

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 ... (Ω_{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

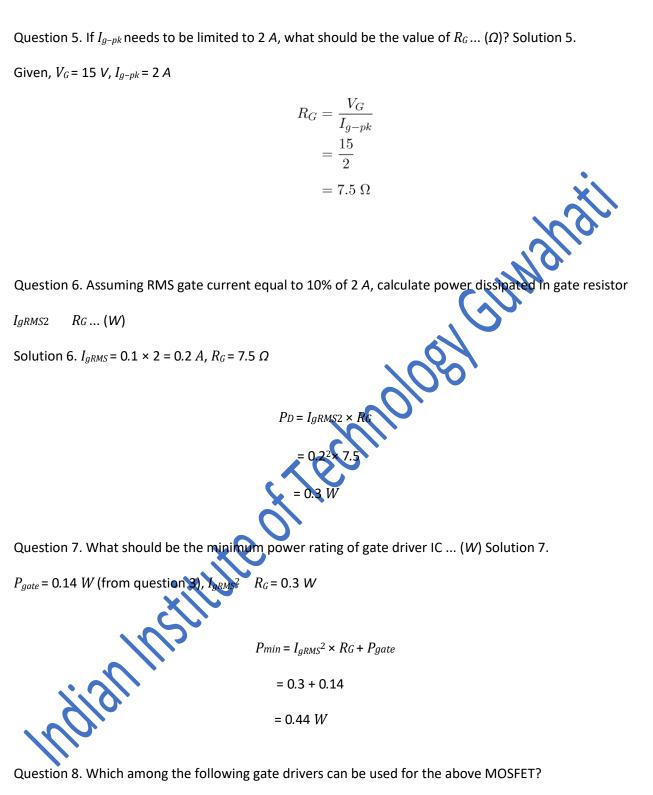
 $te = VG \times Q_g \times fs$

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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