

**650V N-CHANNEL ENHANCEMENT MODE MOSFET**

**MAIN CHARACTERISTICS**

$I_D$	20A
$V_{DSS}$	650V
$R_{DS(ON)-typ}@V_{GS}=10V$	<0.5Ω (Type:0.37 Ω)

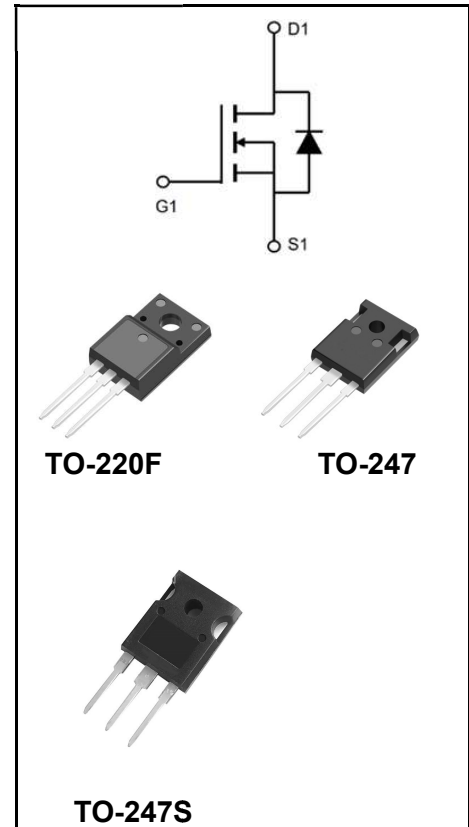
**Features**

- ◆Fast Switching
- ◆Low ON Resistance
- ◆Low Gate Charge
- ◆100% Single Pulse avalanche energy Test
- ◆LeadfreeincomplywithEUROHS2011/65/EUdirectives



**Mechanical Data**

- ◆Case: Molded plastic
- ◆Mounting Position: Any
- ◆Molded Plastic: UL Flammability Classification Rating 94V-0
- ◆Solder bath temperature275°C maximum,10s per JESD22-106



**Product Specification Classification**

Part Number	Package	Marking	Pack
YFW20N65AF	TO-220F	YFW 20N65AF XXXXX	50PCS/Tube
YFW20N65AP	TO-247	YFW 20N65AP XXXXX	30PCS/Tube
YFW20N65APS	TO-247S	YFW 20N65APS XXXXX	30PCS/Tube

**Maximum Ratings at Tc=25°C unless otherwise specified**

Characteristics	Symbols	Value		Units
		220F	247/247S	
Drain-Source Voltage	<b>V<sub>DS</sub></b>	650		<b>V</b>
Gate-Source Voltage	<b>V<sub>GS</sub></b>	±30		<b>V</b>
Continue Drain Current	<b>I<sub>D</sub></b>	20		<b>A</b>
-Continuous (TC = 100°C)		13		
Pulsed Drain Current (Note1)	<b>I<sub>DM</sub></b>	80		<b>A</b>
Power Dissipation	<b>P<sub>D</sub></b>	85	230	<b>W</b>
-Derate above 25°C		0.65	0.58	<b>W/°C</b>
Single Pulse Avalanche Energy (Note2)	<b>E<sub>AS</sub></b>	1250		<b>mJ</b>
Avalanche Current (Note 1)	<b>I<sub>AR</sub></b>	20		<b>A</b>
Repetitive Avalanche Energy (Note 1)	<b>E<sub>AS</sub></b>	37		<b>mJ</b>
Operating Temperature Range	<b>T<sub>J</sub></b>	150		<b>°C</b>
Storage Temperature Range	<b>T<sub>STG</sub></b>	-55 to +150		<b>°C</b>
Thermal Resistance, Junction to Case	<b>R<sub>θJC</sub></b>	1.47	0.5	<b>°C/W</b>
Thermal Resistance, Junction to Ambient	<b>R<sub>θJA</sub></b>	62.5	48.5	<b>°C/W</b>

**Maximum Ratings at Tc=25°C unless otherwise specified**

Characteristics	Test Condition	Symbols	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	<b>BV<sub>DSS</sub></b>	650	-	-	<b>V</b>
Drain-Source Leakage Current	V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V	<b>I<sub>DSS</sub></b>	-	-	1	<b>uA</b>
	V <sub>DS</sub> = 520 V, T <sub>c</sub> = 125°C		-	-	10	
Gate Leakage Current	V <sub>GS</sub> = ± 30 V, V <sub>DS</sub> = 0 V	<b>I<sub>GSS</sub></b>	-	-	±100	<b>nA</b>
Gate-Source Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	<b>V<sub>GS(th)</sub></b>	2	-	4	<b>V</b>
Drain-Source On-State Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10A	<b>R<sub>DS(on)</sub></b>	-	0.37	0.5	<b>Ω</b>
Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 10 A	<b>g<sub>fs</sub></b>	-	18	-	<b>S</b>
Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1MHz	<b>C<sub>iss</sub></b>	-	2567	-	<b>pF</b>
Output Capacitance		<b>C<sub>oss</sub></b>	-	290	-	
Reverse Transfer Capacitance		<b>C<sub>rss</sub></b>	-	20	-	
Turn-on Delay Time	I <sub>D</sub> = 20, V <sub>DD</sub> = 325V, R <sub>G</sub> =10Ω(Note3,4)	<b>td(ON)</b>	-	39	-	<b>nS</b>
Rise Time		<b>tr</b>	-	80	-	
Turn-Off Delay Time		<b>td(OFF)</b>	-	94	-	
Fall Time		<b>tf</b>	-	63	-	
Total Gate Charge	I <sub>D</sub> =20 A, V <sub>DD</sub> = 520 V, V <sub>GS</sub> = 10 V(Note3,4)	<b>Q<sub>G</sub></b>	-	65	-	<b>nC</b>
Gate to Source Charge		<b>Q<sub>GS</sub></b>	-	14	-	
Gate to Drain Charge		<b>Q<sub>GD</sub></b>	-	24	-	

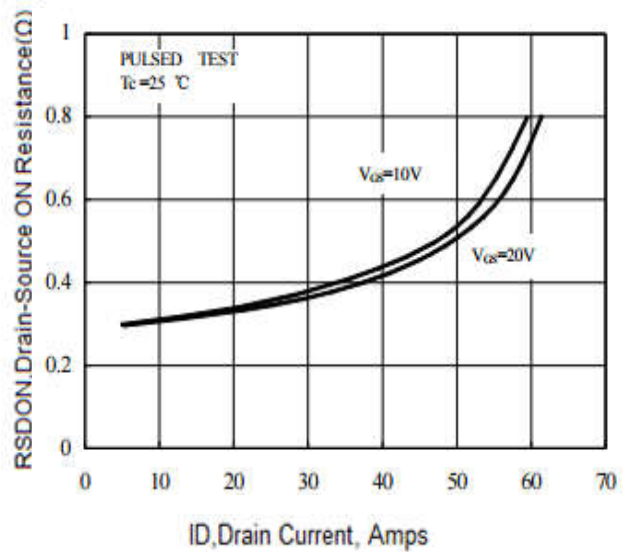
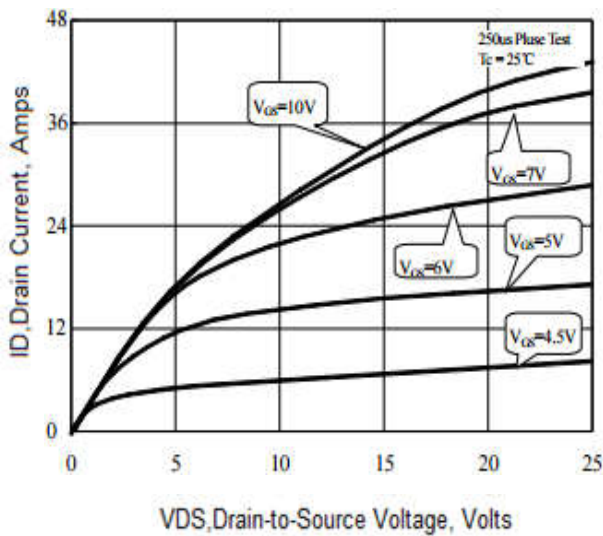
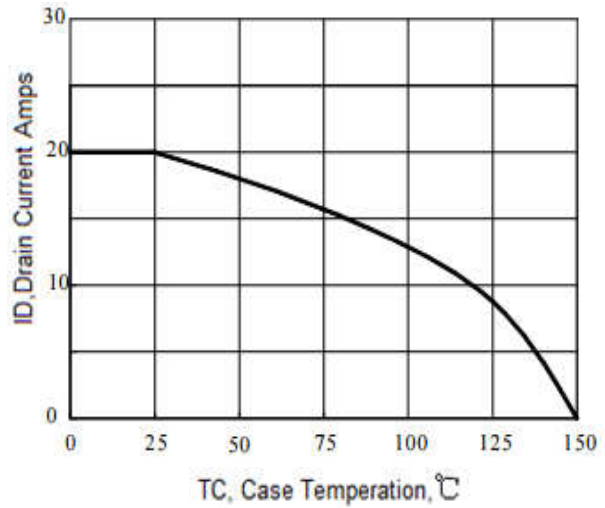
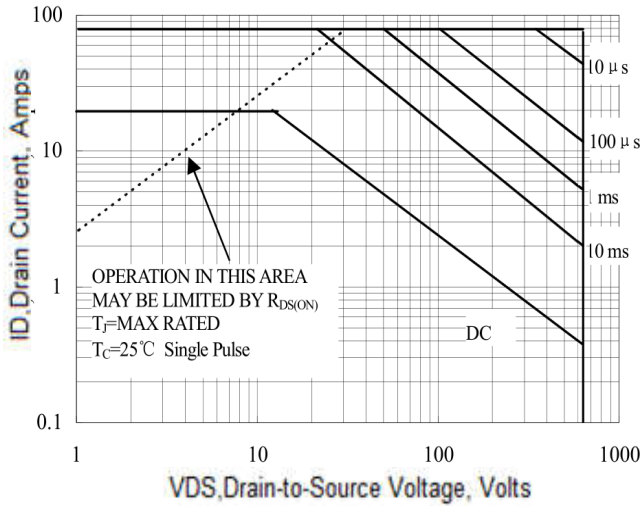
Source-Drain Diode Characteristics at Ta=25°C unless otherwise specified

Characteristics	Test Condition	Symbols	Min	Typ	Max	Units
Maximun Body-Diode Continuous Current		$I_S$	-	-	20	A
Maximun Body-Diode Pulsed Current		$I_{SM}$	-	-	80	A
Drain-Source Diode Forward Voltage	$I_{SD} = 20A$	$V_{SD}$	-	-	1.4	V
Reverse Recovery Time	$I_{SD} = 20A, V_{GS} = 0V,$ $di_F / dt = 100 A/\mu s(\text{Note}3)$	$trr$	-	630	-	nS
Reverse Recovery Charge		$Q_{rr}$	-	7.4	-	$\mu C$

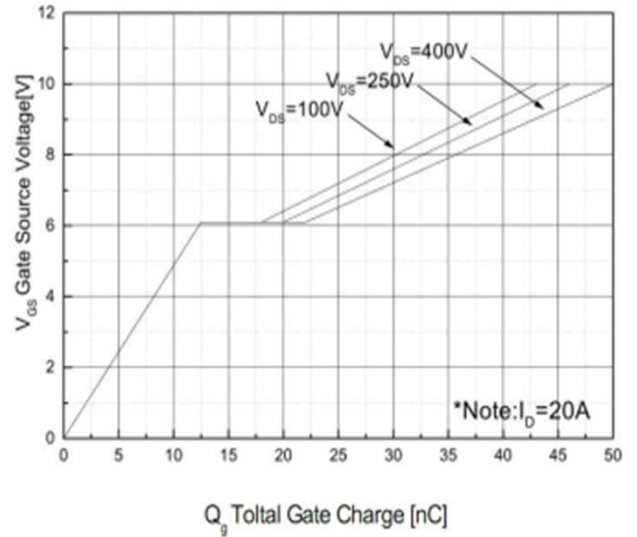
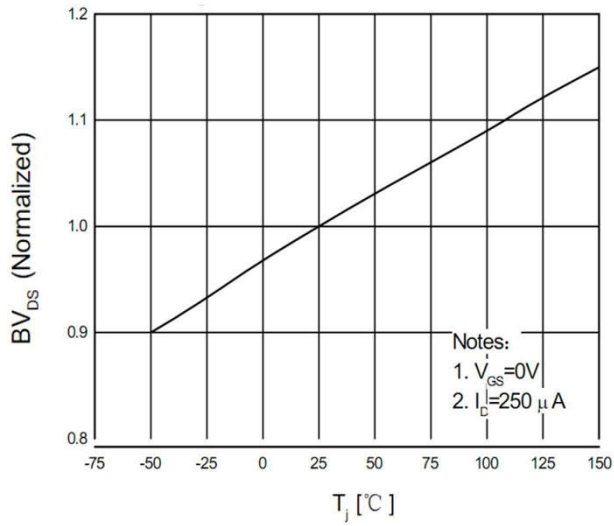
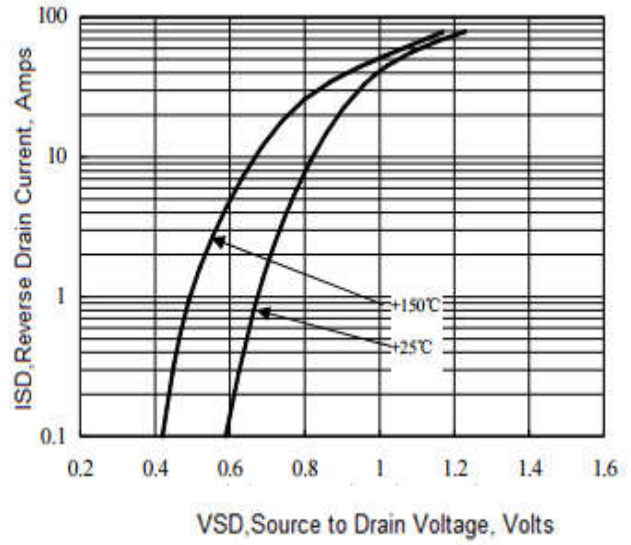
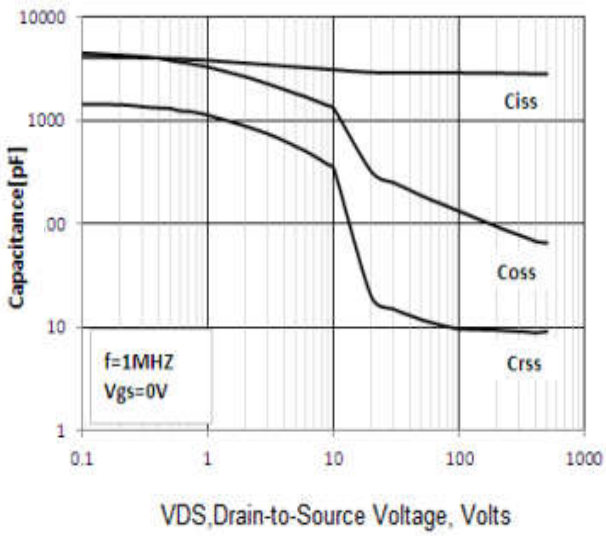
Note:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2.  $I_{AS} = 20A, V_{DD} = 50V, L = 6mH, R_G = 25\Omega,$  starting  $T_J = 25^\circ C.$
3. ulse test: Pulse Width  $\leq 300 \mu s,$  Duty Cycle  $\leq 2\%.$
4. Essentially Independent of Operating Temperature.

Ratings and Characteristic Curves



**Ratings and Characteristic Curves**



Package Outline Dimensions Millimeters

TO-220F

	Dim.	Min.	Max.
	A	9.95	10.25
	B	2.95	3.25
	C	1.25	1.45
	D	12.95	13.25
	E	0.50	0.65
	F	3.1	3.3
	G	1.30	1.45
	H	Typ 2.54	
	I	Typ 5.08	
	J	4.60	4.75
	K	2.50	2.65
	L	6.35	6.55
	M	15.4	16.0
	N	2.75	3.05
O	0.48	0.52	
P	0.76	0.84	
All Dimensions in millimeter			

TO-247

	Dim.	Min.	Max.
	A	15	16
	B	20	21
	C	41	42
	D	5	6
	E	4	5
	F	2.5	3.5
	G	1.75	2.5
	H	3	3.5
	I	8	10
	J	4.9	5.1
	K	1.9	2.1
	L	3.5	4
	M	4.75	5.25
	N	2	3
O	0.55	0.75	
P	Typ 5.08		
Q	1.2	1.3	
All Dimensions in millimeter			

Package Outline Dimensions Millimeters

TO-247S

	Dim.	Min.	Max.
	A	15	16
	B	19.5	20.5
	C	33.5	35.5
	D	5	6
	E	3.5	4.5
	F	2.5	3.5
	G	1.75	2.5
	H	3	4
	I	9	11
	J	4.9	5.1
	K	1	1.3
	L	3.75	4.25
	M	4.75	5.25
	N	1.8	2.2
O	0.45	0.6	
P	Typ 5.08		
Q	1.2	1.3	
All Dimensions in millimeter			

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