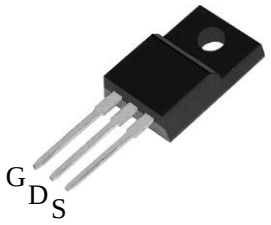
600V N-ch Multi-Epi Super-Junction MOSFET

Lead Free Package and Finish

BV_{DSS}	$R_{DS(ON),typ.}$	I_D
600V	0.139Ω	20A

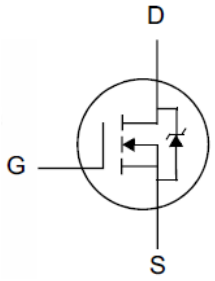
General Features

- Multi-Epi Process
- Proprietary New Super-Junction Technology
- $R_{DS(ON),typ.}$=0.139Ω@V_{GS}=10V
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode



TO-220F

Package No to Scale



Applications

- Adaptor
- Charger
- SMPS Standby Power

Ordering Information

Part Number	Package	Brand
SPTA60R160E	TO-220F	

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	Value	Unit
		SPTA60R160E	
V_{DSS}	Drain-to-Source Voltage	600	V
V_{GSS}	Gate source voltage (static)	±20	
	Gate source voltage (dynamic) AC (f>1Hz)	±30	
I_D	Continuous Drain Current @ T_C = 25ºC	20	A
I_{DM}	Pulsed Drain Current at V_{GS}=10V[1]	60	
dv/dt	Reverse diode dv/dt	15	V/ns
dv/dt	MOSFET dv/dt ruggedness	135	V/ns
E_{AS}	Single Pulse Avalanche Energy[2]	898	mJ
P_D	Power Dissipation	34	W
T_J& T_{STG}	Operating and Storage Temperature Range	-55 to 150	℃

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	Max. Value	Unit
		SPTA60R160E	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.67	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	100	

Electrical Characteristics

OFF Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	600	--	--	V	V_{GS}=0V, I_D=250uA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	uA	V_{DS}=600V, V_{GS}=0V
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	V_{GS}=+30V, V_{DS}=0V
		--	--	-100		V_{GS}=-30V, V_{DS}=0V

ON Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance[3]	--	0.139	0.17	Ω	V_{GS}=10V, I_D=10A
$V_{GS(TH)}$	Gate Threshold Voltage	2.8	--	4.2	V	V_{DS}=V_{GS}, I_D=250uA

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	1760	--	pF	V_{GS}=0V, V_{DS}=50V, f=10KHz
C_{oss}	Output Capacitance	--	176	--		
Crss	Reverse transfer capacitance	--	3.79	--		
R_G	Gate resistance (Intrinsic)	--	5.5	--	Ω	f = 1.0MHz Open Drain
Q_g	Total Gate Charge	--	37.8	--	nC	V_{DD}=400V, I_D=20A, V_{GS}=0 to 10V
Q_{gs}	Gate-to-Source Charge	--	8.04	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	29.3	--		
$V_{plateau}$	Gate plateau voltage	--	7.2	--	V	

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	11.4	--	ns	V_{DD}=300V, I_D=20A, V_{GS}=10V Rg=25Ω
t_{rise}	Rise Time	--	21.8	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	43	--		
t_{fall}	Fall Time	--	18.8	--		

Source-Drain Body Diode Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current[2]	--	--	20	A	Maximum Ratings
I_{SM}	Pulsed Source Current[2]	--	--	60		
V_{SD}	Diode Forward Voltage	--	0.71	1.2	V	I_S=20A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	320	--	ns	V_R=400V,V_{GS}=0V I_F=20A, di/dt =100A/μs
Q_{rr}	Reverse Recovery Charge	--	4.7	--	uC	
I_{rrm}	PeakReverseRecoveryCurrent	--	29.1	--	A	

Note:

[1] Repetitive Rating: Pulse width limited by maximum junction temperature
[2] L = 30mH, VDD= 80V, Starting T_J= 25°C
[3] Pulse Test: Pulse width ≤ 380us, Duty Cycle≤ 2%

Test Circuits and Waveforms

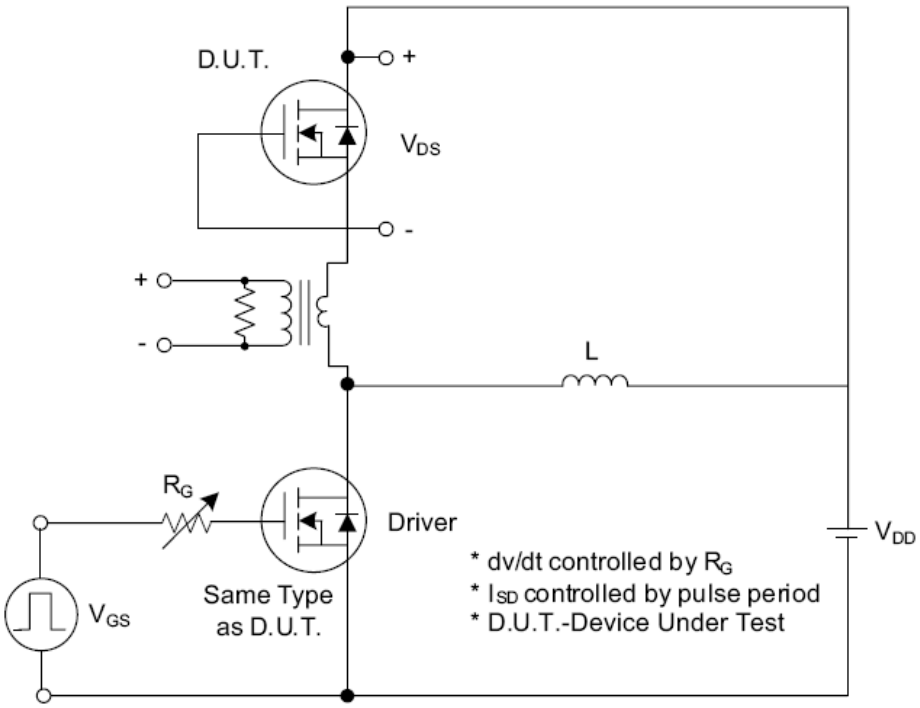


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

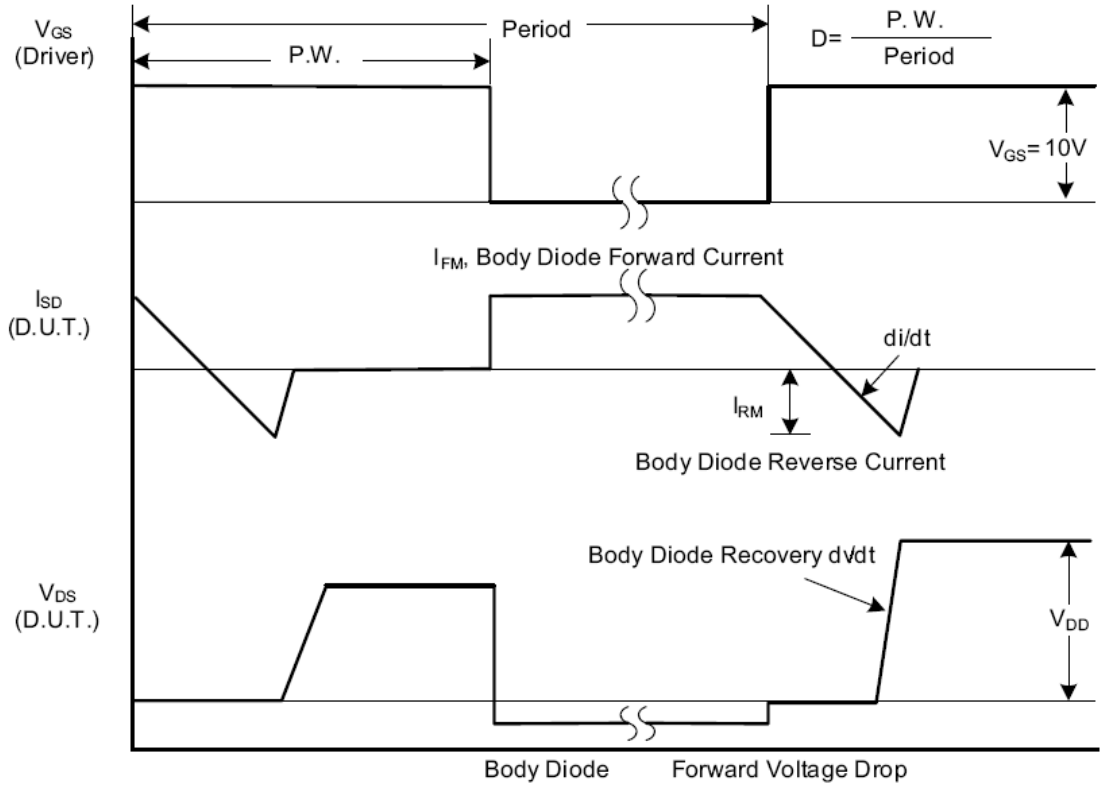


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test Circuits and Waveforms (Cont.)

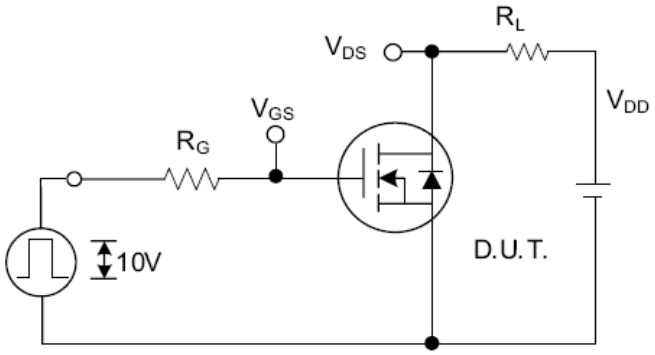


Fig. 2.1 Switching Test Circuit

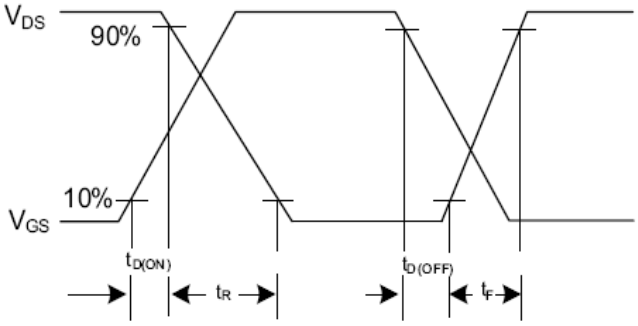


Fig. 2.2 Switching Waveforms

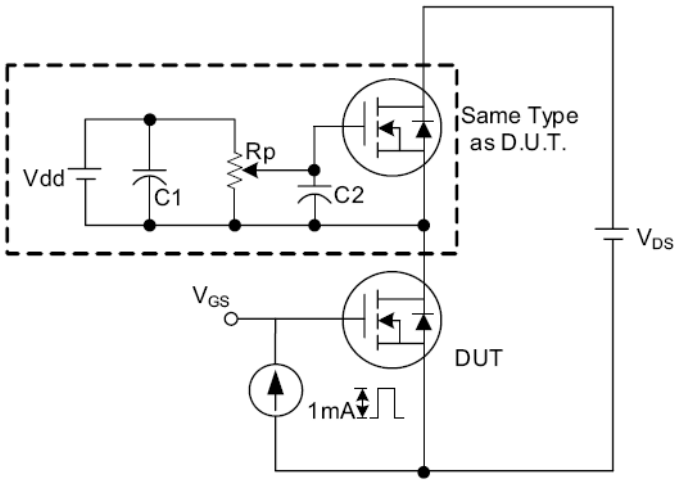


Fig. 3 . 1 Gate Charge Test Circuit

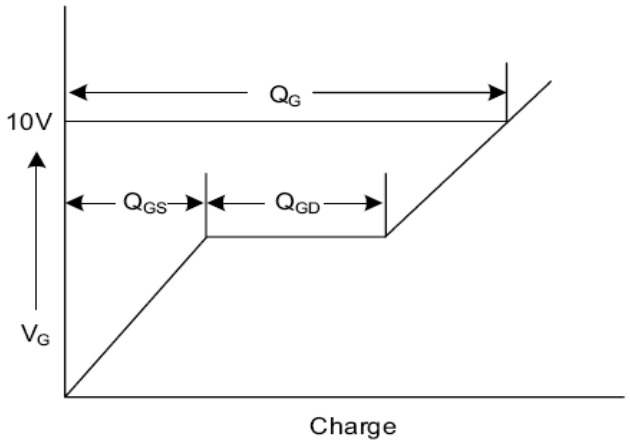


Fig. 3 . 2 Gate Charge Waveform

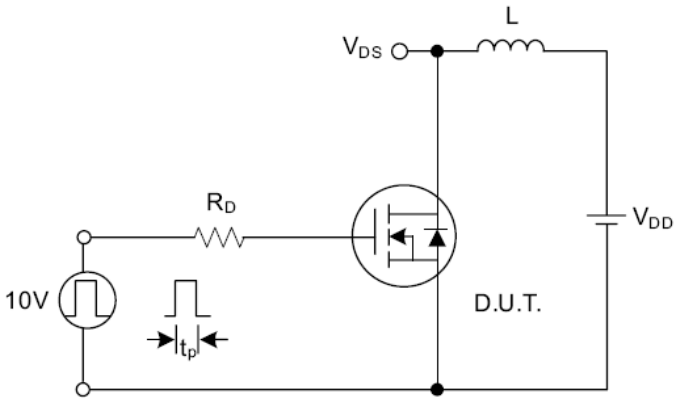


Fig. 4.1 Unclamped Inductive Switching Test Circuit

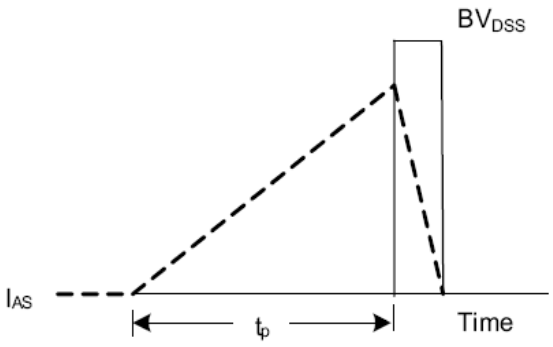


Fig. 4.2 Unclamped Inductive Switching Waveforms

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