Field Effect Transistor - N-Channel, Enhancement Mode



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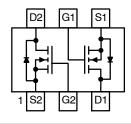
SC-88/SC70-6/SOT-363 CASE 419B-02

MARKING DIAGRAM



2N = Specific Device Code M = Assembly Operation Month

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

2N7002DW

Features

- Dual N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

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

Symbol	Parameter	Ratings	Units	
V_{DSS}	Drain-Source Voltage	60	V	
V_{DGR}	Drain-Gate Voltage (R _{GS}	60	V	
V _{GSS}	Gate-Source Voltage	Continuous	±20	V
		Pulsed	±40	
I _D	Drain Current Continuous		115	mA
	Continuous at 100°C		73	
		Pulsed	800	
T _J , T _{STG}	Junction and Storage Temperature Range		-55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
P _D	Total Device Dissipation	200	mW
	Derate Above T _A = 25°C	1.6	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	415	°C/W

1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch. Minimum land pad size.

ORDERING INFORMATION

Part Number	Top Mark	Package	Shipping [†]
2N7002DW	2N	SC70-6 (Pb-Free)	3000 / Tape & Reel

[†]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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
F CHARAC	TERISTICS (Note 2)	•				
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 10 \mu\text{A}$	60	78	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 60 V, V _{GS} = 0 V	_	0.001	1.0 μΑ	
		$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 125^{\circ}\text{C}$	_	7	500	
I _{GSS}	Gate-Body Leakage	V _{GS} = ±20 V, V _{DS} = 0 V	_	0.2	±10	nA
CHARACT	ERISTICS (Note 2)	•				
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$	1.00	1.76	2.0	V
R _{DS(on)}	Static Drain-Source	V _{GS} = 5 V, I _D = 0.05 A	-	1.6	7.5	Ω
On-Re	On-Resistance	V _{GS} = 10 V, I _D = 0.5 A	-	-	2.0	
		V_{GS} = 10 V, I_D = 0.5 A, T_J = 125°C	-	2.53	13.5	
I _{D(on)}	On-State Drain Current	V _{GS} = 10 V, V _{DS} = 7.5 V	0.50	1.43	-	Α
9 _{FS}	Forward Transconductance	V _{DS} = 10 V, I _D = 0.2 A	80.0	356.5	-	mS
NAMIC CHA	ARACTERISTICS	•				
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	_	37.8	50	pF
C _{oss}	Output Capacitance	7	_	12.4	25	pF
C _{rss}	Reverse Transfer Capacitance	7	-	6.5	7	pF
TTCHING C	HARACTERISTICS (Note 2)	•	-	-		-
t _{D(ON)}	Turn-On Delay Time	$V_{DD} = 30 \text{ V}, I_D = 0.2 \text{ A}, V_{GEN} = 10 \text{ V},$	-	5.85	20	ns
t _{D(OFF)}	Turn-Off Delay Time	R_L = 150 Ω, R_{GEN} = 25 Ω	_	12.5	20	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE CHARACTERISTICS

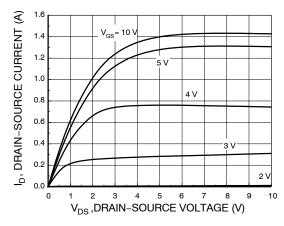


Figure 1. On-Region Characteristics

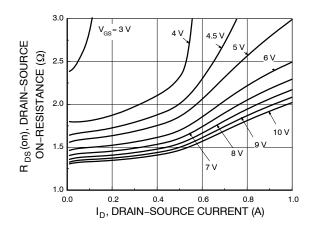


Figure 2. On–Resistance Variation with Gate Voltage and Drain Current

^{2.} Short duration test pulse used to minimize self-heating effect.

2N7002DW

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

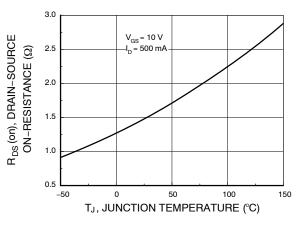


Figure 3. On–Resistance Variation with Temperature

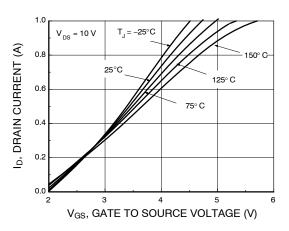


Figure 5. Transfer Characteristics

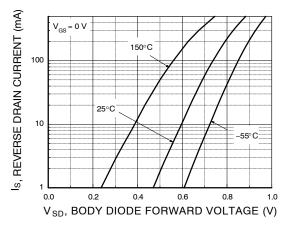


Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

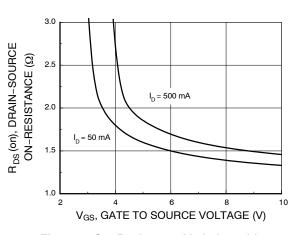


Figure 4. On-Resistance Variation with Gate-Source Voltage

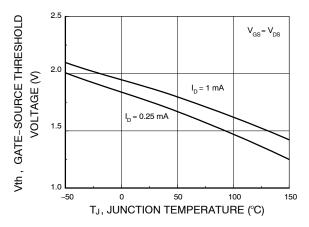


Figure 6. Gate Threshold Variation with Temperature

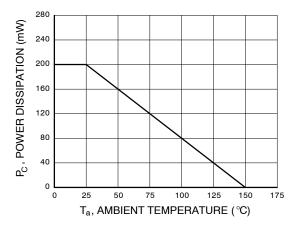
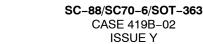
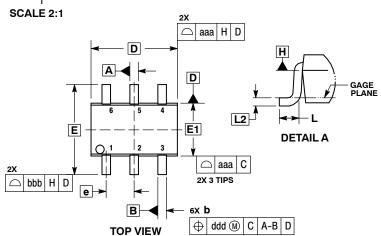


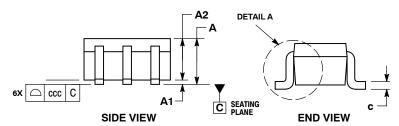
Figure 8. Power Derating





DATE 11 DEC 2012





NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M. 1994.
- CONTROLLING DIMENSION: MILLIMETERS.
 DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH,
- PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRU-SIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.

- SIONS, OH GAILE BURHS SHALL NOT EXCEED 0.20 PEH END.
 DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF
 THE PLASTIC BODY AND DATUM H.
 DATUMS A AND B ARE DETERMINED AT DATUM H.
 DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE
 LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
- DIMENSION 6 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION 6 AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α			1.10			0.043
A1	0.00		0.10	0.000		0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
С	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
е		0.65 BS	С	0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			-	0.006 BS	SC
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10 0				0.004	
ddd		0.10			0.004	

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

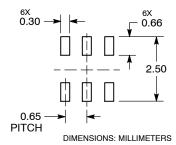
= Date Code*

= Pb-Free Package

(Note: Microdot may be in either location)

- *Date Code orientation and/or position may vary depending upon manufacturing location.
- *This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "=", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED SOLDERING FOOTPRINT*



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

STYLES ON PAGE 2

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SC-88/SC70-6/SOT-363 CASE 419B-02 ISSUE Y

DATE 11 DEC 2012

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13: PIN 1. ANODE 2. N/C 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 14: PIN 1. VREF 2. GND 3. GND 4. IOUT 5. VEN 6. VCC	STYLE 15: PIN 1. ANODE 1 2. ANODE 2 3. ANODE 3 4. CATHODE 3 5. CATHODE 2 6. CATHODE 1	STYLE 16: PIN 1. BASE 1 2. EMITTER 2 3. COLLECTOR 2 4. BASE 2 5. EMITTER 1 6. COLLECTOR 1	STYLE 17: PIN 1. BASE 1 2. EMITTER 1 3. COLLECTOR 2 4. BASE 2 5. EMITTER 2 6. COLLECTOR 1	STYLE 18: PIN 1. VIN1 2. VCC 3. VOUT2 4. VIN2 5. GND 6. VOUT1
STYLE 19: PIN 1. I OUT 2. GND 3. GND 4. V CC 5. V EN 6. V REF	STYLE 20: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR	STYLE 21: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. N/C 6. CATHODE 1	STYLE 22: PIN 1. D1 (i) 2. GND 3. D2 (i) 4. D2 (c) 5. VBUS 6. D1 (c)	STYLE 23: PIN 1. Vn 2. CH1 3. Vp 4. N/C 5. CH2 6. N/C	STYLE 24: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE
STYLE 25: PIN 1. BASE 1 2. CATHODE 3. COLLECTOR 2 4. BASE 2 5. EMITTER 6. COLLECTOR 1	STYLE 26: PIN 1. SOURCE 1 2. GATE 1 3. DRAIN 2 4. SOURCE 2 5. GATE 2 6. DRAIN 1	STYLE 27: PIN 1. BASE 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. EMITTER 2 6. COLLECTOR 2	STYLE 28: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	STYLE 29: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE/ANODE 6. CATHODE	STYLE 30: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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