

NP50P06KDG-VB Datasheet

P-Channel 60-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^d
- 60	0.0065 at $V_{GS} = - 10$ V	- 110
	0.0085 at $V_{GS} = - 4.5$ V	

FEATURES

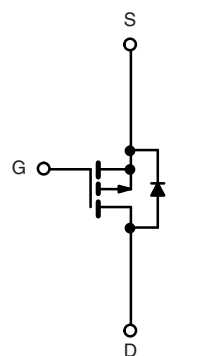
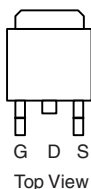
- Trench Power MOSFET
- Package with Low Thermal Resistance
- 100 % R_g Tested



Available

RoHS*
 COMPLIANT

TO-263



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	- 60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ^d ($T_J = 175\text{ }^\circ\text{C}$)	I_D	$T_C = 25\text{ }^\circ\text{C}$ - 110	A
		$T_C = 125\text{ }^\circ\text{C}$ - 75	
Pulsed Drain Current	I_{DM}	- 200	
Avalanche Current	I_{AS}	- 85	
Single Pulse Avalanche Energy ^d	E_{AS}	211	mJ
Maximum Power Dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}$ 272 ^c	W
		$T_A = 25\text{ }^\circ\text{C}^b$ 3.75 ^b	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient	R_{thJA}	40	$^\circ\text{C/W}$
Junction-to-Case	R_{thJC}	0.55	

Notes:

a. Duty cycle $\leq 1\%$.

b. When Mounted on 1" square PCB (FR-4 material).

c. See SOA curve for voltage derating.

d. Limited by Package.

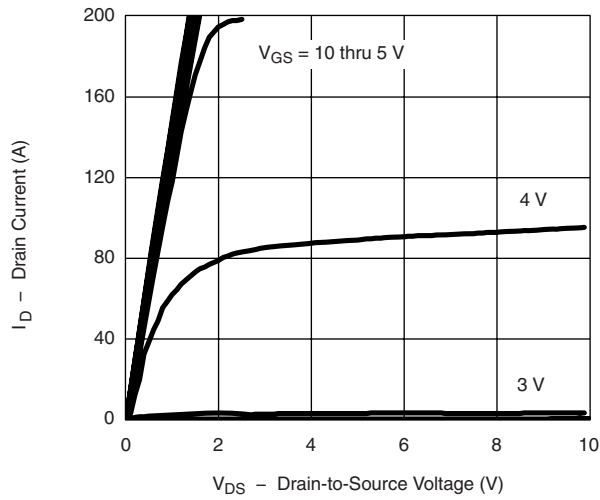
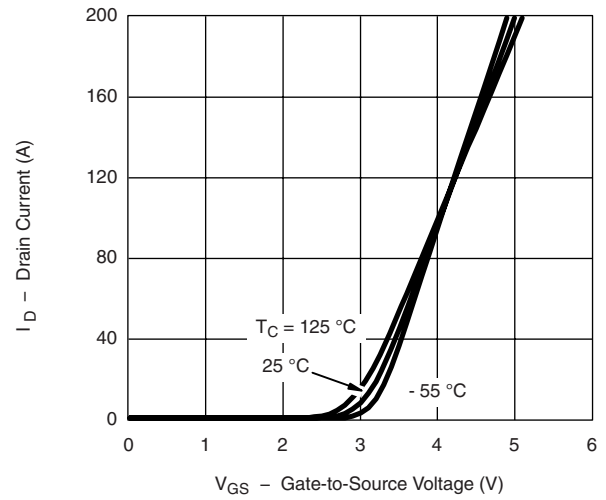
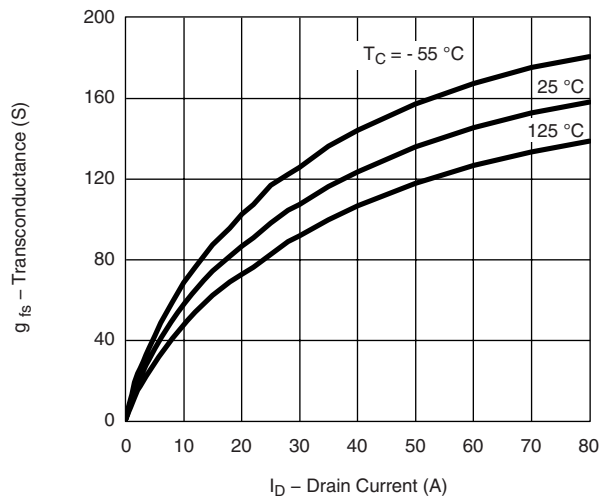
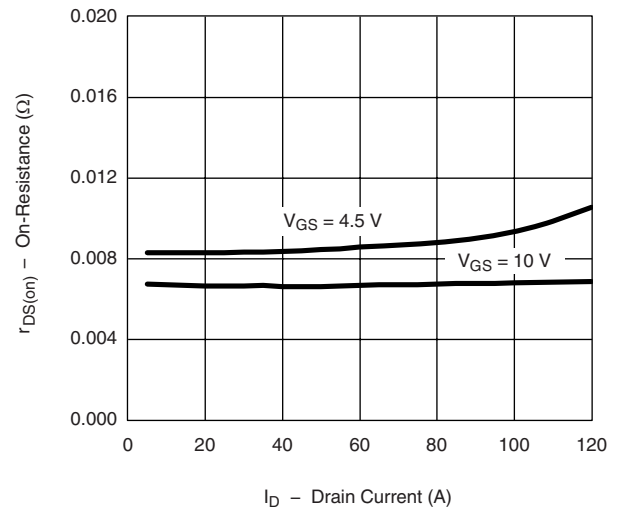
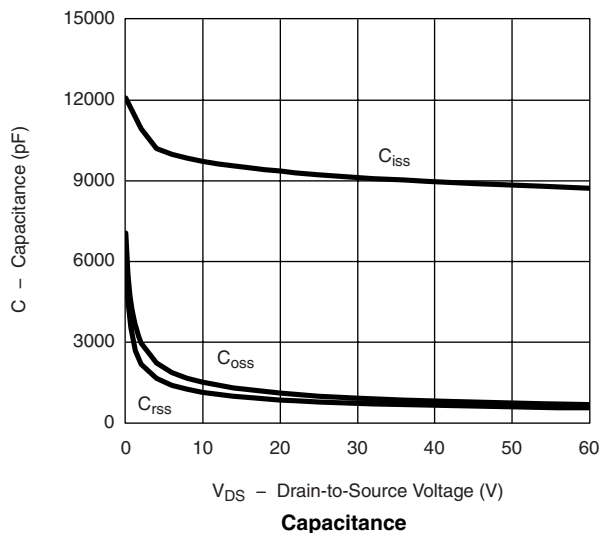
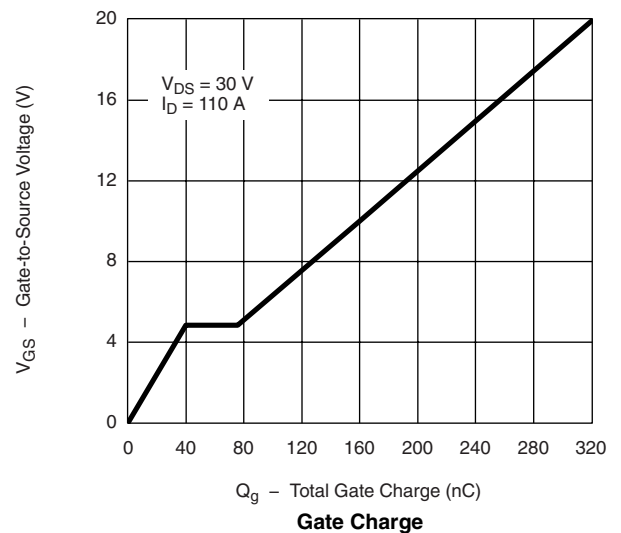
* Pb containing terminations are not RoHS compliant, exemptions may apply.

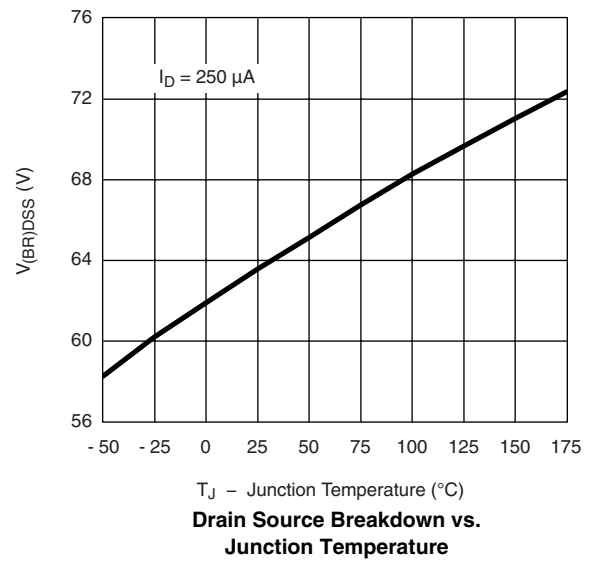
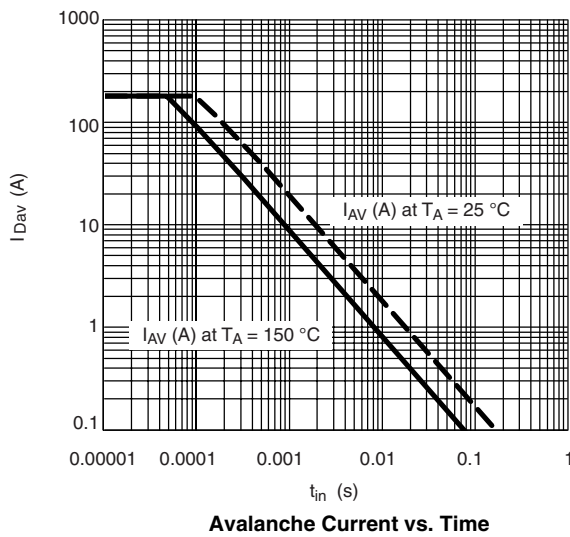
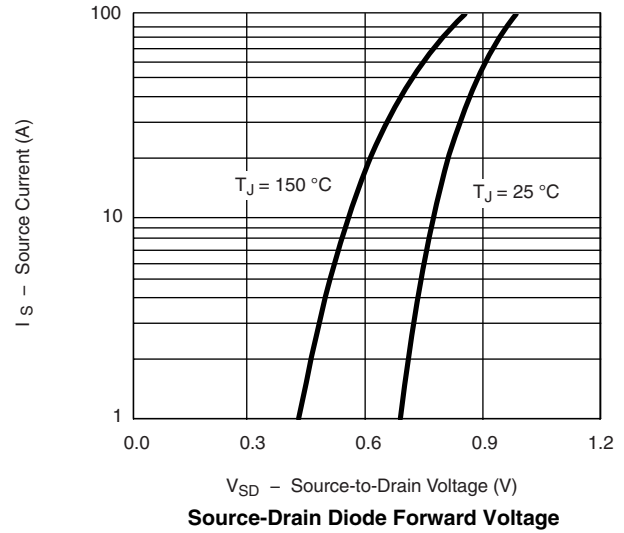
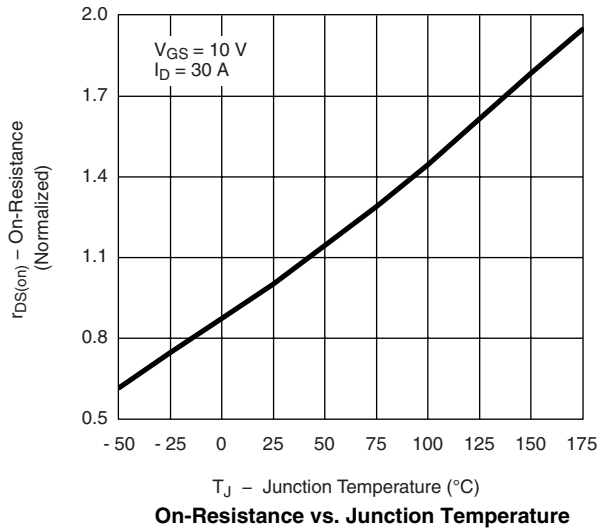
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 1		- 3	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$			- 50	
		$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^{\circ}\text{C}$			- 250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -10\text{ V}$	- 120			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -30\text{ A}$		0.0065		Ω
		$V_{GS} = -10\text{ V}, I_D = -30\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$		0.0129		
		$V_{GS} = -10\text{ V}, I_D = -30\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$		0.016		
		$V_{GS} = -4.5\text{ V}, I_D = -20\text{ A}$		0.0085		
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -50\text{ A}$	20			S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = -25\text{ V}, f = 1\text{ MHz}$		9200		pF
Output Capacitance	C_{oss}			975		
Reverse Transfer Capacitance	C_{rss}			760		
Total Gate Charge ^c	Q_g	$V_{DS} = -30\text{ V}, V_{GS} = -10\text{ V}, I_D = -110\text{ A}$		160	240	nC
Gate-Source Charge ^c	Q_{gs}			40		
Gate-Drain Charge ^c	Q_{gd}			36		
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.5	3	4.5	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -30\text{ V}, R_L = 0.27\text{ }\Omega$ $I_D \cong -110\text{ A}, V_{GEN} = -10\text{ V}, R_G = 2.5\text{ }\Omega$		20	30	ns
Rise Time ^c	t_r			190	285	
Turn-Off Delay Time ^c	$t_{d(off)}$			140	210	
Fall Time ^c	t_f			300	450	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}^b$						
Continuous Current	I_S				- 110	A
Pulsed Current	I_{SM}				- 200	
Forward Voltage ^a	V_{SD}	$I_F = -50\text{ A}, V_{GS} = 0\text{ V}$		- 1.0	- 1.5	V
Reverse Recovery Time	t_{rr}	$I_F = -50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		60	90	ns
Peak Reverse Recovery Charge	$I_{RM(REC)}$			- 3	- 4.5	A
Reverse Recovery Charge	Q_{rr}			0.09	0.2	μC

Notes:

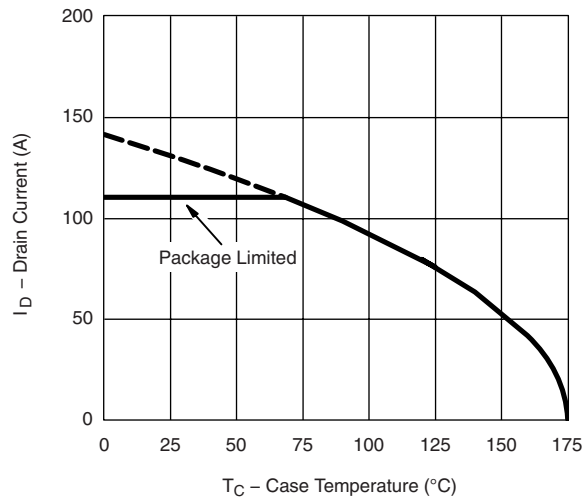
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.
 c. Independent of operating temperature.

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.

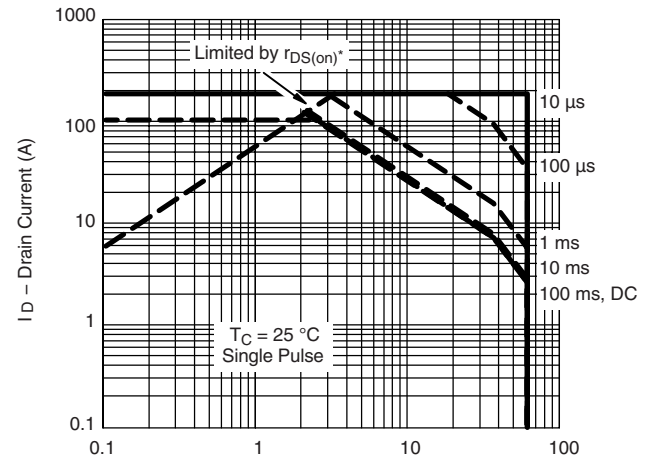
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


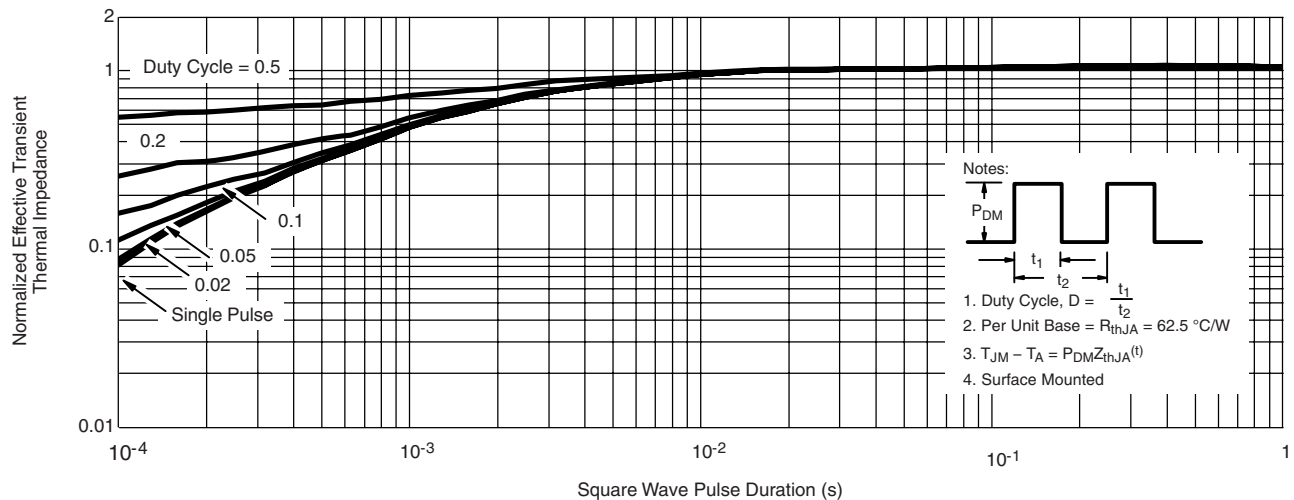
THERMAL RATINGS



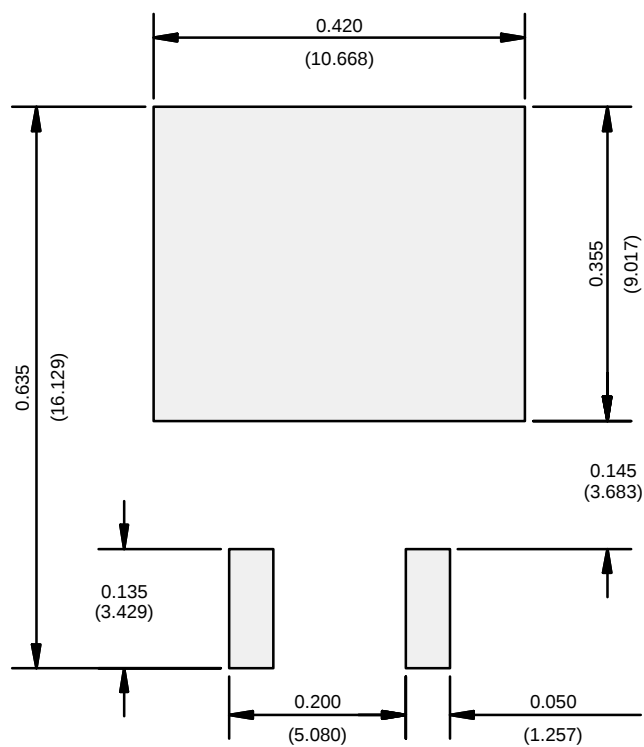
**Maximum Avalanche and Drain Current
vs. Case Temperature**



Safe Operating Area
* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified



Normalized Thermal Transient Impedance, Junction-to-Case

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

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