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With the principle of "Quality Parts, Customers Priority, Honest Operation, and Considerate Service", our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip, ALPS, ROHM, Xilinx, Pulse, ON, Everlight and Freescale. Main products comprise IC, Modules, Potentiometer, IC Socket, Relay, Connector. Our parts cover such applications as commercial, industrial, and automotives areas.

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Power MOSFET

30 V, 55 A, Single N-Channel, DPAK/IPAK

Features

- Low R_{DS(on)} to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- Three Package Variations for Design Flexibility
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- CPU Power Delivery
- DC-DC Converters
- Recommended for High Side (Control)

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Para	Parameter				
Drain-to-Source Vo	Drain-to-Source Voltage				V
Gate-to-Source Vol	Gate-to-Source Voltage			±20	V
Continuous Drain		T _A = 25°C	I _D	11.1	Α
Current R _{θJA} (Note 1)		T _A = 85°C		8.0	
Power Dissipation R _{θJA} (Note 1)		T _A = 25°C	P_{D}	1.68	W
Continuous Drain		T _A = 25°C	ID	8.9	Α
Current R _{0JA} (Note 2)	Steady State	T _A = 85°C		6.4	
Power Dissipation R _{θJA} (Note 2)	Siale	T _A = 25°C	P _D	1.07	W
Continuous Drain	1	T _C = 25°C	I _D	55	Α
Current R _{θJC} (Note 1)		T _C = 85°C		40	
Power Dissipation $R_{\theta JC}$ (Note 1)		T _C = 25°C	P _D	35.71	W
Pulsed Drain Current	t _p =10μs	T _A = 25°C	I _{DM}	137	Α
Current Limited by P	ackage	T _A = 25°C	I _{DmaxPkg}	45	Α
Operating Junction a Temperature	Operating Junction and Storage Temperature				
Source Current (Bod	I _S	29.7	Α		
Drain to Source dV/c	dV/dt	6	V/ns		
Single Pulse Drain-to-Source Avalanche Energy (T_J = 25°C, V_{DD} = 50 V, V_{GS} = 10 V, I_L = 32 A_{pk} , L = 0.1 mH, R_G = 25 Ω)			EAS	51.2	mJ
	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)				°C

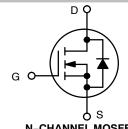
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



ON Semiconductor®

http://onsemi.com

V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX	
30 V	8.0 mΩ @ 10 V	55 A	
30 V	12.7 m Ω @ 4.5 V	35 A	



N-CHANNEL MOSFET





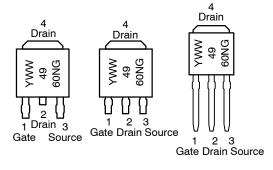


CASE 369AA **DPAK** (Bent Lead) STYLE 2

CASE 369AC 3 IPAK (Straight Lead) (Straight Lead

CASE 369D **IPAK** DPAK)

MARKING DIAGRAMS & PIN ASSIGNMENTS



= Year WW = Work Week 4960N = Device Code = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{ heta JC}$	3	°C/W
Junction-to-TAB (Drain)	$R_{\theta JC-TAB}$	3.5	
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	74.5	
Junction-to-Ambient - Steady State (Note 2)	$R_{ heta JA}$	116.5	

- Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
 Surface-mounted on FR4 board using the minimum recommended pad size.

FLECTRICAL CHARACTERISTICS (T. - 25°C unless otherwise specified)

Parameter	Symbol	Test Cond	lition	Min	Тур	Max	Unit
OFF CHARACTERISTICS							
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /				25		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V,	T _J = 25°C			1.0	
		V _{DS} = 24 V	T _J = 125°C			10	μΑ
Gate-to-Source Leakage Current	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS}$	_S = ±20 V			±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}, I_{D}$	= 250 μΑ	1.5		2.5	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J				5.0		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 30 A		6.1	8.0	mΩ
			I _D = 15 A		6.1		
		V _{GS} = 4.5 V	I _D = 30 A		10	12.7	mΩ
			I _D = 15 A		10		
Forward Transconductance	9FS	V _{DS} = 1.5 V, I	_D = 15 A		48		S
CHARGES, CAPACITANCES AND GATE	RESISTANCE						
Input Capacitance	C _{ISS}				1300		
Output Capacitance	C _{OSS}	V _{GS} = 0 V, f = 1.0 M	Hz, V _{DS} = 15 V		342		pF
Reverse Transfer Capacitance	C _{RSS}				169		
Total Gate Charge	Q _{G(TOT)}				11		
Threshold Gate Charge	Q _{G(TH)}	V 45VV	45.V.I. 00.A		1.2		0
Gate-to-Source Charge	Q _{GS}	V_{GS} = 4.5 V, V_{DS} =	15 V, I _D = 30 A		4.0		nC
Gate-to-Drain Charge	Q_{GD}				4.7		1
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 1	15 V, I _D = 30 A		22		nC
SWITCHING CHARACTERISTICS (Note	4)						
Turn-On Delay Time	t _{d(ON)}				12		
Rise Time	t _r	V _{GS} = 4.5 V, V _E	_{OS} = 15 V,		20]
Turn-Off Delay Time	t _{d(OFF)}	$I_D = 15 \text{ A}, R_G = 3.0 \Omega$			15		ns
		İ					4

- 3. Pulse Test: pulse width \leq 300 μ s, duty cycle \leq 2%.
- 4. Switching characteristics are independent of operating junction temperatures.
 5. Assume terminal length of 110 mils.

Fall Time

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Test Condi	tion	Min	Тур	Max	Unit
SWITCHING CHARACTERISTICS (No	ote 4)						
Turn-On Delay Time	t _{d(ON)}				7.0		
Rise Time	t _r	V _{GS} = 11.5 V, V _D	_S = 15 V,		17		ns
Turn-Off Delay Time	t _{d(OFF)}	$V_{GS} = 11.5 \text{ V, } V_{D}$ $I_{D} = 15 \text{ A, } R_{G} = 10.0 \text{ A}$: 3.0 Ω		22		
Fall Time	t _f]			3.0		
DRAIN-SOURCE DIODE CHARACTE	RISTICS						
Forward Diode Voltage	V _{SD}	$V_{GS} = 0 \text{ V}.$ $T_J = 25^{\circ}\text{C}$			0.9	1.2	
		$V_{GS} = 0 \text{ V},$ $I_{S} = 30 \text{ A}$ $I_{J} = 25^{\circ}\text{C}$ $I_{J} = 125^{\circ}\text{C}$	T _J = 125°C		0.76		V
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dIS/dt = 100 A/μs, I _S = 30 A			13.0		ns
Charge Time	t _a				7.0		
Discharge Time	t _b				6.0		
Reverse Recovery Charge	Q _{RR}				4.0		nC
PACKAGE PARASITIC VALUES							
Source Inductance (Note 5)	L _S	T _A = 25°C			2.49		nH
Drain Inductance, DPAK	L _D				0.0164		
Drain Inductance, IPAK (Note 5)	L _D				1.88		
Gate Inductance (Note 5)	L _G				3.46		
Gate Resistance	R_{G}				1.0		Ω

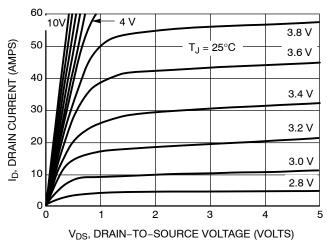
- 3. Pulse Test: pulse width \leq 300 μ s, duty cycle \leq 2%.
- Switching characteristics are independent of operating junction temperatures.
 Assume terminal length of 110 mils.

ORDERING INFORMATION

Device	Package	Shipping [†]
NTD4960NT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NTD4960N-1G	IPAK (Pb-Free)	75 Units / Rail
NTD4960N-35G	IPAK Trimmed Lead (Pb-Free)	75 Units / Rail

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

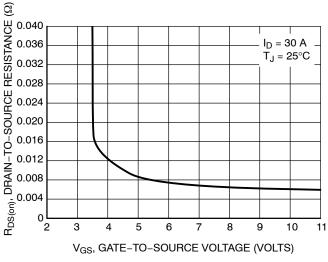
TYPICAL PERFORMANCE CURVES



60 $V_{DS} \ge 10 \text{ V}$ ID, DRAIN CURRENT (AMPS) 50 40 30 20 T_J = 125°C 10 $T_J = -55^{\circ}C$ 01 0 2 3 4 5 V_{GS}, GATE-TO-SOURCE VOLTAGE (VOLTS)

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics



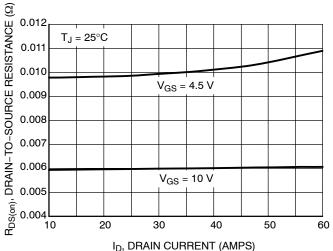
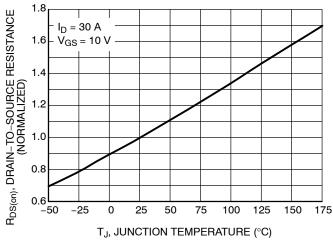


Figure 3. On-Resistance vs. Gate-to-Source Voltage

Figure 4. On-Resistance vs. Drain Current and Gate Voltage



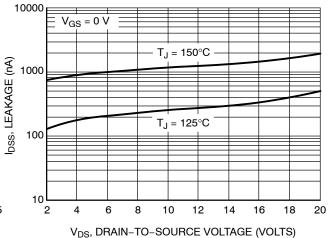


Figure 5. On–Resistance Variation with Temperature

Figure 6. Drain-to-Source Leakage Current vs. Drain Voltage

TYPICAL PERFORMANCE CURVES

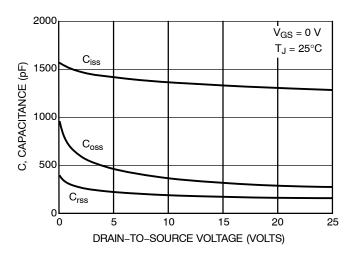


Figure 7. Capacitance Variation

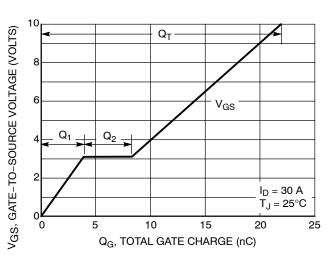


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

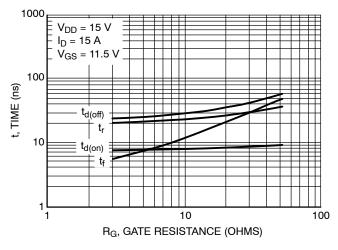


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

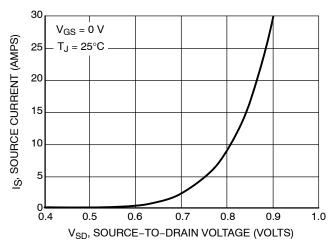


Figure 10. Diode Forward Voltage vs. Current

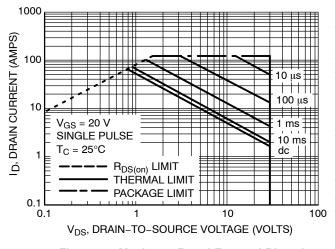


Figure 11. Maximum Rated Forward Biased Safe Operating Area

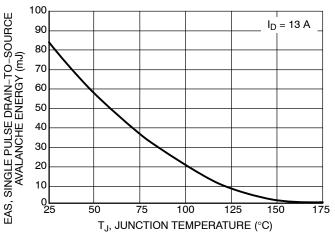
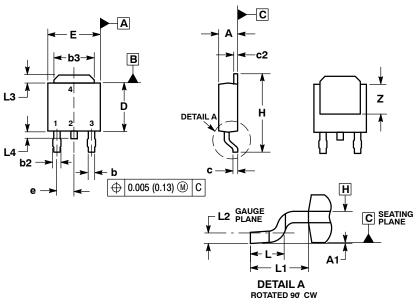


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

PACKAGE DIMENSIONS

DPAK (SINGLE GUAGE)

CASE 369AA-01 **ISSUE B**



NOTES:

- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

 2. CONTROLLING DIMENSION: INCHES.

 3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.

 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.

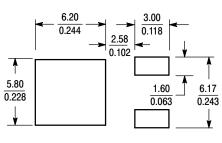
 5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.

 6. DATUMS A AND B ARE DETERMINED AT DATUM
- 6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.086	0.094	2.18	2.38
A 1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
Е	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29	BSC
Η	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108	REF	2.74 REF	
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4		0.040		1.01
Z	0.155		3.93	

STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN

SOLDERING FOOTPRINT*



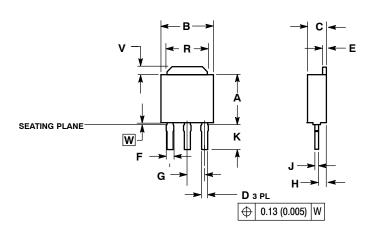
 $\left(\frac{\text{mm}}{\text{inches}}\right)$ SCALE 3:1

^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

3 IPAK, STRAIGHT LEAD

CASE 369AC-01 **ISSUE O**



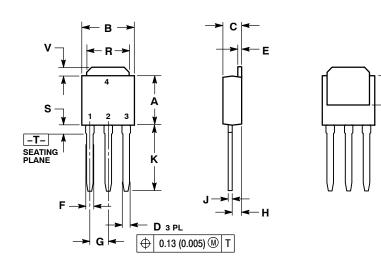
NOTES:

- 1.. DIMENSIONING AND TOLERANCING
- PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: INCH.
- SEATING PLANE IS ON TOP OF DAMBAR POSITION.
- DIMENSION A DOES NOT INCLUDE DAMBAR POSITION OR MOLD GATE.

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.235	0.245	5.97	6.22
В	0.250	0.265	6.35	6.73
С	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
Е	0.018	0.023	0.46	0.58
F	0.037	0.043	0.94	1.09
G	0.090	0.090 BSC		BSC
Н	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.134	0.142	3.40	3.60
R	0.180	0.215	4.57	5.46
٧	0.035	0.050	0.89	1.27
w	0.000	0.010	0.000	0.25

IPAK (STRAIGHT LEAD DPAK)

CASE 369D-01 **ISSUE B**



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

	INC	HES	MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.235	0.245	5.97	6.35
В	0.250	0.265	6.35	6.73
С	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090	BSC	2.29	BSC
Н	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
٧	0.035	0.050	0.89	1.27
Z	0.155		3.93	

STYLE 2:

PIN 1. GATE

- 2. DRAIN
- SOURCE 3. DRAIN

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