

K56E12N1-VB Datasheet

N-Channel 100 V (D-S) MOSFET

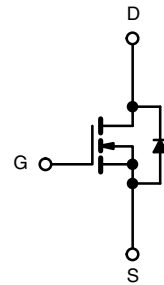
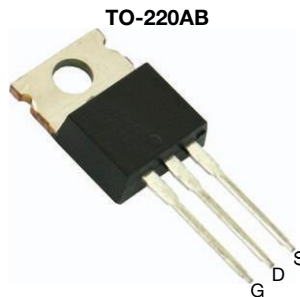
PRODUCT SUMMARY	
V_{DS} (V)	100
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.005
I_D (A) ^a	120
Configuration	Single

FEATURES

- ThunderFET® power MOSFET
- Maximum 175 °C junction temperature
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see



RoHS
COMPLIANT



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	I_D	120 ^d	A
	$T_C = 70$ °C		90 ^d	
Pulsed Drain Current ($t = 100$ μ s)		I_{DM}	480	
Avalanche Current		I_{AS}	73	
Single Avalanche Energy ^a	$L = 0.1$ mH	E_{AS}	266	mJ
Maximum Power Dissipation ^a	$T_C = 25$ °C	P_D	370 ^b	W
	$T_C = 125$ °C		120 ^b	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) ^c		R_{thJA}	40	°C/W
Junction-to-Case (Drain)		R_{thJC}	0.4	

Notes

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).
- Package limited.

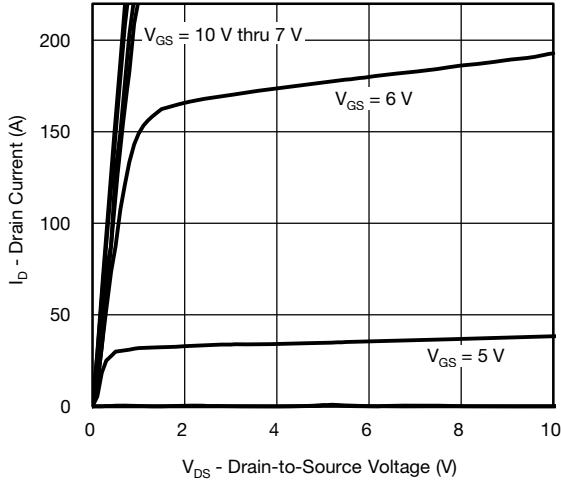
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	100	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2.5	-	4	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 250	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 125 °C	-	-	150	
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 175 °C	-	-	5	mA
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	120	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A	-	0.005	-	Ω
		V _{GS} = 7.5 V, I _D = 15 A	-	0.006	-	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 20 A	-	82	-	S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 50 V, f = 1 MHz	-	10000	-	pF
Output Capacitance	C _{oss}		-	2025	-	
Reverse Transfer Capacitance	C _{rss}		-	165	-	
Total Gate Charge ^c	Q _g	V _{DS} = 50 V, V _{GS} = 10 V, I _D = 20 A	-	76	120	nC
Gate-Source Charge ^c	Q _{gs}		-	23	-	
Gate-Drain Charge ^c	Q _{gd}		-	17	-	
Gate Resistance	R _g	f = 1 MHz	0.6	3.3	6.6	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 50 V, R _L = 5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	-	15	30	ns
Rise Time ^c	t _r		-	22	40	
Turn-Off Delay Time ^c	t _{d(off)}		-	55	100	
Fall Time ^c	t _f		-	15	30	
Drain-Source Body Diode Ratings and Characteristics ^b (T_C = 25 °C)						
Pulsed Current	I _{SM}		-	-	480	A
Forward Voltage ^a	V _{SD}	I _F = 10 A, V _{GS} = 0 V	-	0.8	1.5	V

Notes

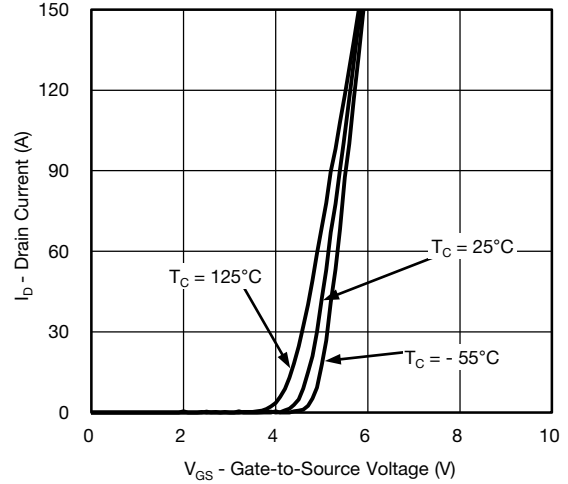
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

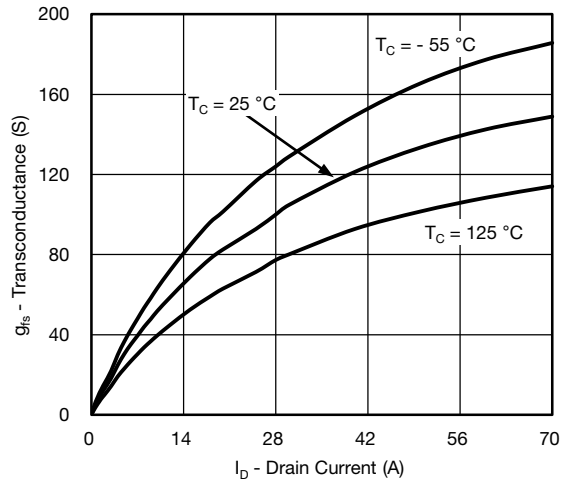
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



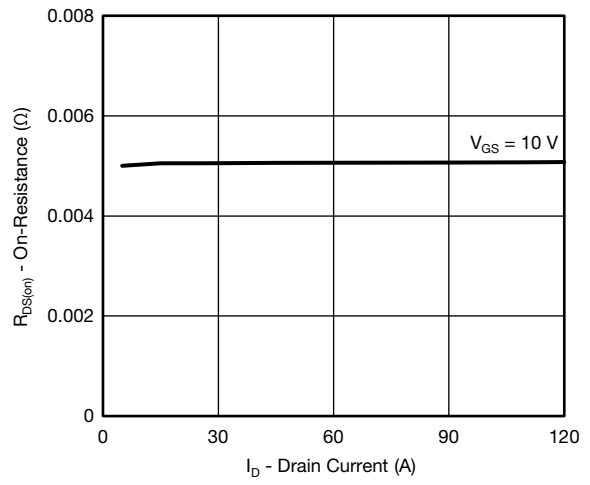
Output Characteristics



Transfer Characteristics



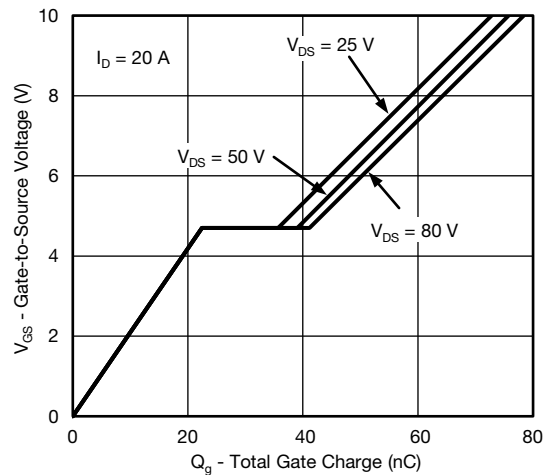
Transconductance



On-Resistance vs. Drain Current



Capacitance



Gate Charge

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



On-Resistance vs. Junction Temperature



Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

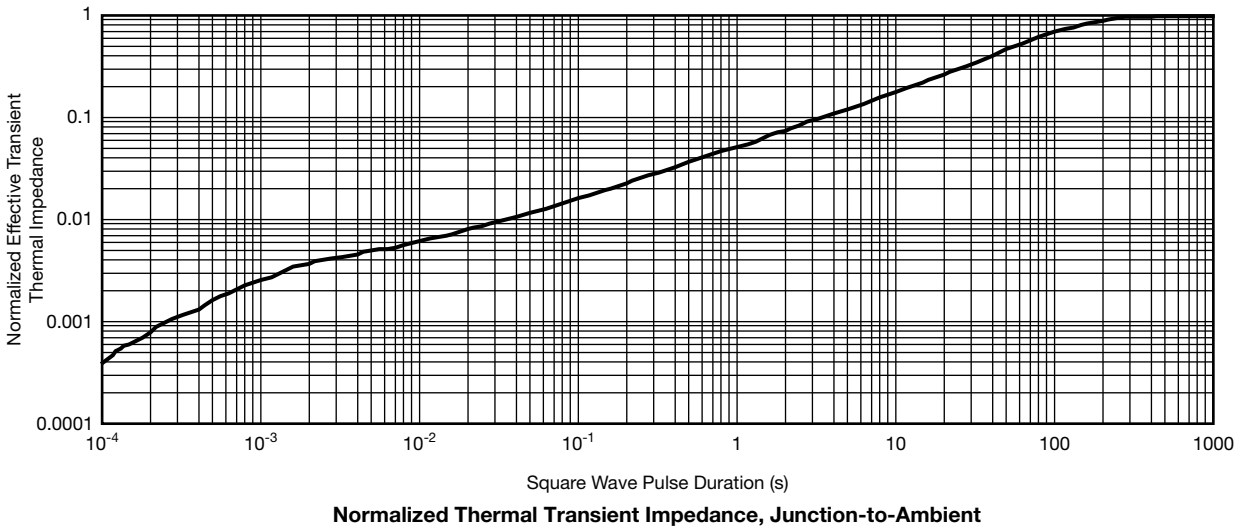
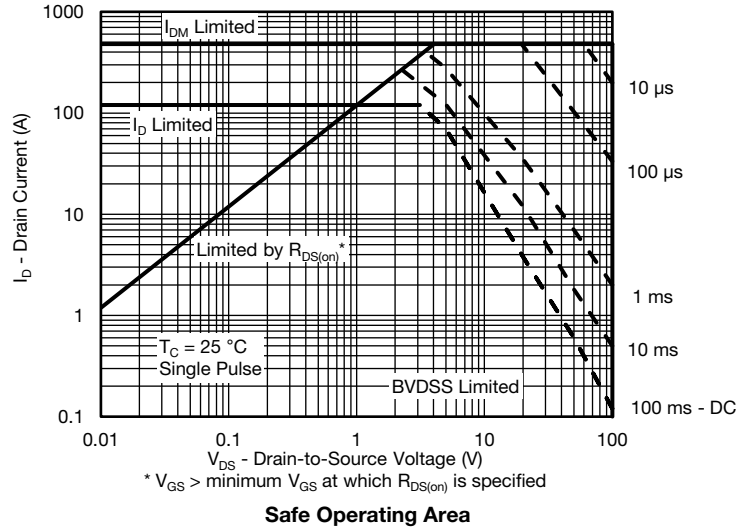


Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, 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 ($25\text{ }^\circ\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Case ($25\text{ }^\circ\text{C}$)
 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-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
$\varnothing P$	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

ECN: T14-0413-Rev. P, 16-Jun-14
DWG: 5471

Note

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM



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