

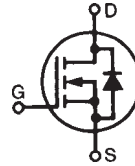


**PolarHV™ Power MOSFET**

**FMD12N500  
FMT12N500**

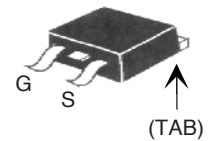
$V_{DSS} = 500 \text{ V}$   
 $I_{D25} = 12 \text{ A}$   
 $R_{DS(on)} \leq 0.5 \text{ } \Omega$   
 $t_{rr} \leq 200 \text{ ns}$

N-Channel Enhancement Mode  
Avalanche Rated

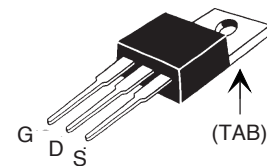


Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	500	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$	500	V
$V_{GSM}$	Transient	$\pm 40$	V
$V_{GSM}$	Continuous	$\pm 30$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	12	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	20	A
$I_{AR}$	$T_C = 25^\circ\text{C}$	12	A
$E_{AR}$	$T_C = 25^\circ\text{C}$	24	mJ
$E_{AS}$	$T_C = 25^\circ\text{C}$	600	mJ
$dv/dt$	$I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ , $R_G = 10 \text{ } \Omega$	20	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	200	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_L$	1.6 mm (0.062 in.) from case for 10 s Plastic body for 10 seconds	300 260	$^\circ\text{C}$ $^\circ\text{C}$
$M_d$	Mounting torque (TO-220)	1.13/10	Nm/lb.in.
Weight	TO-220	4	g
	TO-263	3	g

TO-263 FMD12N500



TO-220 FMT12N500



G = Gate      D = Drain  
S = Source      TAB = Drain

**Features**

- International standard packages
- Unclamped Inductive Switching (UIS) rated
- Low package inductance  
- easy to drive and to protect

**Advantages**

- Easy to mount
- Space savings
- High power density

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{DSS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \text{ } \mu\text{A}$	500		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 1 \text{ mA}$	3.0		5.5 V
$I_{GSS}$	$V_{GS} = \pm 30 \text{ V}_{DC}$ , $V_{DS} = 0$			$\pm 100 \text{ nA}$
$I_{DSS}$	$V_{DS} = V_{DSS}$			5 $\mu\text{A}$
	$V_{GS} = 0 \text{ V}$ $T_J = 125^\circ\text{C}$			150 $\mu\text{A}$
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$ , Note 1			500 m $\Omega$



# FMD/T12N500 12A 500V N-Channel Polar HV™ Power MOSFET

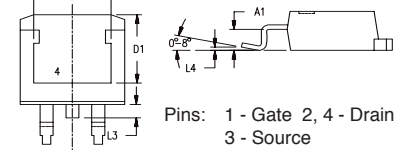
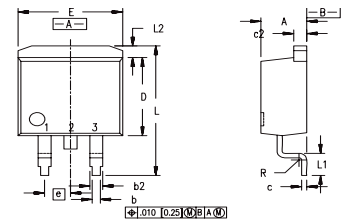
Symbol	Test Conditions	Characteristic Values (T <sub>J</sub> = 25°C unless otherwise specified)		
		Min.	Typ.	Max.
<b>g<sub>fs</sub></b>	V <sub>DS</sub> = 20 V; I <sub>D</sub> = 0.5 I <sub>D25</sub> , Note 1		13	S
<b>C<sub>iss</sub></b>			1690	pF
<b>C<sub>oss</sub></b>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz		182	pF
<b>C<sub>rss</sub></b>			16	pF
<b>t<sub>d(on)</sub></b>			22	ns
<b>t<sub>r</sub></b>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = I <sub>D25</sub>		27	ns
<b>t<sub>d(off)</sub></b>	R <sub>G</sub> = 50 Ω (External)		65	ns
<b>t<sub>f</sub></b>			20	ns
<b>Q<sub>g(on)</sub></b>			29	nC
<b>Q<sub>gs</sub></b>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 0.5 I <sub>D25</sub>		11	nC
<b>Q<sub>gd</sub></b>			10	nC
<b>R<sub>thJC</sub></b>				0.62 K/W
<b>R<sub>thCK</sub></b>	(TO-220)	0.25		KW

## Source-Drain Diode

Symbol	Test Conditions	Characteristic Values (T <sub>J</sub> = 25°C unless otherwise specified)		
		Min.	Typ.	Max.
<b>I<sub>S</sub></b>	V <sub>GS</sub> = 0 V			44 A
<b>I<sub>SM</sub></b>	Repetitive			132 A
<b>V<sub>SD</sub></b>	I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V, Note 1			1.5 V
<b>t<sub>rr</sub></b>	I <sub>F</sub> = 22 A, -di/dt = 100 A/μs			200 ns
<b>Q<sub>RM</sub></b>	V <sub>R</sub> = 100 V, V <sub>GS</sub> = 0 V		0.4	μC
<b>I<sub>RM</sub></b>			4f	A

Note 1: Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %

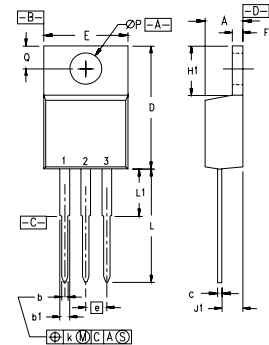
## TO-263 Outline



Pins: 1 - Gate 2, 4 - Drain  
3 - Source

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	.160	.190
A1	2.03	2.79	.080	.110
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.46	0.74	.018	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	7.11	8.13	.280	.320
E	9.65	10.29	.380	.405
E1	6.86	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.38	0	.015
R	0.46	0.74	.018	.029

## TO-220 Outline

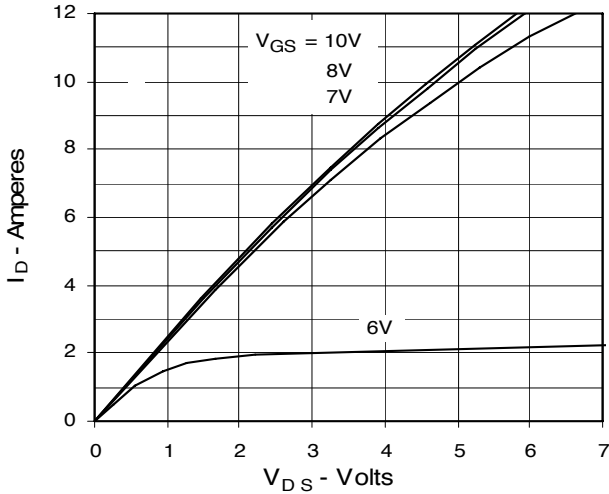


Pins: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

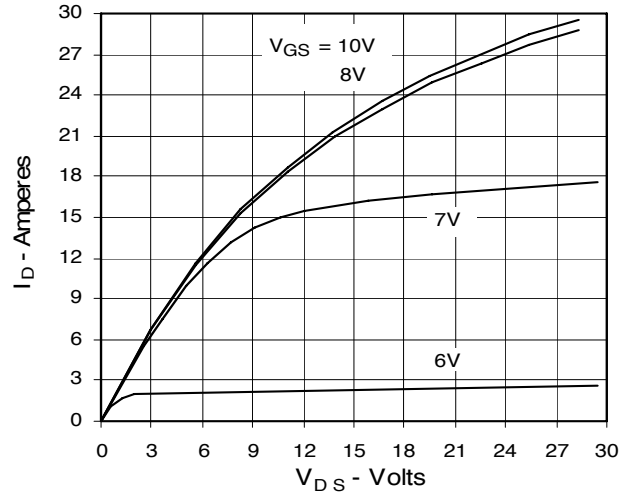
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18



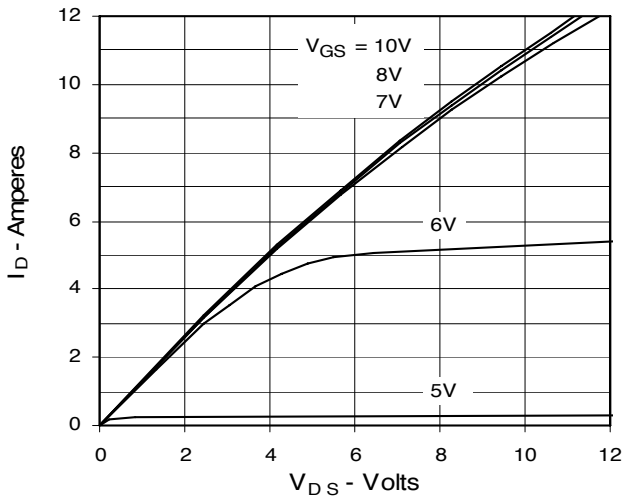
**Fig. 1. Output Characteristics**  
@ 25°C



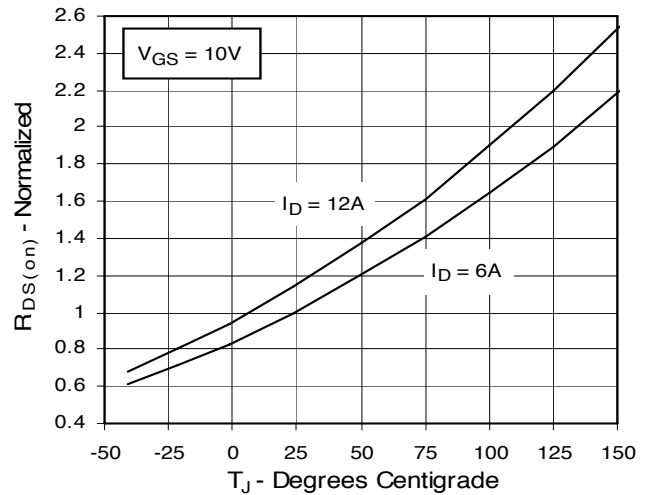
**Fig. 2. Extended Output Characteristics**  
@ 25°C



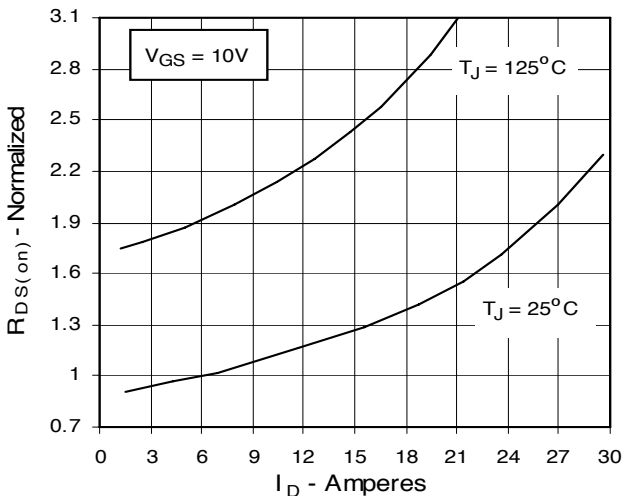
**Fig. 3. Output Characteristics**  
@ 125°C



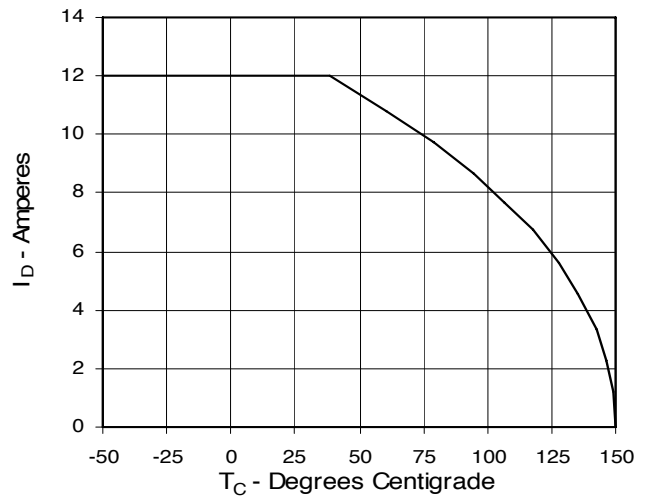
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



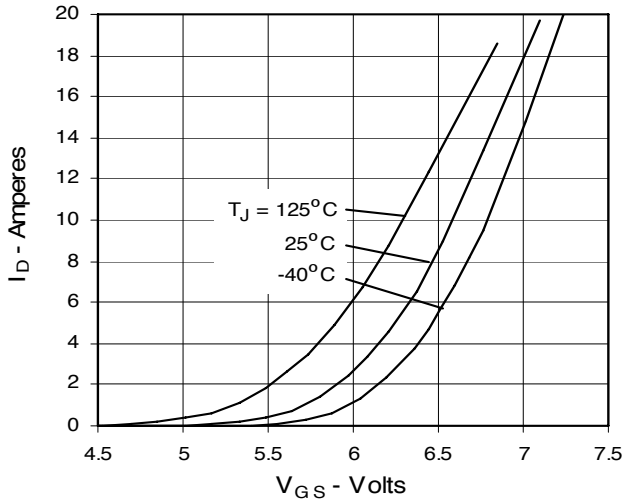
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



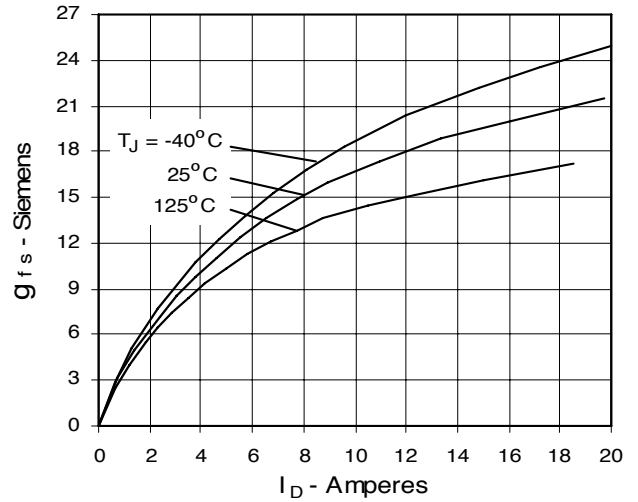
**Fig. 6. Drain Current vs. Case Temperature**



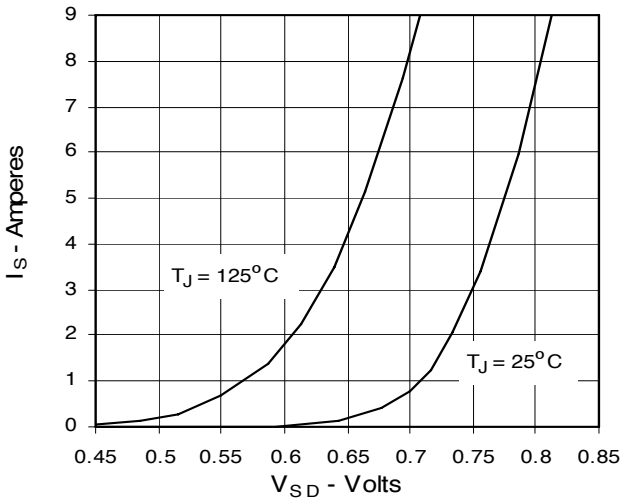
**Fig. 7. Input Admittance**



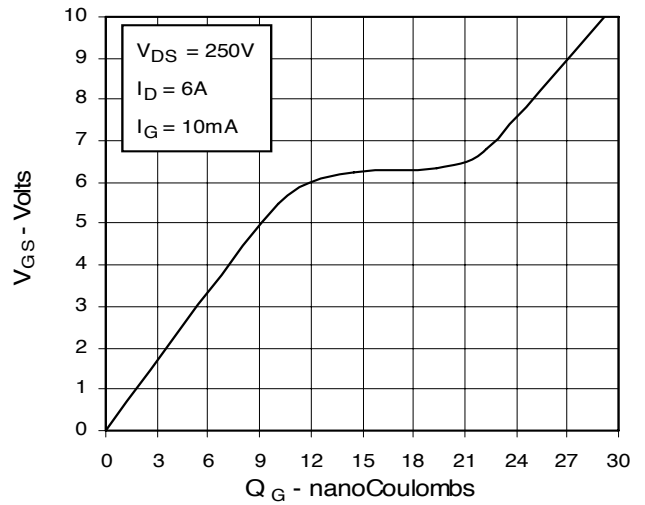
**Fig. 8. Transconductance**



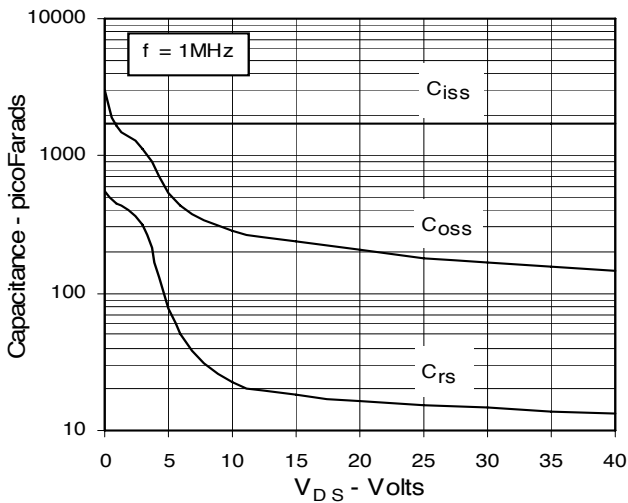
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

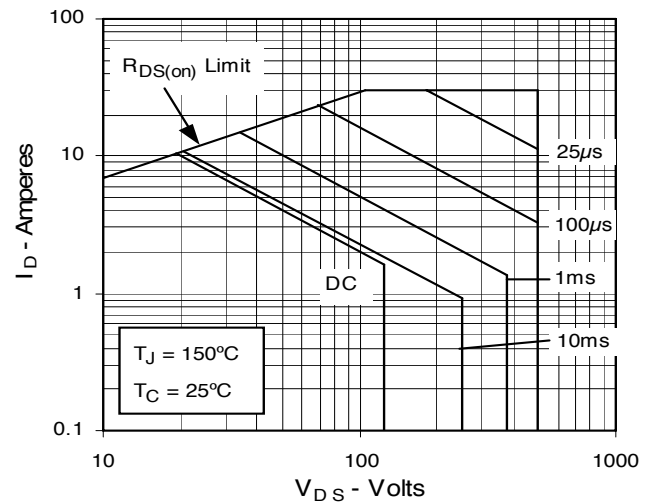


Fig. 13. Maximum Transient Thermal Resistance

