March 2013

FDA38N30

N-Channel UniFET™ MOSFET

300 V, 38 A, 85 mΩ

Features

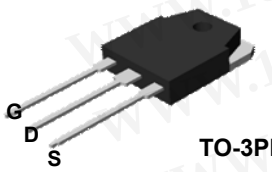
- $R_{DS(on)}$ = 70 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 19 A
- Low Gate Charge (Typ. 60 nC)
- Low C_{rss} (Typ. 60 pF)
- 100% Avalanche Tested
- ESD Improved Capability
- RoHS Compliant

Description

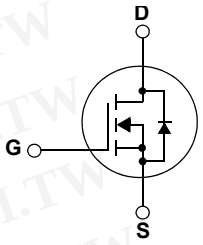
UniFET™ MOSFET is Fairchild Semiconductor®'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.

Applications

- PDP TV
- Uninterruptible Power Supply
- AC-DC Power Supply



TO-3PN



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FDA38N30	Unit
V_{DSS}	Drain to Source Voltage		300	V
V_{GSS}	Gate to Source Voltage		±30	V
I_D	Drain Current	- Continuous (T_C = 25°C)	38	A
		- Continuous (T_C = 100°C)	22	
I_{DM}	Drain Current	- Pulsed (Note 1)	150	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		1200	mJ
I_{AR}	Avalanche Current (Note 1)		38	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		31	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
P_D	Power Dissipation	(T_C = 25°C)	312	W
		- Derate above 25°C	2.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FDA38N30	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	°C/W

Package Marking and Ordering Infomation

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDA38N30	FDA38N30	TO-3PN	-	-	30

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, T_C = 25°C	300	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.3	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 300V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 240V, T_C = 125°C	-	-	10	
I_{GSS}	Gate-Body Leakage Current	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 19A	-	0.07	0.085	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20V, I_D = 19A	-	6.3	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V f = 1MHz	-	2600	-	pF
C_{oss}	Output Capacitance		-	500	-	pF
C_{rss}	Reverse Transfer Capacitance		-	60	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 240V, I_D = 38A V_{GS} = 10V (Note 4)	-	60	-	nC
Q_{gs}	Gate to Source Gate Charge		-	17	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	28	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 150V, I_D = 38A R_G = 25Ω, V_{GS} = 10V (Note 4)	-	53	69	ns
t_r	Turn-On Rise Time		-	110	143	ns
$t_{d(off)}$	Turn-Off Delay Time		-	118	153	ns
t_f	Turn-Off Fall Time		-	54	70	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	38	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	150	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 38A	-	-	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 38A dI_F/dt = 100A/μs	-	315	-	ns
Q_{rr}	Reverse Recovery Charge		-	4.0	-	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 1.7mH, I_{AS} = 38A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 38A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

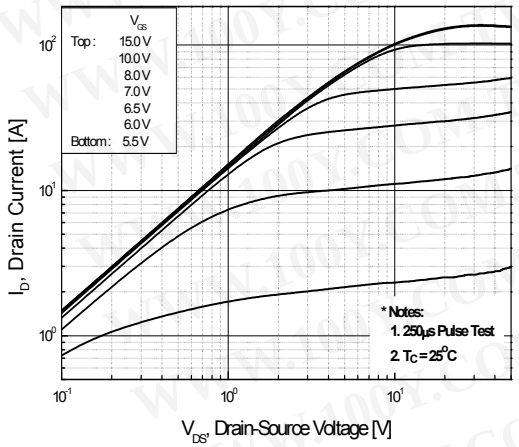


Figure 2. Transfer Characteristics

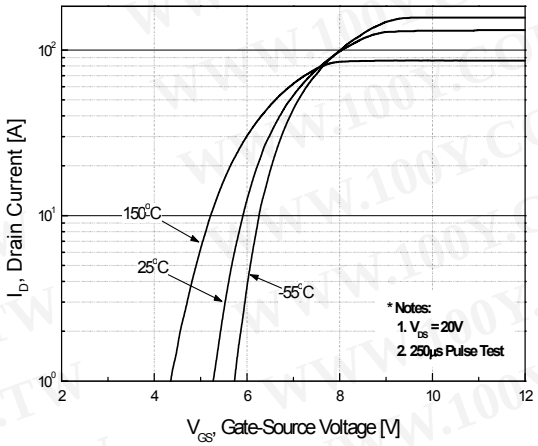


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

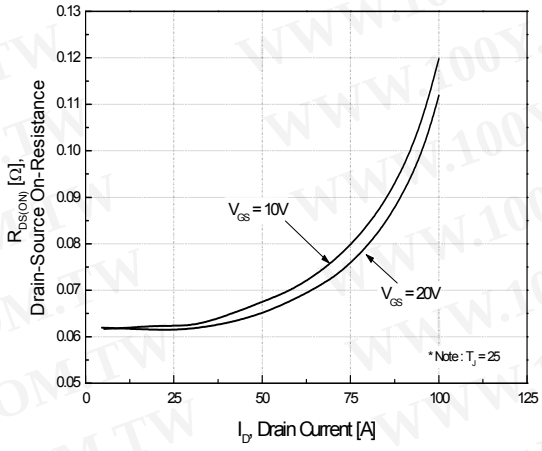


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

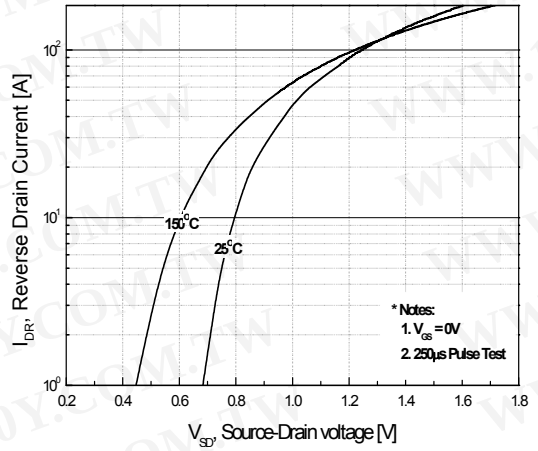


Figure 5. Capacitance Characteristics

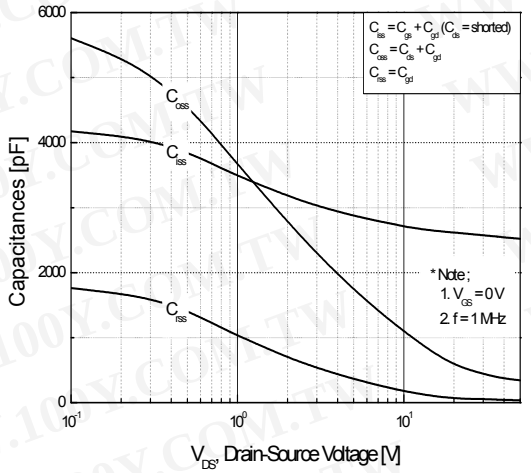
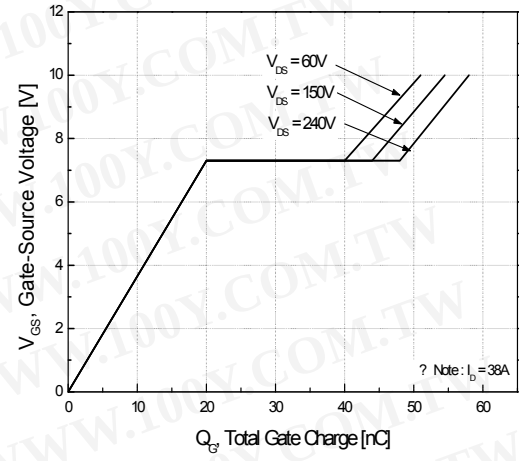


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

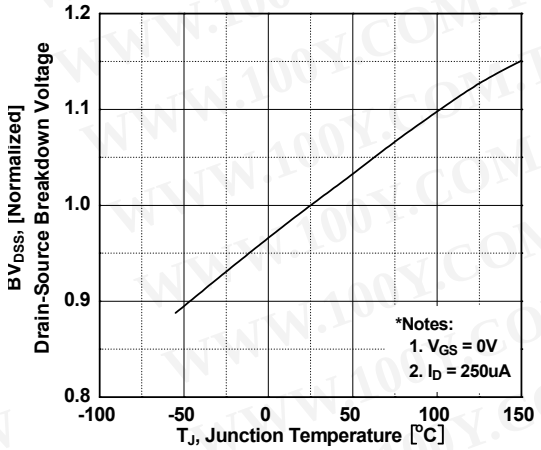


Figure 8. On-Resistance Variation vs. Temperature

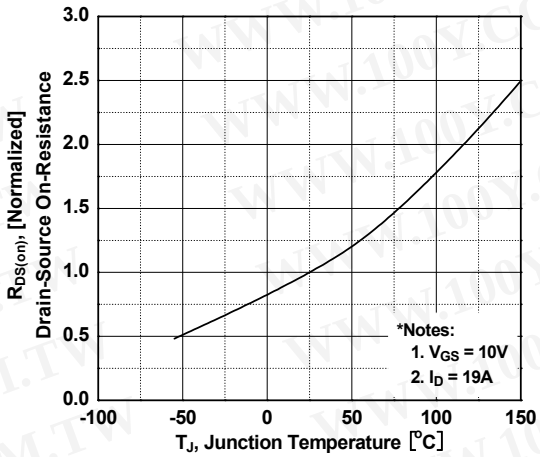


Figure 9. Maximum Safe Operating Area

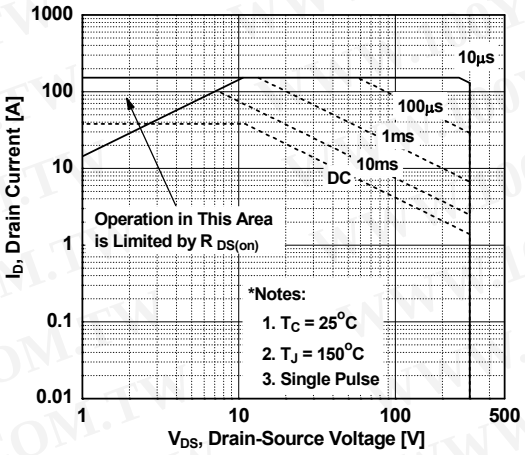


Figure 10. Maximum Drain Current vs. Case Temperature

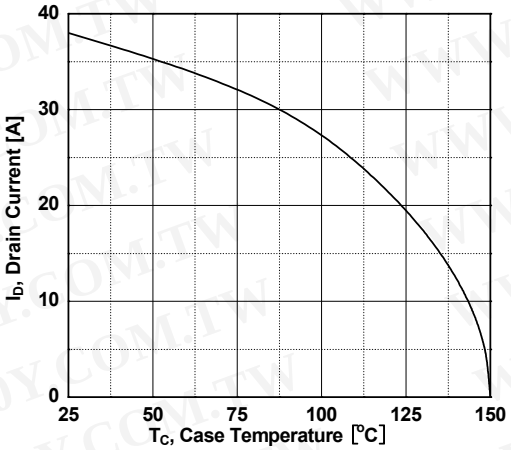
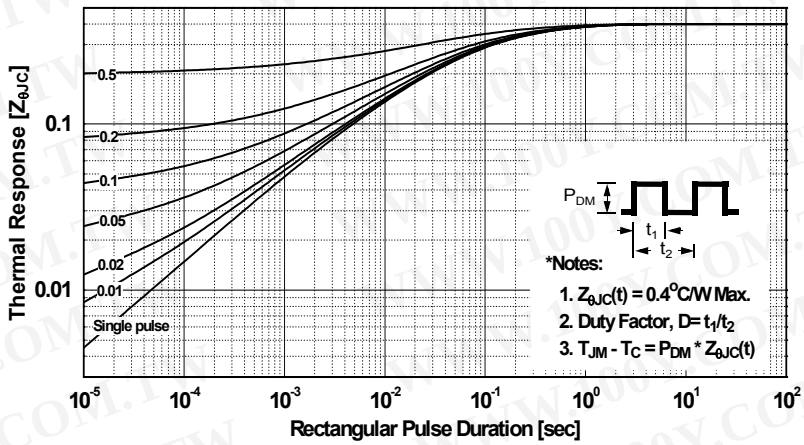
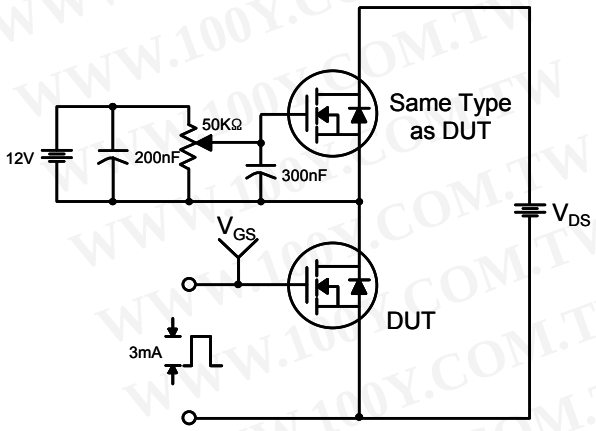
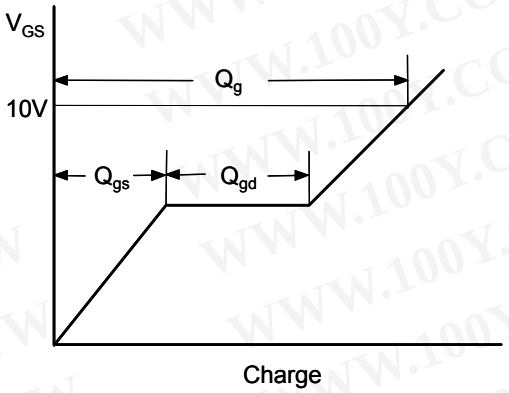


Figure 11. Transient Thermal Response Curve

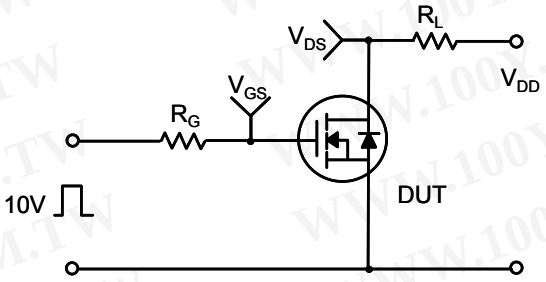


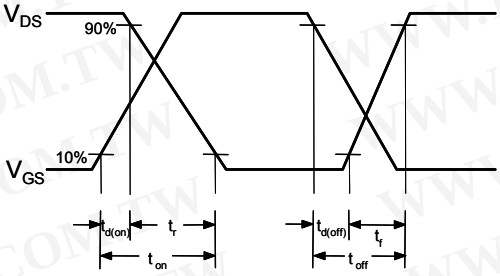
Gate Charge Test Circuit & Waveform



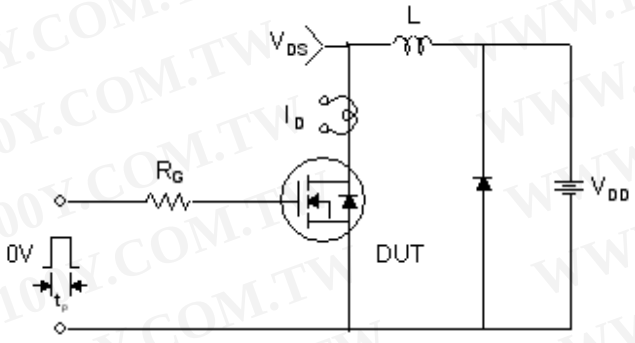


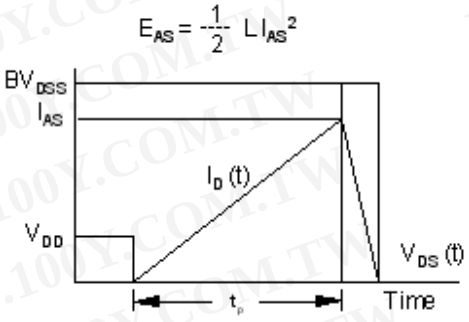
Resistive Switching Test Circuit & Waveforms



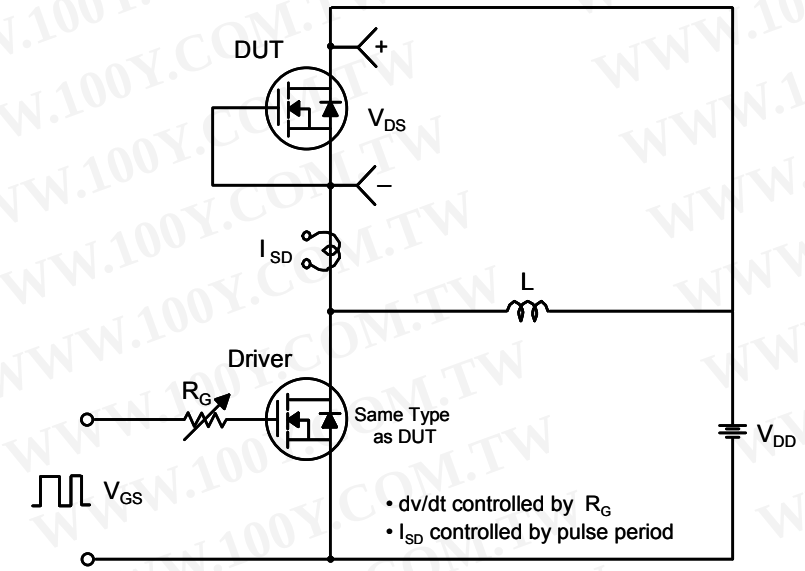


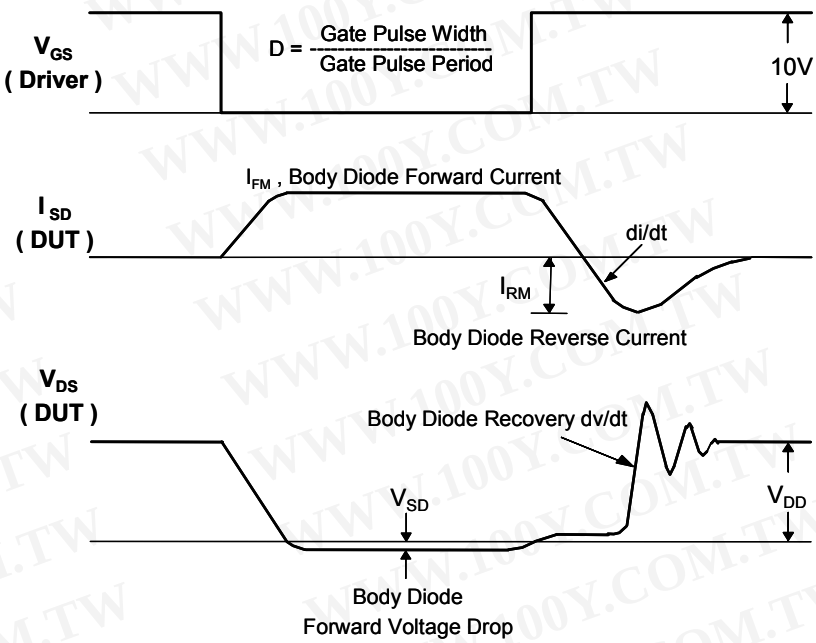
Unclamped Inductive Switching Test Circuit & Waveforms





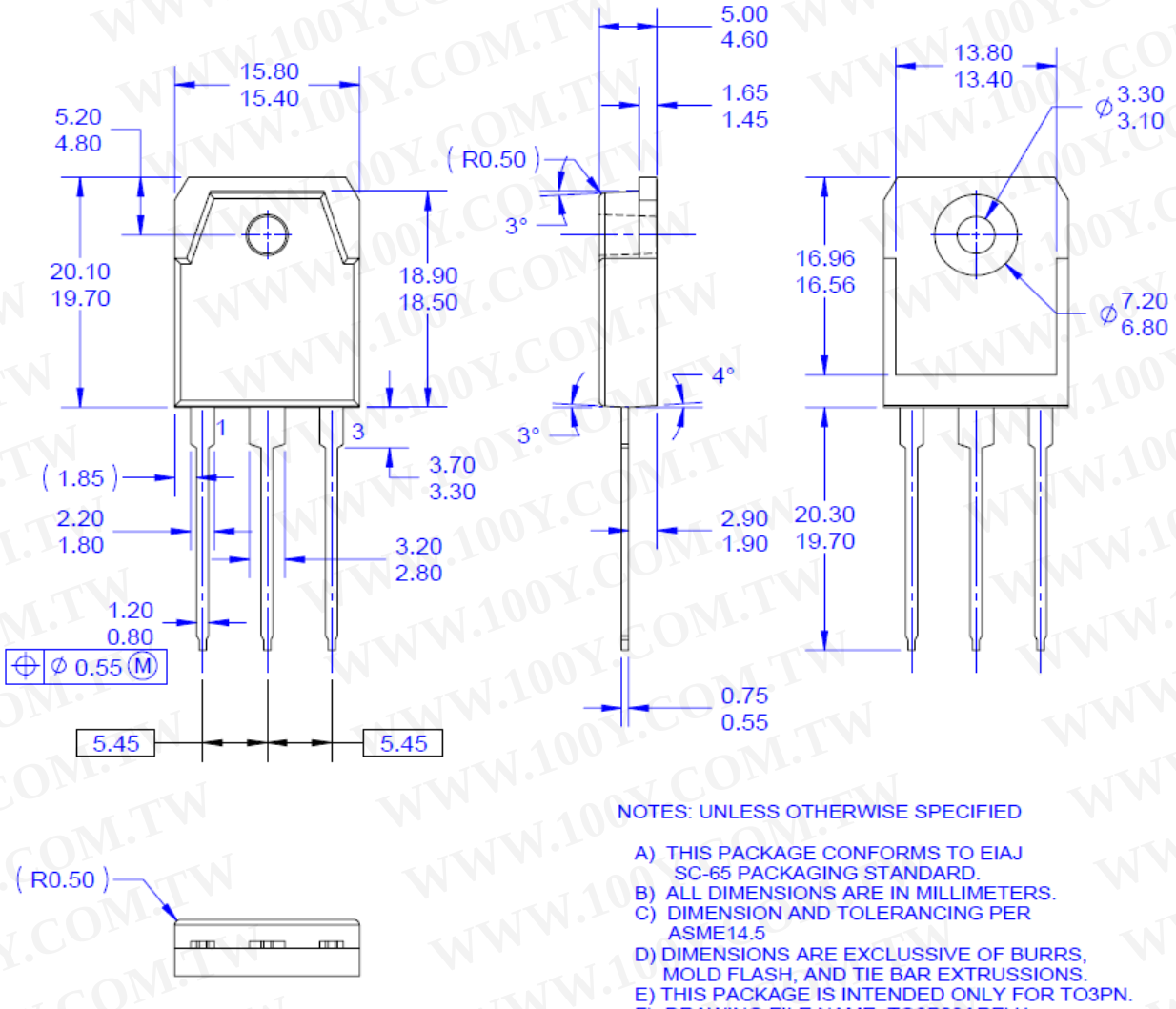
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

TO-3PN



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