August 2016

SemiHow
Know-How for Semiconductor

HCS80R250T

800V N-Channel Super Junction MOSFET

Description

- ☐ Very Low FOM ($R_{DS(on)}$ X Q_g)
- ☐ Extremely low switching loss
- ☐ Excellent stability and uniformity
- ☐ 100% Avalanche Tested

Key Parameters

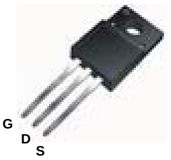
Parameter	Value	Unit
BV_{DSS} @$T_{j,max}$	850	V
I_D	18	A
$R_{DS(on), max}$	0.25	Ω
$Qg_{, Typ}$	58	nC

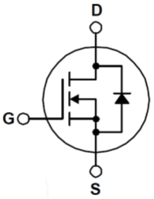
Features

- ☐ Switch Mode Power Supply (SMPS)
- ☐ Uninterruptible Power Supply (UPS)
- ☐ Power Factor Correction (PFC)
- ☐ Motor Control & LED Lighting Power
- ☐ DC-DC Converters

Package & Internal Circuit

TO-220F





Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	800	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Drain Current – Continuous (T_C = 25℃)	18 *	A
	Drain Current – Continuous (T_C = 100℃)	11*	A
I_{DM}	Drain Current – Pulsed (Note 1)	54 *	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	280	mJ
I_{AR}	Avalanche Current (Note 1)	7.5	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	0.5	mJ
dv/dt	MOSFET dv/dt ruggedness, V_{DS}=0…480V	50	V/ns
dv/dt	Reverse diode dv/dt, V_{DS}=0…480V, $I_{DS} \leq I_D$	15	V/ns
P_D	Power Dissipation (T_C = 25℃)	34	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃
T_L	Maximum lead temperature for soldering purposes, 1/8” from case for 5 seconds	300	℃

* Drain current limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	3.67	℃/W
$R_{\theta JA}$	Junction-to-Ambient	--	80	

Electrical Characteristics T_J=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 250 ㎂	2.5	--	4.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 9 A	--	0.22	0.25	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 ㎂	800	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800 V, V_{GS} = 0 V	--	--	1	㎂
		V_{DS} = 800 V, T_J = 125℃	--	--	100	㎂
I_{GSS}	Gate-Body Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	--	--	±100	㎁
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz	--	2550	--	㎊
C_{oss}	Output Capacitance		--	260	--	㎊
C_{rss}	Reverse Transfer Capacitance		--	15	--	㎊
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 400 V, I_D = 18 A, R_G = 25 Ω	--	64	--	㎱
t_r	Turn-On Rise Time		--	28	--	㎱
$t_{d(off)}$	Turn-Off Delay Time		--	180	--	㎱
t_f	Turn-Off Fall Time		--	19	--	㎱
Q_g	Total Gate Charge	V_{DS} = 640 V, I_D = 18 A V_{GS} = 10 V	--	58	--	nC
Q_{gs}	Gate-Source Charge		--	15	--	nC
Q_{gd}	Gate-Drain Charge		--	23	--	nC
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	18	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	54	
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 18 A, V_{GS} = 0 V	--	--	1.3	V
trr	Reverse Recovery Time	I_S = 18 A, V_{DD} = 400 V di_F/dt = 100 A/μs	--	400	--	㎱
Qrr	Reverse Recovery Charge		--	4	--	μC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. I_{AS}=7.5A, V_{DD}=50V, R_G=25Ω, Starting T_J =25°C
3. $I_{SD} \leq I_D$, di/dt ≤ 200A/us, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25 ℃
4. Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Characteristics

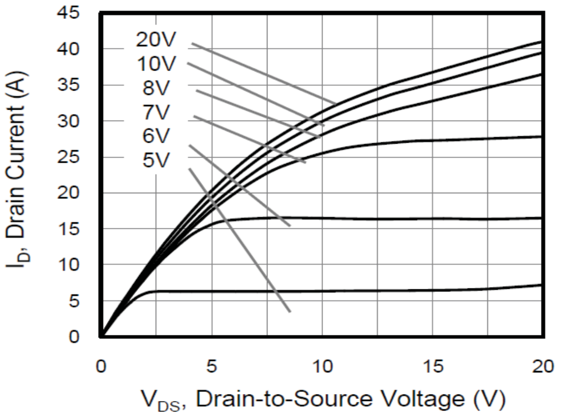


Figure 1. On Region Characteristics

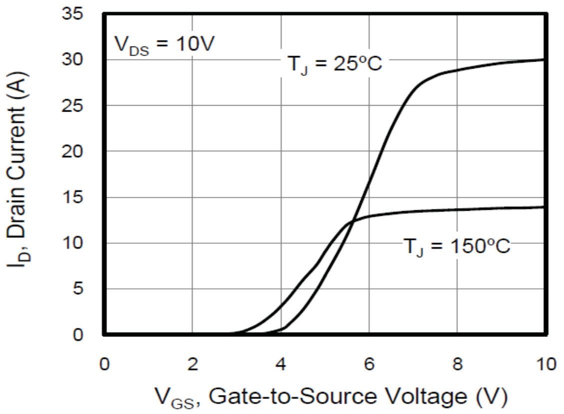


Figure 2. Transfer Characteristics

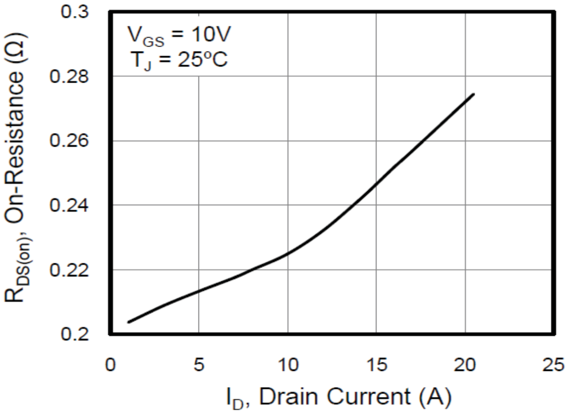


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

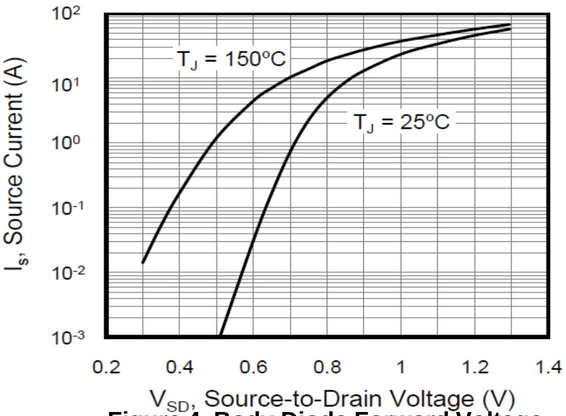


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

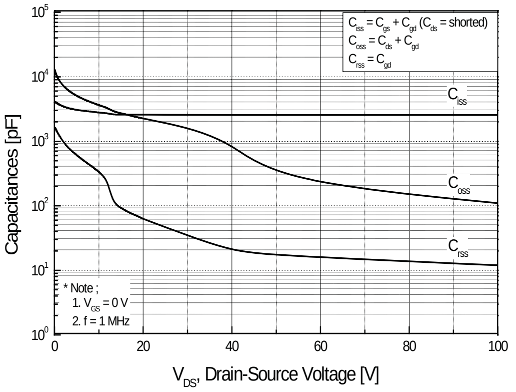


Figure 5. Capacitance Characteristics

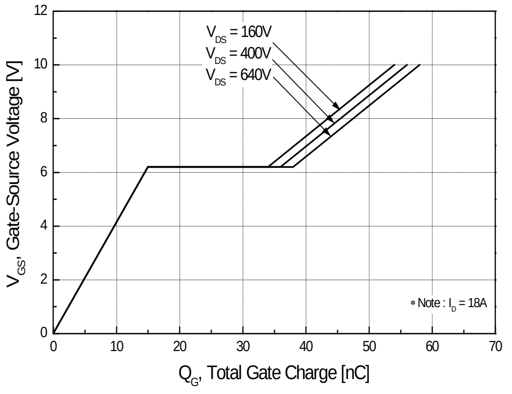


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

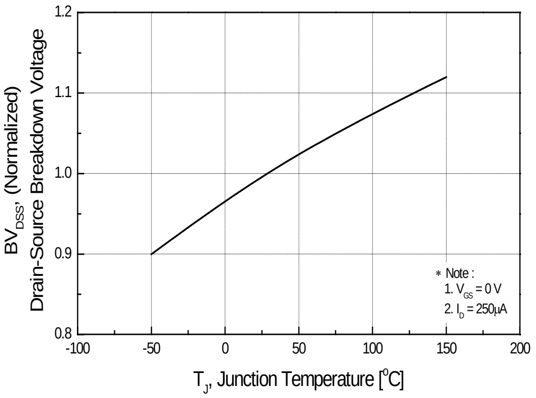


Figure 7. Breakdown Voltage Variation vs Temperature

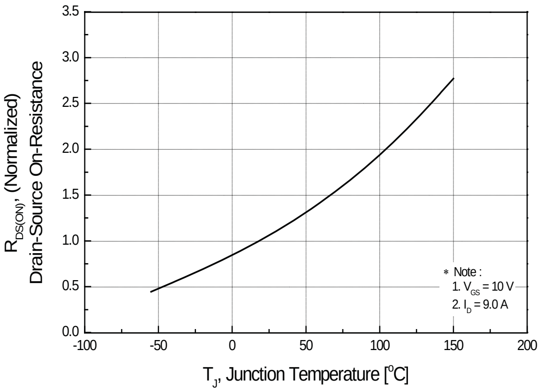


Figure 8. On-Resistance Variation vs Temperature

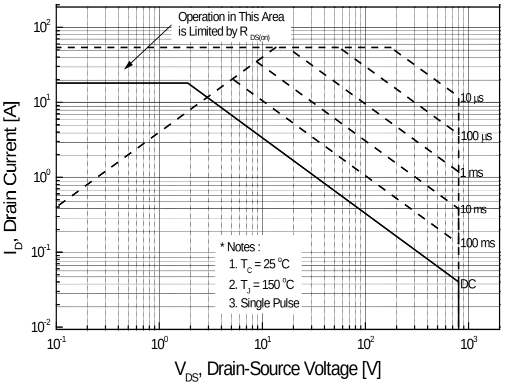


Figure 9. Maximum Safe Operating Area

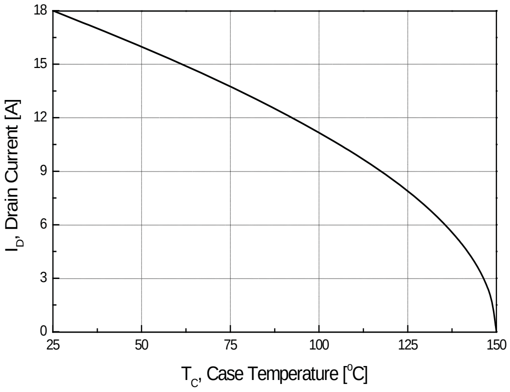


Figure 10. Maximum Drain Current vs Case Temperature

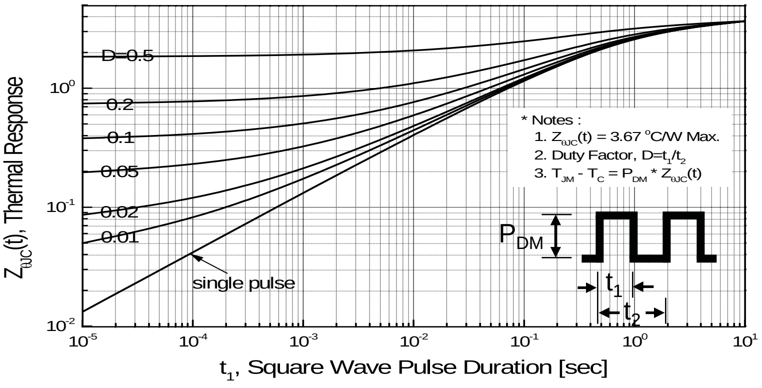


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform

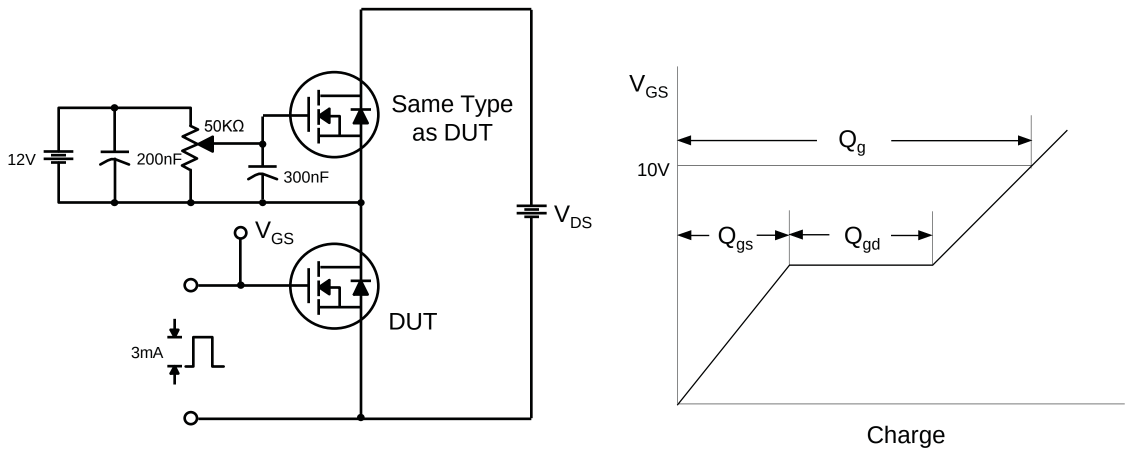


Fig 13. Resistive Switching Test Circuit & Waveforms

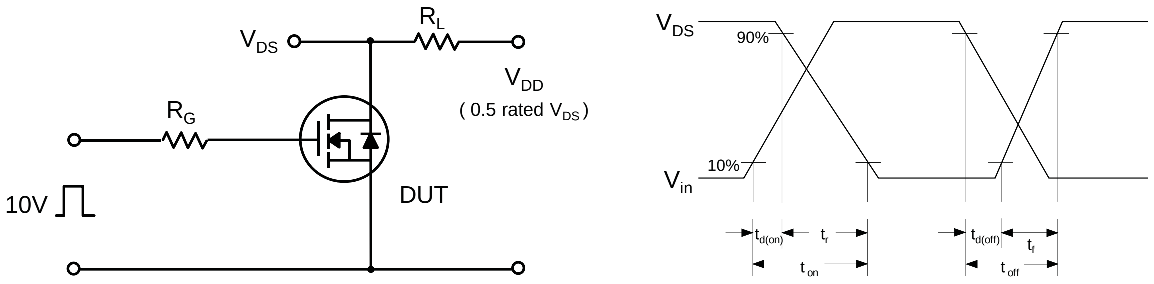


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

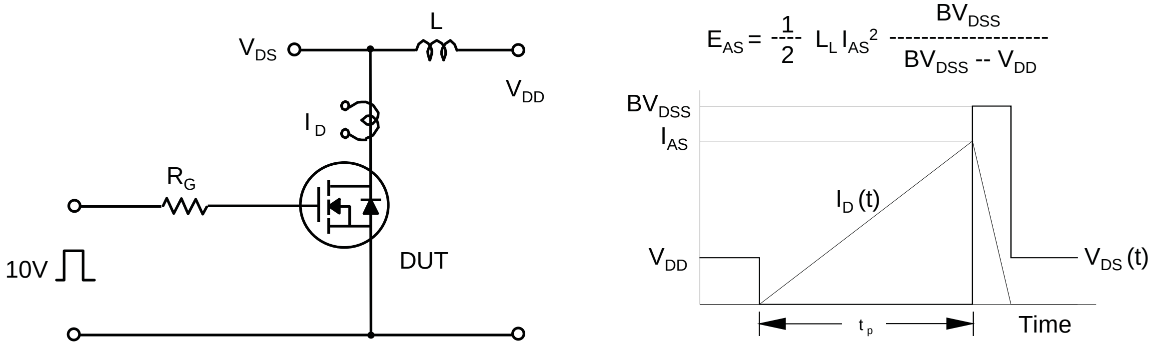
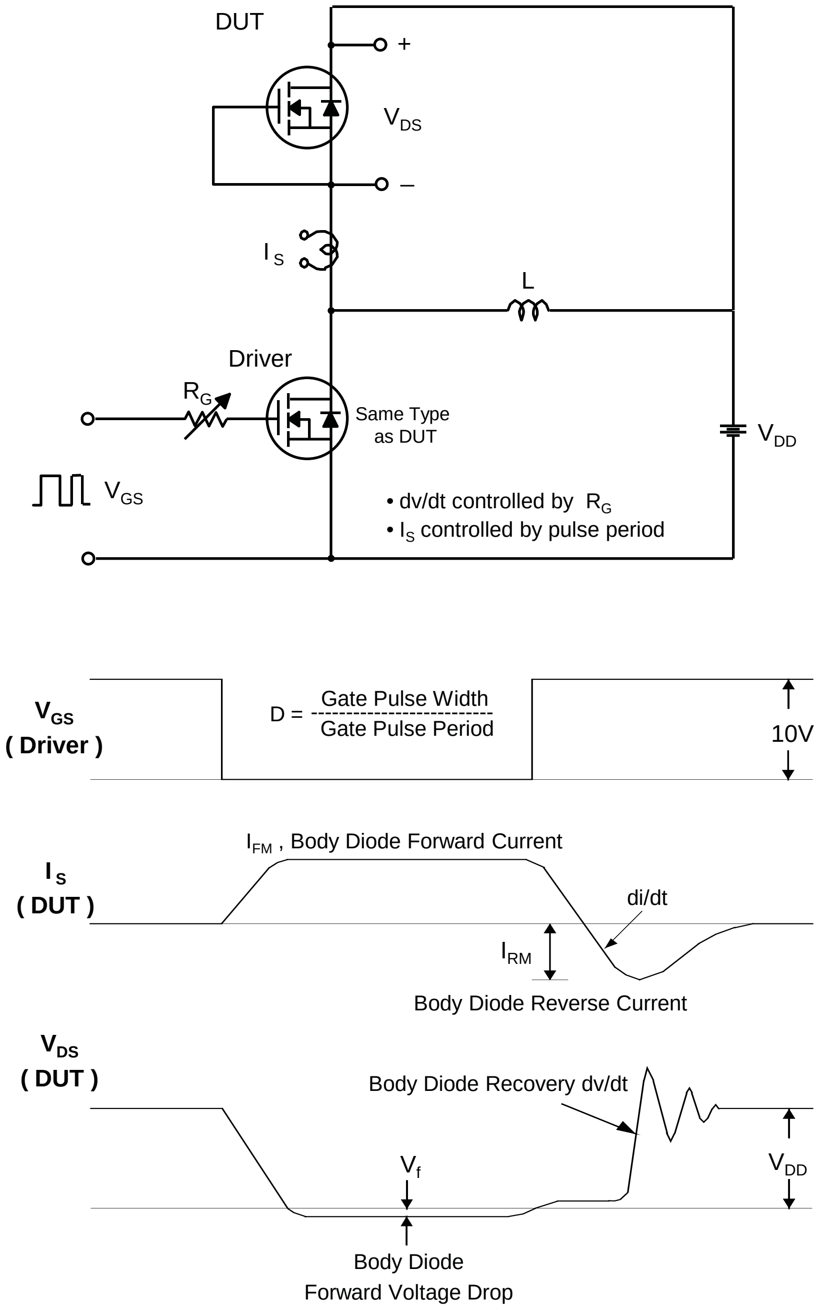
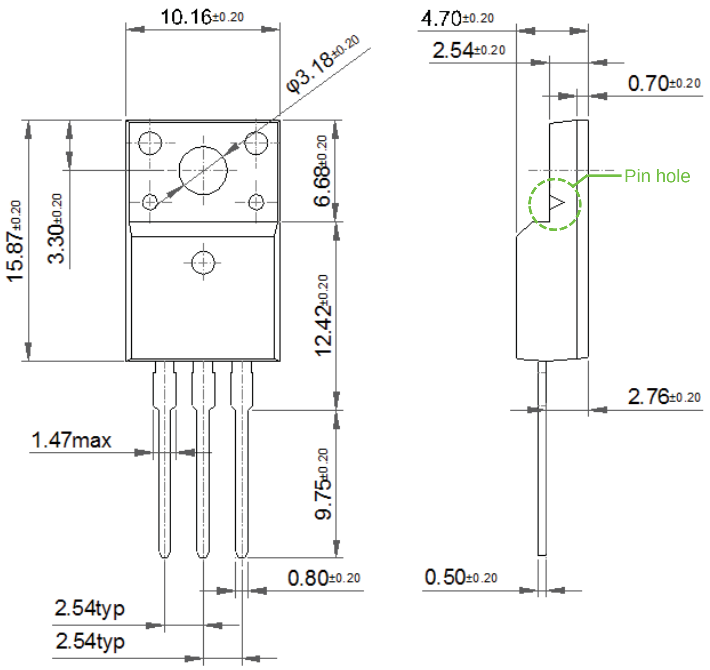


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

TO-220F



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