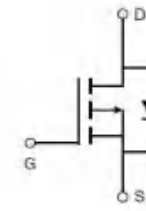


AP60P20Q

P-Channel Enhancement Mosfet

Feature

- -20V,-60A
 $R_{DS(ON)} < 7.0m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 9.0m\Omega @ V_{GS} = -2.5V$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge



Schematic Diagram

Application

- PWM applications
- Load Switch
- Power management



Marking and pin Assignment

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
60P20Q	AP60P20Q	PDFN3X3	13 inch	-	5000

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ($T_a = 25^\circ\text{C}$)	I_D	-60	A
Continuous Drain Current ($T_a = 100^\circ\text{C}$)	I_D	-42	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	-240	A
Single Pulsed Avalanche Energy ⁽⁴⁾	E_{AS}	81	mJ
Power Dissipation	P_D	80	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	1.6	$^\circ\text{C/W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~ +150	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS(T_a=25°C unless otherwise noted)

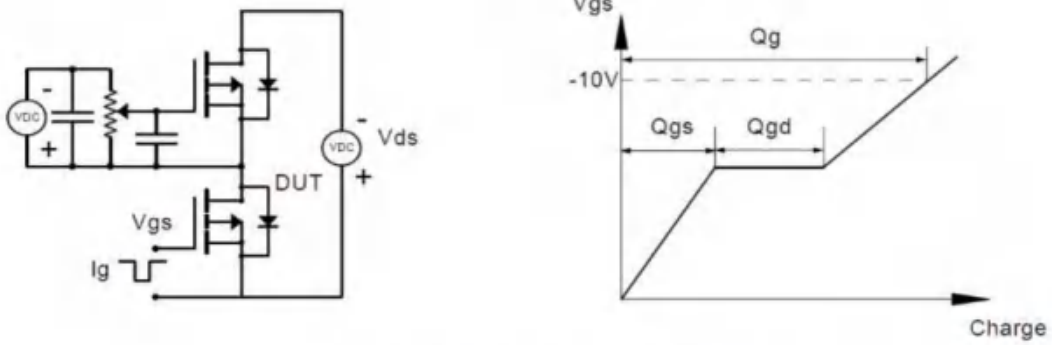
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = -250μA	-20	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} = -20V, V _{GS} = 0V	-	-	1	μA
Gate-body leakage current	I _{GSS}	V _{GS} = ±12V, V _{DS} = 0V	-	-	±100	nA
Gate threshold voltage ⁽³⁾	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250μA	0.35	0.6	1.0	V
Drain-source on-resistance ⁽³⁾	R _{DS(on)}	V _{GS} = -4.5V, I _D = -20A	-	5.8	7.0	mΩ
		V _{GS} = -2.5V, I _D = -10A	-	7.0	9.0	
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} = -10V, V _{GS} = 0V, f = 1MHz	-	7170	-	pF
Output Capacitance	C _{oss}		-	860	-	
Reverse Transfer Capacitance	C _{rss}		-	650	-	
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} = -10V, I _D = -15A, R _L = 0.5Ω V _{GS} = -4.5V, R _G = 3Ω	-	20	-	ns
Turn-on rise time	t _r		-	55	-	
Turn-off delay time	t _{d(off)}		-	100	-	
Turn-off fall time	t _f		-	35	-	
Total Gate Charge	Q _g	V _{DS} = -10V, I _D = -20A, V _{GS} = -4.5V	-	63	-	nC
Gate-Source Charge	Q _{gs}		-	10	-	
Gate-Drain Charge	Q _{gd}		-	18	-	
Source-Drain Diode characteristics						
Diode Forward voltage ⁽²⁾	V _{DS}	V _{GS} = 0V, I _S = -20A	-	-	-1.2	V
Diode Forward current ⁽³⁾	I _S		-	-	-60	A

Notes:

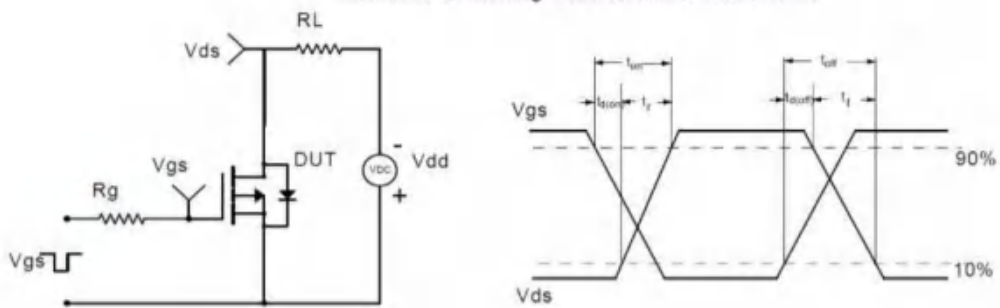
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%
3. Surface Mounted on FR4 Board, t ≤ 10 sec
4. EAS Condition: T_J = 25°C, V_{DD} = -10V, R_G = 25 Ω, L = 0.5mH

Test Circuit

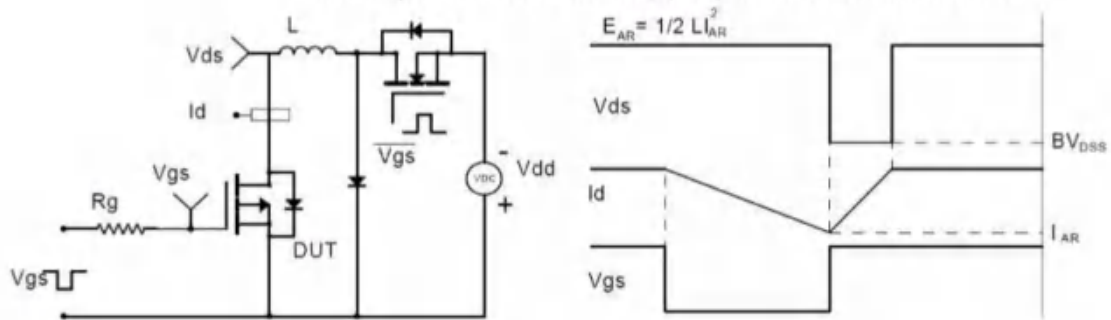
Gate Charge Test Circuit & Waveform



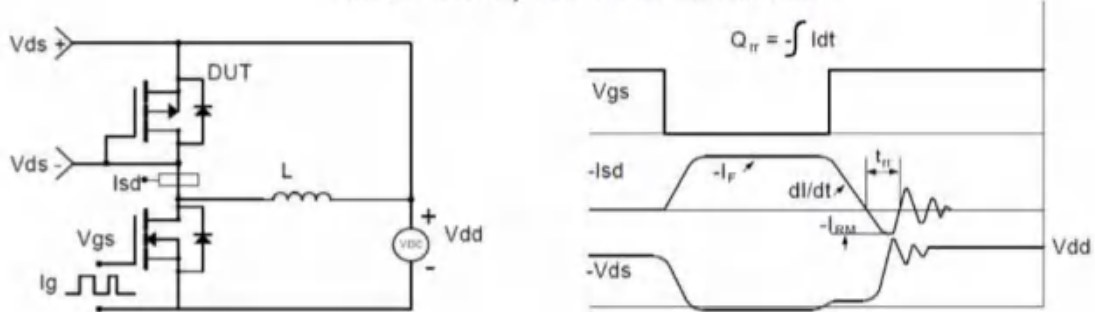
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

Figure 1: Output Characteristics

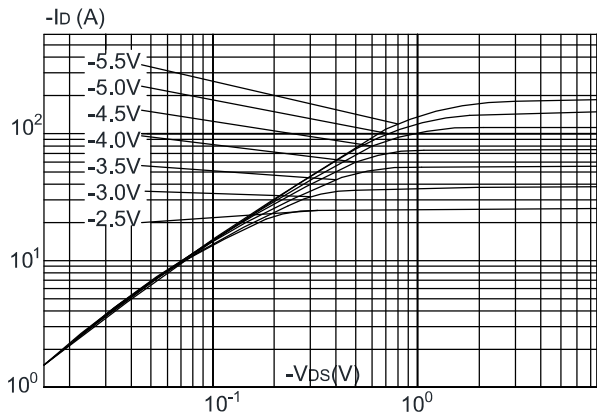


Figure 2: Typical Transfer Characteristics

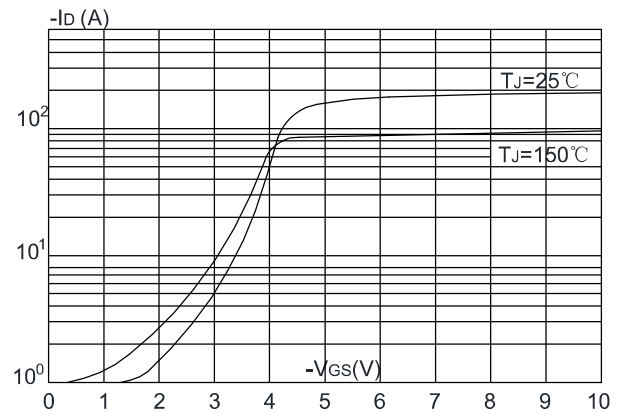


Figure 3: On-resistance vs. Drain Current

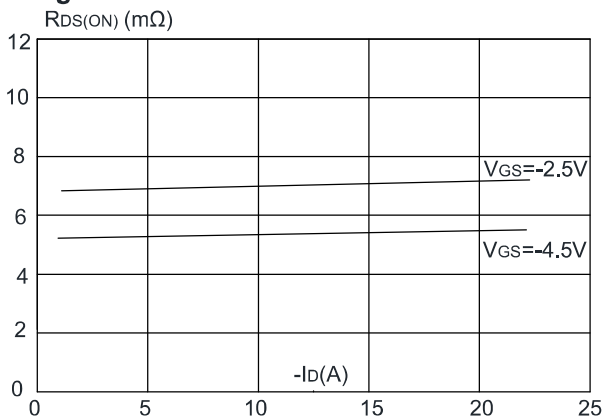


Figure 4: Body Diode Characteristics

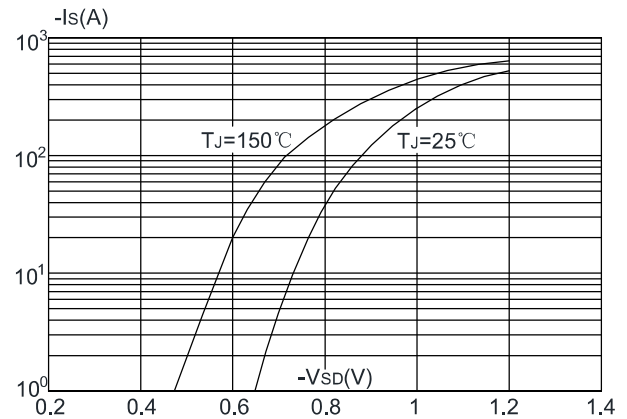


Figure 5: Gate Charge Characteristics

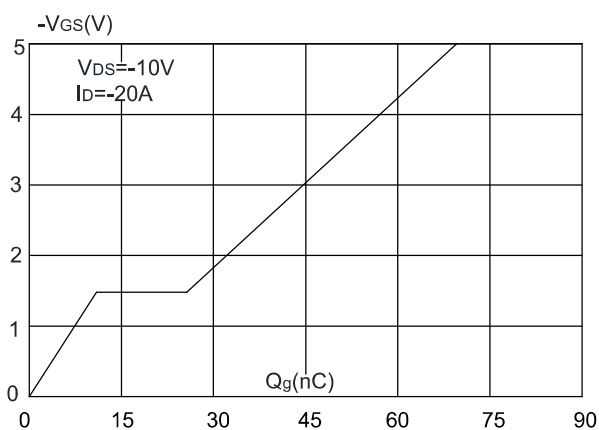


Figure 6: Capacitance Characteristics

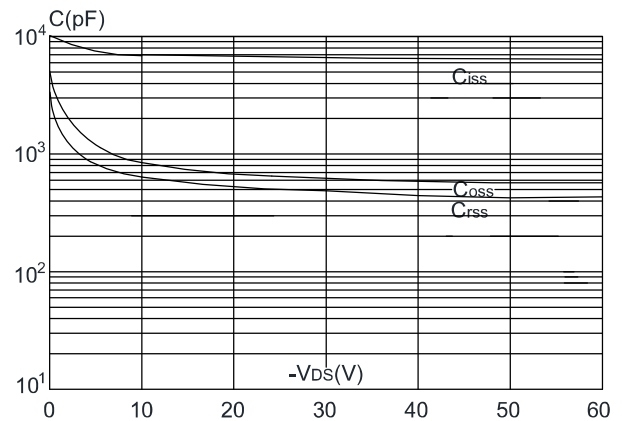


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

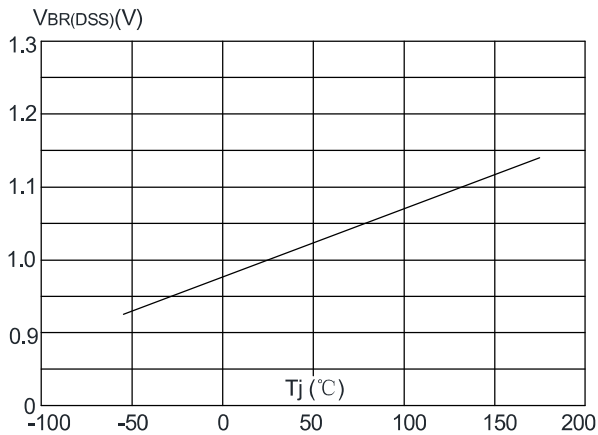


Figure 8: Normalized on Resistance vs. Junction Temperature

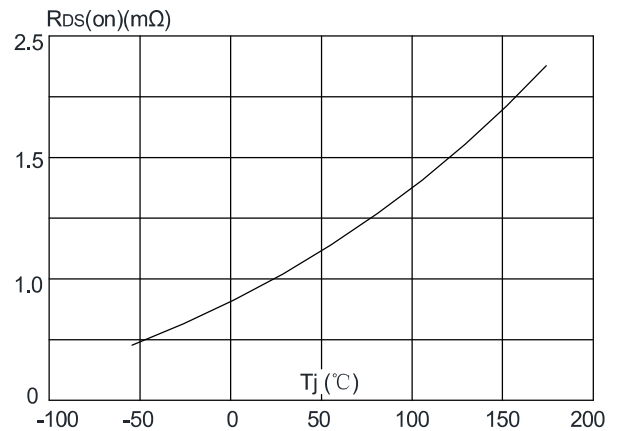


Figure 9: Maximum Safe Operating Area

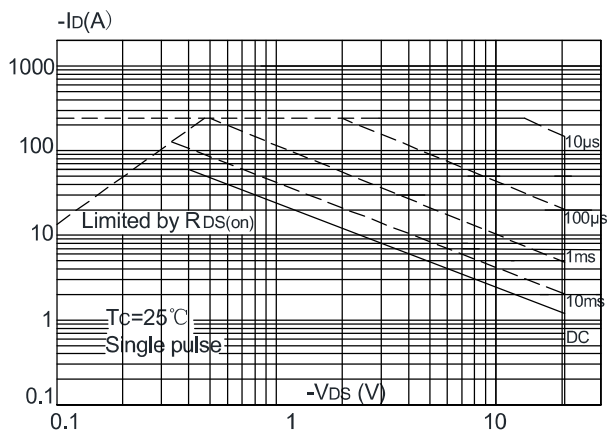


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

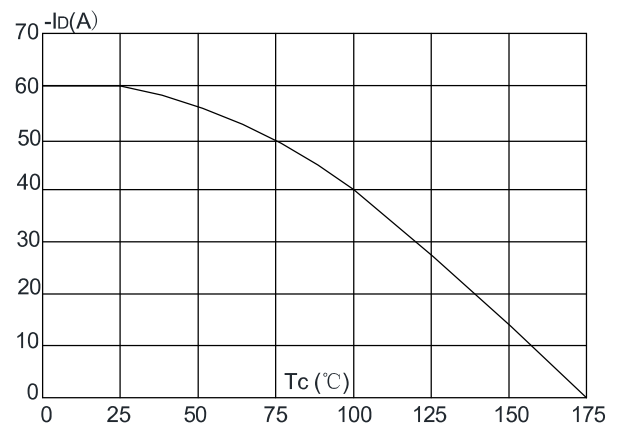
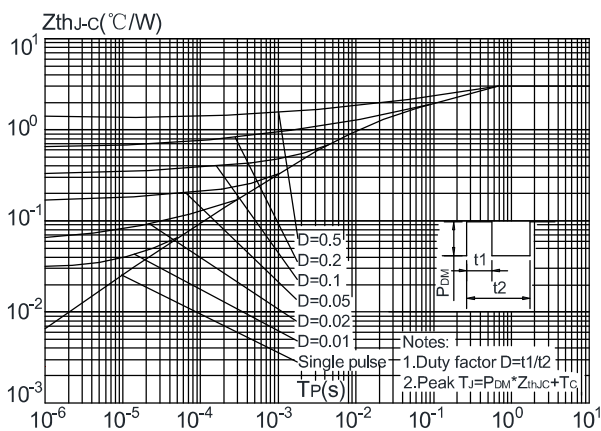
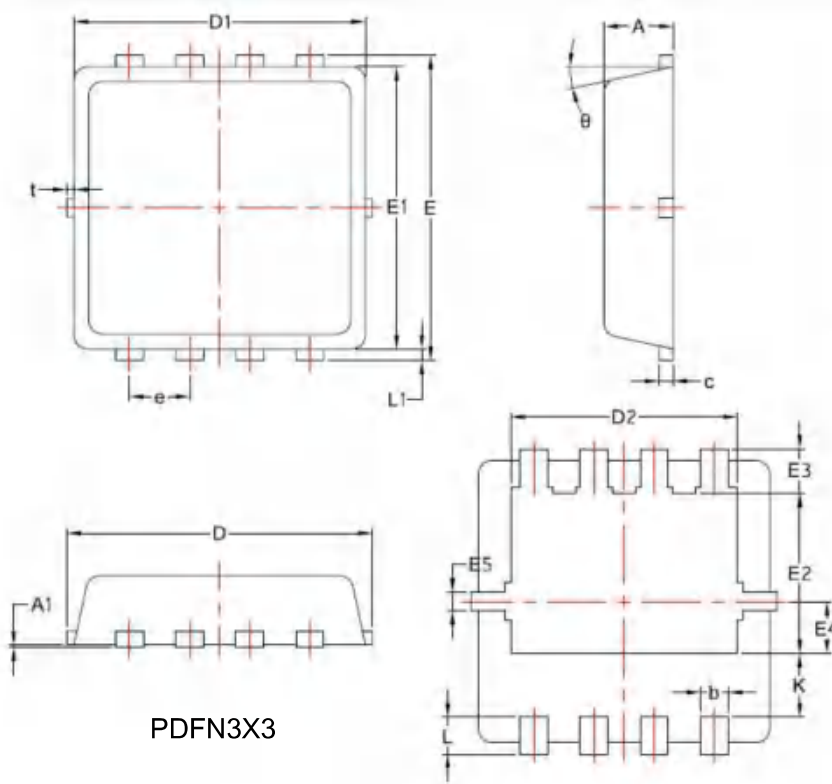


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



AP60P20Q
P-Channel Enhancement Mosfet

Package Mechanical Data



SYMBOL	COMMON		
	MM		
	MIN	NOM	MAX
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
θ	10°	12°	14°