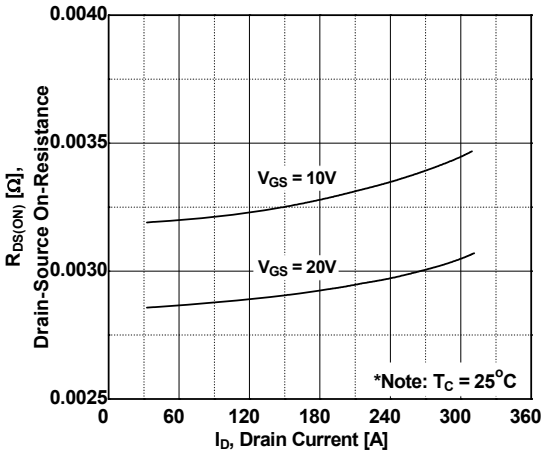


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

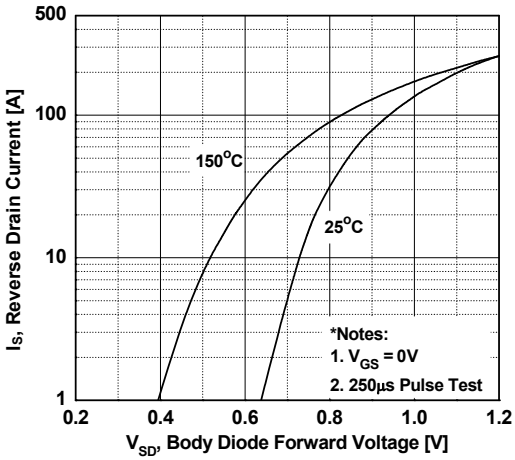


Figure 5. Capacitance Characteristics

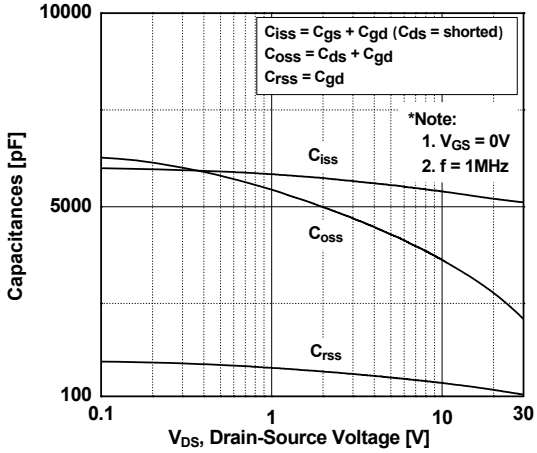
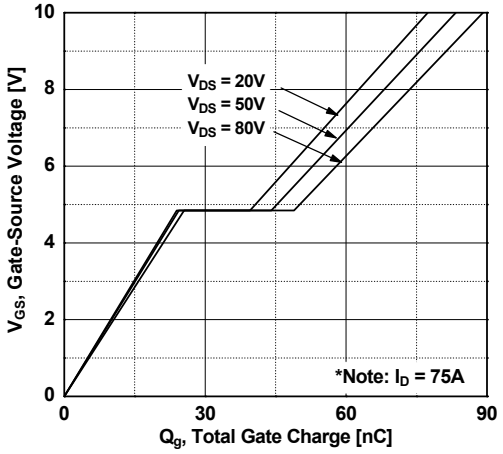


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

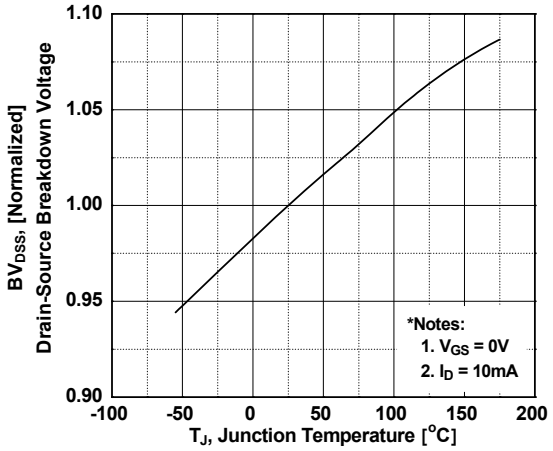


Figure 8. On-Resistance Variation vs. Temperature

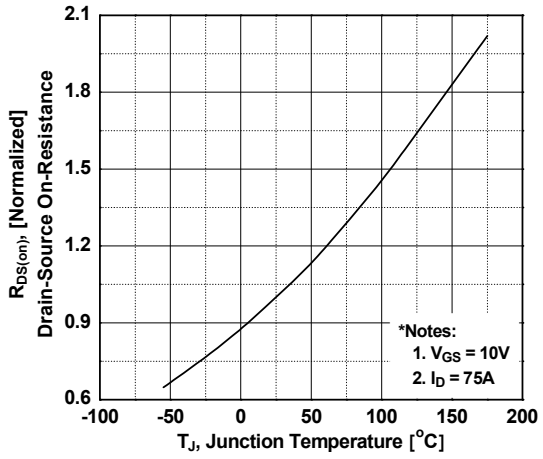


Figure 9. Maximum Safe Operating Area

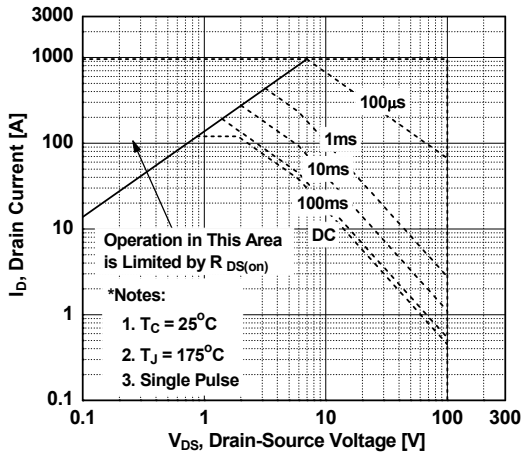


Figure 10. Maximum Drain Current vs. Case Temperature

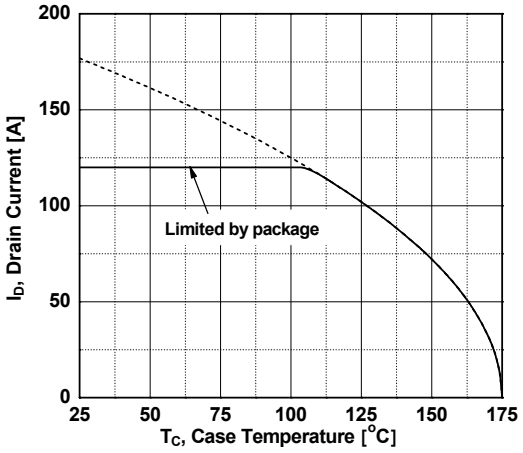
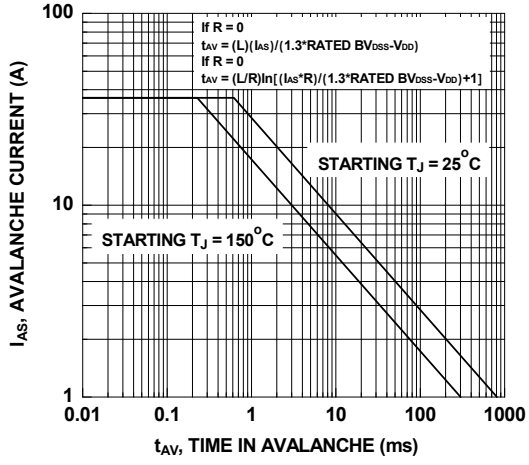
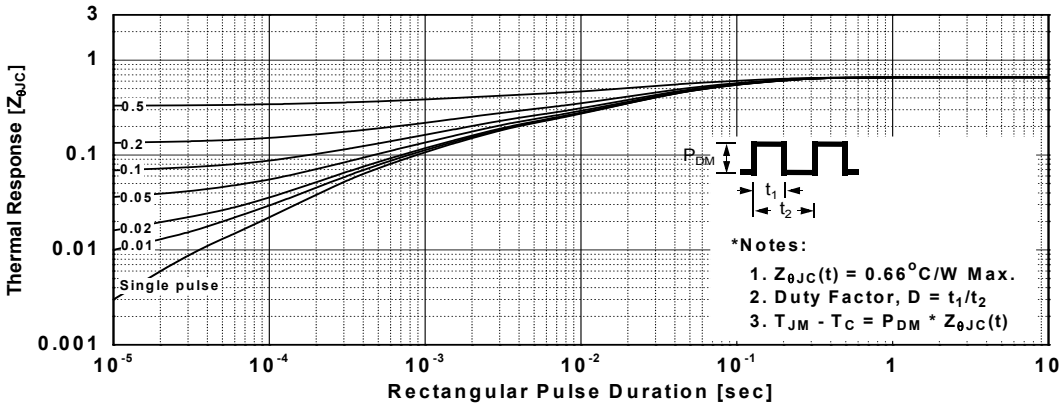


Figure 11. Unclamped Inductive Switching Capability

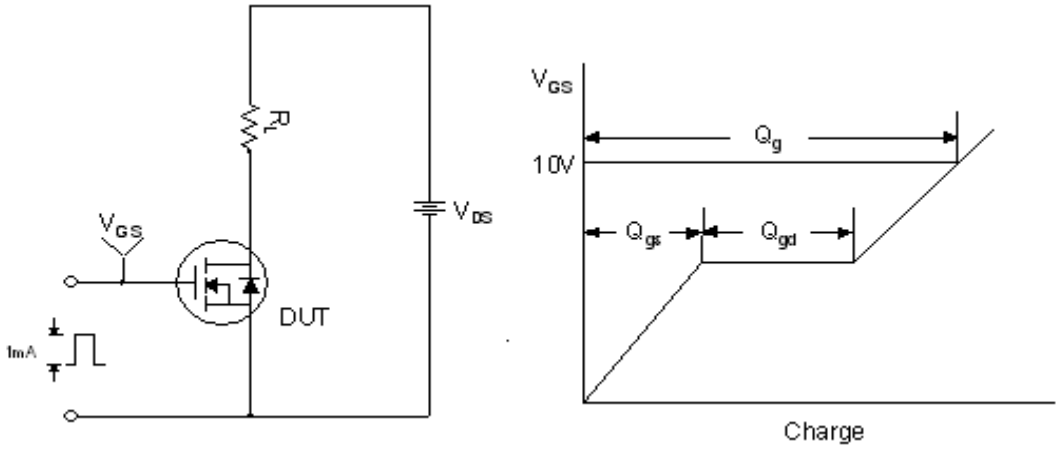


Typical Performance Characteristics

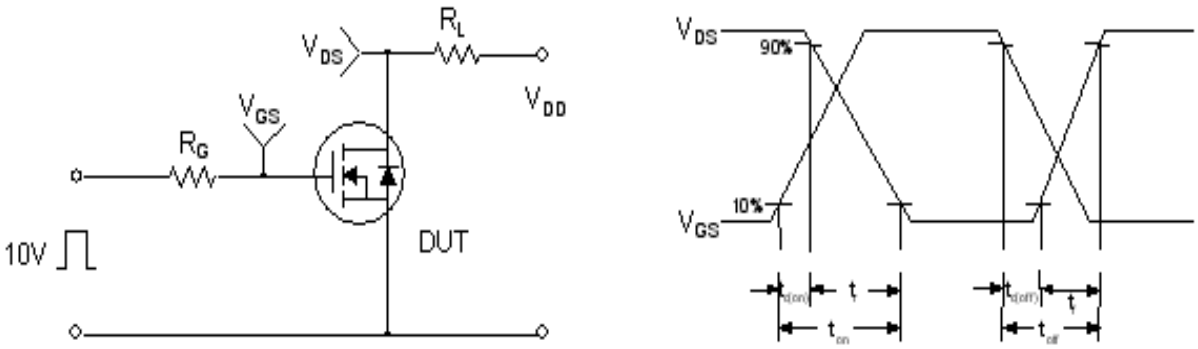
Figure 12. Transient Thermal Response Curve



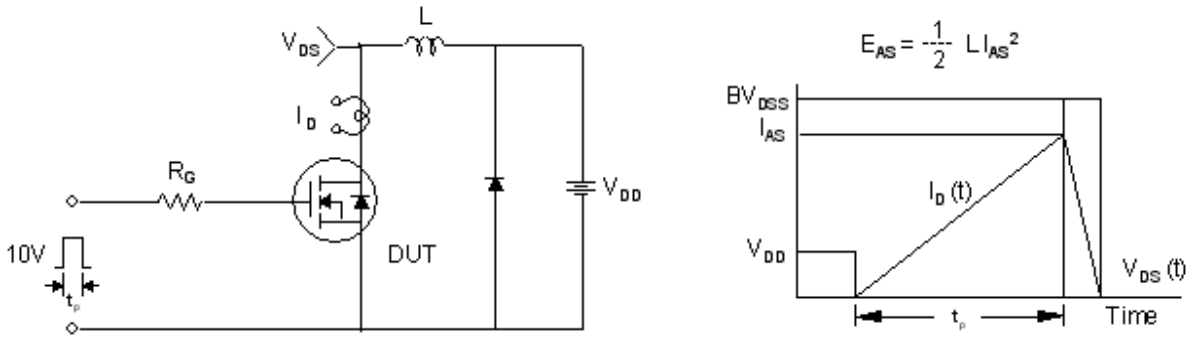
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms