

NPTEL Online Certification Course <Design of Power Electronics converter> <Assignment Number 3>: Detailed Solution Indian Institute of Technology Guwahati



From the datasheet enter the following:

Question 1. Gate resistor  $R_G$  used by manufacturer to measure turn ON/OFF times ... ( $\Omega_{h_c}$ 

Answer 1.  $R_G = 1.2 \Omega$ 

Question 2. The maximum value of total gate charge ... (nC)

Answer 2.  $Q_{gmax}$  = 270 nC

A buck converter needs to be designed with input voltage  $V_{in}$  = 100 V and switching frequency,  $f_s$  = 50

*kHz*. The MOSFET IRFP90N20DPbF is chosen for the design. A gate driver IC and gate resistor need to be

chosen for the MOSFET. A voltage of  $V_G$  = 15 V is chosen to be applied for the gate drive

circuit.

Question 3. Calculate the power required to drive the MOSFET,  $P_{gate}$ ... (W)

Solution 3. Given,  $V_G = 15 V$ ,  $f_s = 50 kHz$ ,  $Q_g = 180 nC$  (from datasheet)

 $= 15 \times 180 \times 10^{-9} \times 50 \times 10^{3}$ 

= 0.14 W

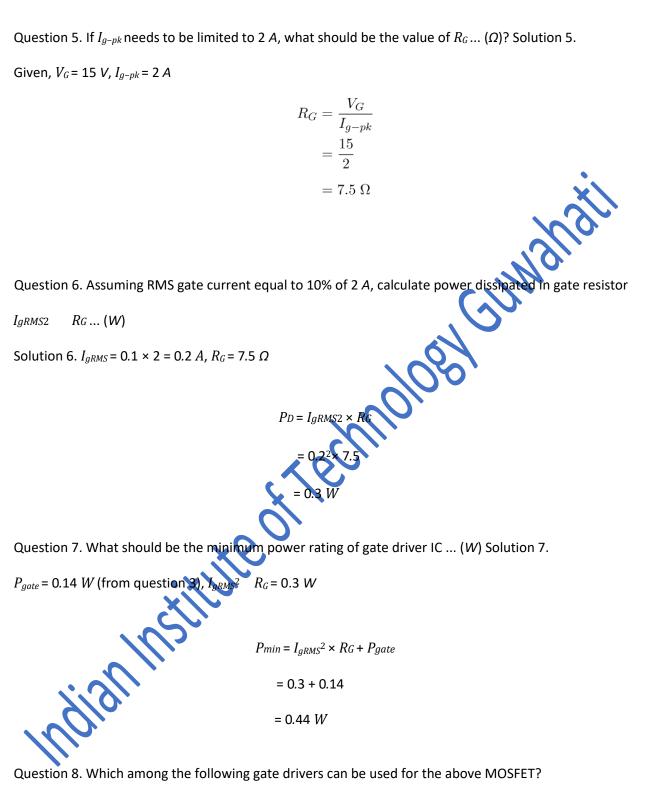
 $te = VG \times Q_g \times fs$ 

Question 4. Using the same value of  $R_G$  as used by manufacturer to measure turn ON/OFF times,



Solution 4. Given,  $V_G = 15 V$ ,  $R_G = 1.2 \Omega$  (from datasheet)

$$I_{g-pk} = \frac{V_G}{R_G}$$
$$= \frac{15}{1.2}$$
$$= 12.5 A$$



- a. FOD3150
- b. FOD3180
- c. TLP152
- d. TLP351H

Answer 8. "b. FOD3180" or "c. TLP152", only these two gate drivers satisfy the output gate current requirement.

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