

NCE60P04R-VB Datasheet

P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
- 60	0.055 at $V_{GS} = -10$ V	- 7.0	30 nC
	0.065 at $V_{GS} = -4.5$ V	- 6.0	

FEATURES

- Trench Power MOSFET
- 100 % UIS Tested

APPLICATIONS

- Load Switch



RoHS
COMPLIANT
HALOGEN
FREE

SOT-223



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	I_D	- 7.0 ^a	A
	$T_C = 70$ °C		- 5.2	
	$T_A = 25$ °C		- 4.8 ^b	
	$T_A = 70$ °C		- 4.1 ^b	
Pulsed Drain Current		I_{DM}	- 25	
Avalanche Current Pulse		I_{AS}	- 4.5	mJ
Single Pulse Avalanche Energy		E_{AS}	10.1	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	I_S	6.9 ^a	A
	$T_A = 25$ °C		3.5 ^b	
Maximum Power Dissipation	$T_C = 25$ °C	P_D	10.4 ^a	W
	$T_C = 70$ °C		6.6 ^a	
	$T_A = 25$ °C		2.1 ^b	
	$T_A = 70$ °C		1.1 ^b	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^b	Steady State	R_{thJA}	33	40	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.98	1.2	

Notes:

a. Based on $T_C = 25$ °C.

b. Surface mounted on 1" x 1" FR4 board.

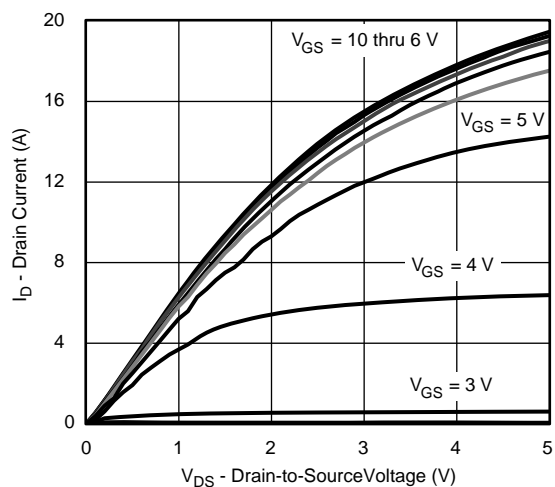
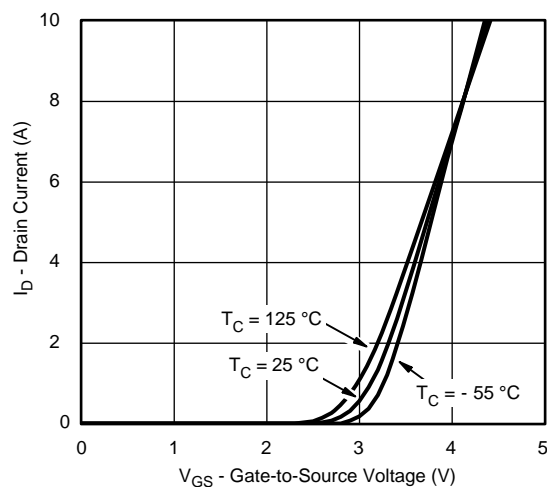
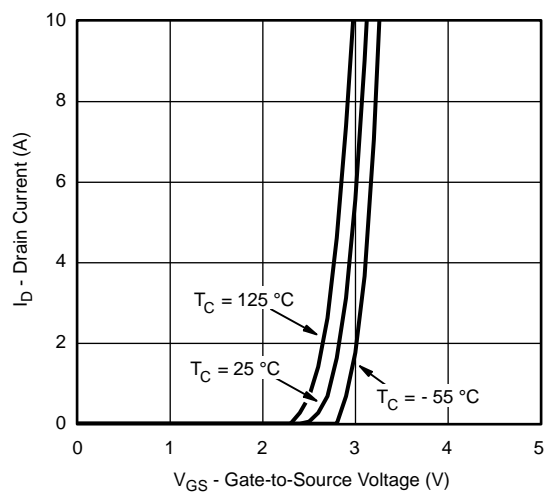
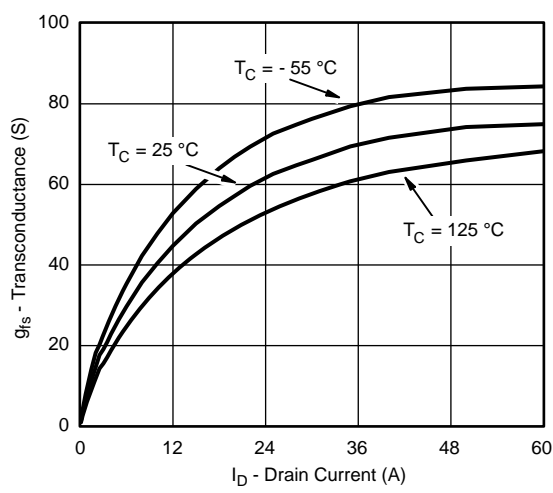
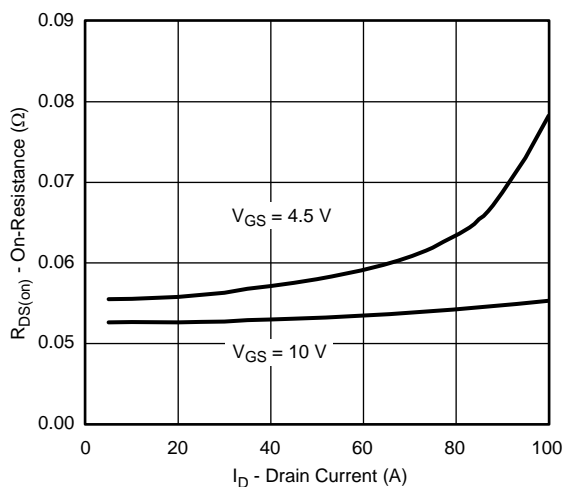
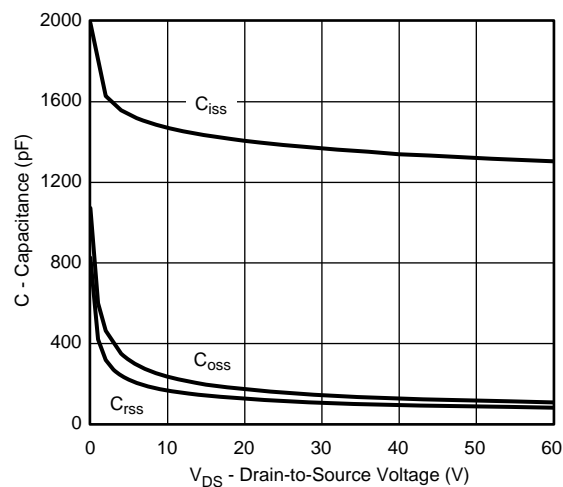
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA	- 60			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		68		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 5.2		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 1.0		- 2.5	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 60 V, V _{GS} = 0 V			- 1	μA
		V _{DS} = - 60 V, V _{GS} = 0 V, T _J = 55 °C			- 10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} = - 5 V, V _{GS} = - 10 V	- 25			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 10 V, I _D = - 3 A		0.055		Ω
		V _{GS} = - 4.5 V, I _D = - 2 A		0.065		
Forward Transconductance ^a	g _{fs}	V _{DS} = - 15 V, I _D = - 5 A	20			S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 25 V, V _{GS} = 0 V, f = 1 MHz		1500		pF
Output Capacitance	C _{oss}			200		
Reverse Transfer Capacitance	C _{rss}			150		
Total Gate Charge	Q _g	V _{DS} = - 30 V, V _{GS} = - 10 V, I _D = - 5 A		38	56	nC
		V _{DS} = - 30 V, V _{GS} = - 4.5 V, I _D = - 5 A		19	30	
Gate-Source Charge	Q _{gs}			9		
Gate-Drain Charge	Q _{gd}			10		
Gate Resistance	R _g	f = 1 MHz		5.2		Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 2 V, R _L = 2 Ω I _D ≅ - 5 A, V _{GEN} = - 10 V, R _g = 1 Ω		10	15	ns
Rise Time	t _r			7	15	
Turn-Off Delay Time	t _{d(off)}			70	110	
Fall Time	t _f			40	60	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 6.9	A
Pulse Diode Forward Current ^a	I _{SM}				- 15	
Body Diode Voltage	V _{SD}	I _S = - 3 A		- 1	- 1.5	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 5 A, di/dt = 10 A/μs, T _J = 25 °C		45	68	ns
Body Diode Reverse Recovery Charge	Q _{rr}			59	120	nC
Reverse Recovery Fall Time	t _a			29		ns
Reverse Recovery Rise Time	t _b			16		

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.

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

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


Gate Charge



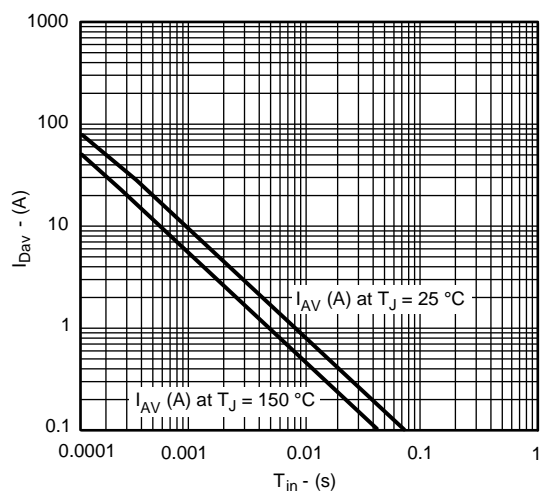
On-Resistance vs. Gate-to-Source Voltage



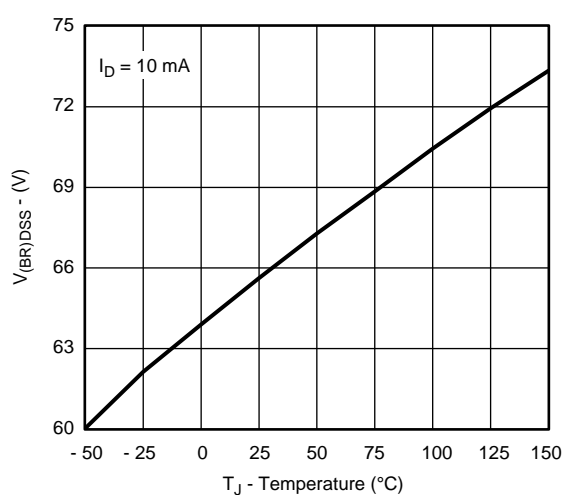
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

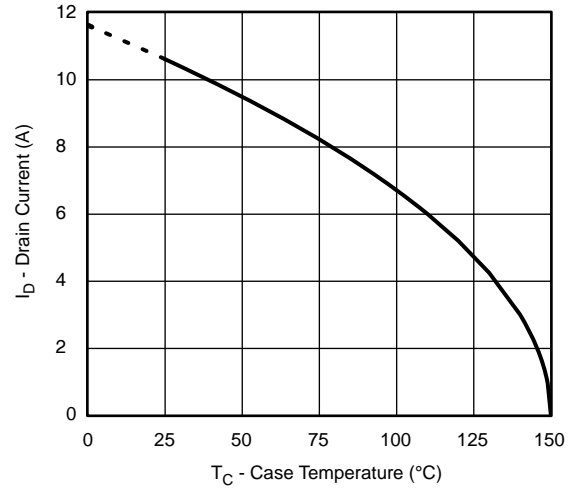
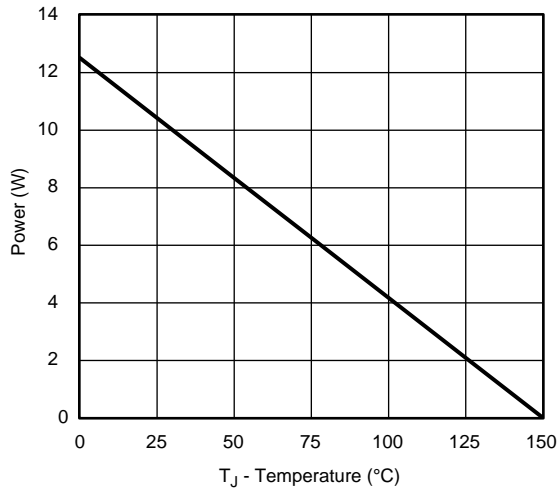
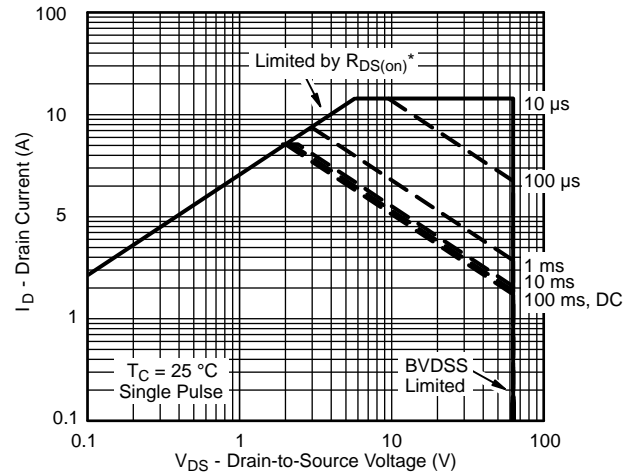


Single Pulse Avalanche Current Capability vs. Time



Drain-Source Breakdown Voltage vs. Junction Temperature

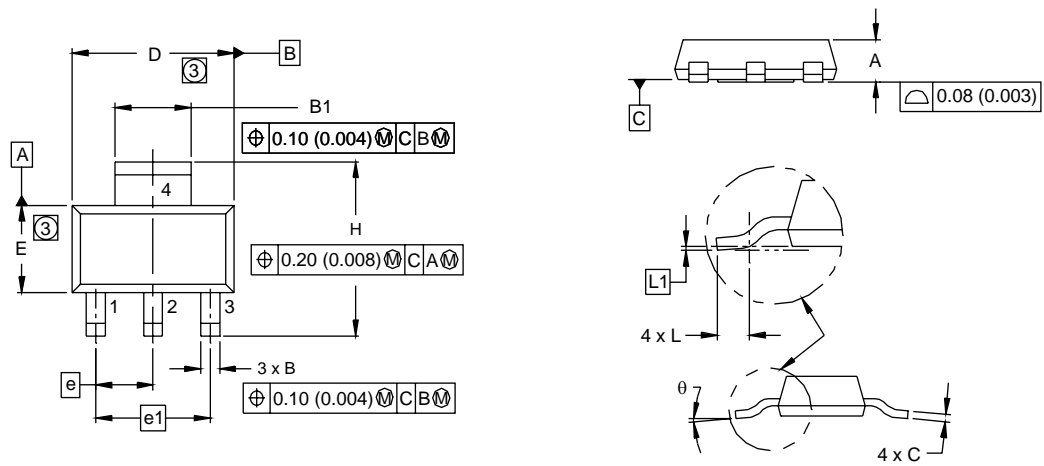
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Threshold Voltage

Max. Drain Current vs. Case Temperature

Power Derating, Junction-to-Case


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

Normalized Thermal Transient Impedance, Junction-to-Case

SOT-223 (HIGH VOLTAGE)

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
θ	-	10°	-	10°
ECN: S-82109-Rev. A, 15-Sep-08 DWG: 5969				

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension do not include mold flash.
4. Outline conforms to JEDEC outline TO-261AA.

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