

# STB140NF55-VB Datasheet

# N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub>	60	V	
R <sub>DS(on)</sub> V <sub>GS</sub> = 10 V	4	mΩ	
ID	150	A	
Configuration	Single		

#### FEATURES

- Trench power MOSFET
- Package with low thermal resistance
- 100 % R<sub>g</sub> and UIS tested







ABSOLUTE MAXIMUM RATINGS	$(T_C = 25 \ ^{\circ}C, \text{ unless of})$	therwise noted)			
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V <sub>DS</sub>	60	M	
Gate-Source Voltage		V <sub>GS</sub>	± 20	V	
Continuous Drain Current	T <sub>C</sub> = 25 °C ª	1	150		
	T <sub>c</sub> = 125 °C	- ID	65		
Continuous Source Current (Diode Conduction) <sup>a</sup>		ls	120	А	
Pulsed Drain Current <sup>b</sup>		I <sub>DM</sub>	350		
Single Pulse Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	65		
Single Pulse Avalanche Energy		E <sub>AS</sub>	211	mJ	
Maximum Power Dissipation <sup>b</sup>	T <sub>c</sub> = 25 °C	D	220	10/	
	T <sub>C</sub> = 125 °C	۳D	70	vv	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C	

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	LIMIT	UNIT	
Junction-to-Ambient	PCB Mount <sup>c</sup>	R <sub>thJA</sub>	40	°C ////	
Junction-to-Case (Drain)		R <sub>thJC</sub>	0.65	0/10	

#### Notes

a. Package limited.

b. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %.

c. When mounted on 1" square PCB (FR4 material).

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SPECIFICATIONS (T <sub>c</sub> = 25 °C, unless otherwise noted)								
PARAMETER	SYMBOL	TES	MIN.	TYP.	MAX.	UNIT		
Static								
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0, I <sub>D</sub> = 250 μA		60	-	-	V	
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =	V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.0		4.0	v	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> =	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	± 100	nA	
		$V_{GS} = 0 V$	V <sub>DS</sub> = 60 V	-	-	1		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$V_{GS} = 0 V$	$V_{DS}$ = 60 V, $T_{J}$ = 125 °C	-	-	50	μA	
		$V_{GS} = 0 V$	$V_{DS}$ = 60 V, $T_{J}$ = 175 °C	-	-	250		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	$V_{\text{DS}} \geq 5 \; V$	120	-	-	A	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 30 A	-	4	-		
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 30 A, T <sub>J</sub> = 125 °C	-	12	-	mΩ	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 30 A, T <sub>J</sub> = 175 °C	-	15	-		
Forward Transconductance <sup>b</sup>	9 <sub>fs</sub>	V <sub>DS</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A		94	-	S	
Dynamic <sup>b</sup>								
Input Capacitance	C <sub>iss</sub>			-	-	7000		
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V V <sub>DS</sub> = 25 V, f = 1 MHz		-	-	715	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	-	360	]	
Total Gate Charge <sup>c</sup>	Qg			-	96	145		
Gate-Source Charge	Q <sub>gs</sub>	V <sub>GS</sub> = 10 V	$V_{DS}$ = 30 V, $I_{D}$ = 75 A	-	24	-	nC	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	27	-		
Gate Resistance	Rg	f = 1 MHz		0.3	1	1.7	Ω	
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			-	16	24		
Rise Time <sup>c</sup>	tr	$V_{\text{DD}} = 30 \text{ V}, \text{ R}_{\text{L}} = 0.4 \Omega$ $I_{\text{D}} \cong 75 \text{ A}, \text{ V}_{\text{GEN}} = 10 \text{ V}, \text{ R}_{\text{g}} = 1 \Omega$		-	14	21	ns	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	34	51		
Fall Time <sup>c</sup>	t <sub>f</sub>			-	9	14		
Source-Drain Diode Ratings and Characteristics <sup>b</sup>								
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	450	Α	
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> :	= 75 A, V <sub>GS</sub> = 0	-	0.9	1.5	V	

#### Notes

a. Pulse test; pulse width  $\leq$  300  $\mu s,$  duty cycle  $\leq$  2 %. b. Guaranteed by design, not subject to production testing.

c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



## TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



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## TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)







Source Drain Diode Forward Voltage





**On-Resistance vs. Junction Temperature** 



On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



#### THERMAL RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)





Square Wave Pulse Duration (s)

Normalized Thermal Transient Impedance, Junction-to-Ambient



## THERMAL RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

#### Note

The characteristics shown in the two graphs

- Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)

- Normalized Transient Thermal Impedance Junction to Case (25 °C) are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.



TO-263 (D<sup>2</sup>PAK): 3-LEAD









DETAIL A (ROTATED 90°)



	INCHES		MILLIMETERS			
DIM.		MIN.	MAX.	MIN.	MAX.	
A		0.160	0.190	4.064	4.826	
	b	0.020	0.039	0.508	0.990	
	b1	0.020	0.035	0.508	0.889	
	b2	0.045	0.055	1.143	1.397	
С*	Thin lead	0.013	0.018	0.330	0.457	
	Thick lead	0.023	0.028	0.584	0.711	
	Thin lead	0.013	0.017	0.330	0.431	
CI	Thick lead	0.023	0.027	0.584	0.685	
	c2	0.045	0.055	1.143	1.397	
	D	0.340	0.380	8.636	9.652	
D1		0.220	0.240	5.588	6.096	
D2		0.038	0.042	0.965	1.067	
D3		0.045	0.055	1.143	1.397	
D4		0.044	0.052	1.118	1.321	
E		0.380	0.410	9.652	10.414	
	E1	0.245	-	6.223	-	
	E2	0.355	0.375	9.017	9.525	
E3		0.072	0.078	1.829	1.981	
	е	0.100 BSC		2.54 BSC		
	К	0.045	0.055	1.143	1.397	
	L	0.575	0.625	14.605	15.875	
L1		0.090	0.110	2.286	2.794	
L2		0.040	0.055	1.016	1.397	
L3		0.050	0.070	1.270	1.778	
	L4	0.010 BSC		0.254 BSC		
	Μ	-	0.002	-	0.050	
ECN: T13-0707-Rev. K, 30-Sep-13 DWG: 5843						

#### Notes

- 1. Plane B includes maximum features of heat sink tab and plastic.
- 2. No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- 3. Pin-to-pin coplanarity max. 4 mils.
- 4. \*: Thin lead is for SUB, SYB.
  - Thick lead is for SUM, SYM, SQM.
- 5. Use inches as the primary measurement.



## **RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads Dimensions in Inches/(mm)



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