Order this document by MC3399/D

MOTOROLA

MC3399

Automotive Half-Amp High-Side Switch

The MC3399 is a High–Side Switch designed to drive loads from the positive side of the power supply. The output is controlled by a TTL compatible input Enable pin. In the “on” state, the device exhibits very low saturation voltages for load currents in excess of 750 mA. The device isolates the load from positive or negative going high voltage transients by abruptly “opening” thus protecting the load from the transient voltage for the duration of the transient. The device automatically re–establishes its original operating state following the transient condition.

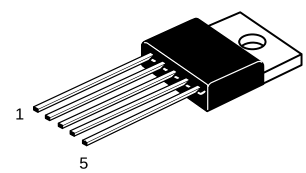
The MC3399 is fabricated on a power BIMOS process which combines the best features of Bipolar and MOS technologies. The mixed technology provides higher gain PNP output devices and results in Power Integrated Circuits having substantially reduced quiescent currents.

The device operates over a wide power supply voltage range and can withstand voltage transients (positive or negative) of ±100 V. A rugged PNP output stage along with active clamp circuitry, output current limit and thermal shutdown permit the driving of all types of loads, including inductive. The MC3399 is offered in 5–lead TO–220 and 16–lead SOIC plastic packages to facilitate either “thru–hole” or surface mount use. In addition, it is specified over a wide ambient operating temperature of –40°C to +125°C and is ideally suited for industrial and automotive applications where harsh environments exist.

- Low Switch Voltage Drop
- Load Currents in Excess of 750 mA
- Low Quiescent Current
- Transient Protection Up to ±100 V
- TTL Compatible Enable Input
- On–Chip Current Limit and Thermal Shutdown Circuitry

AUTOMOTIVE HALF–AMP HIGH–SIDE SWITCH

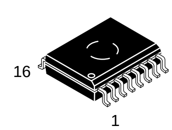
SEMICONDUCTOR TECHNICAL DATA



Pin 1. Ignition
2. Output
3. Output
4. Ground
5. Input

T SUFFIX
PLASTIC PACKAGE
CASE 314D

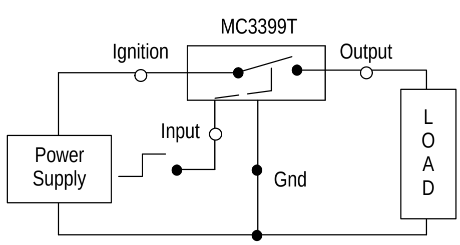
Pins 2 and 3 connected to package tab.



Pin 1. Ignition
2. N.C.
3. N.C.
4. N.C.
5. Ground
6. N.C.
7. Input
8. N.C.
9. Output
10. Output
11. Output
12. Output
13. Output
14. Output
15. Output
16. Output

DW SUFFIX
PLASTIC PACKAGE
CASE 751G
SOP(8+8)L

Representative Block Diagram



This device contains 52 active transistors.

ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC3399DW	T_A = – 40° to +125°C	SOP(8+8)L
MC3399T		Plastic Power

MAXIMUM RATINGS

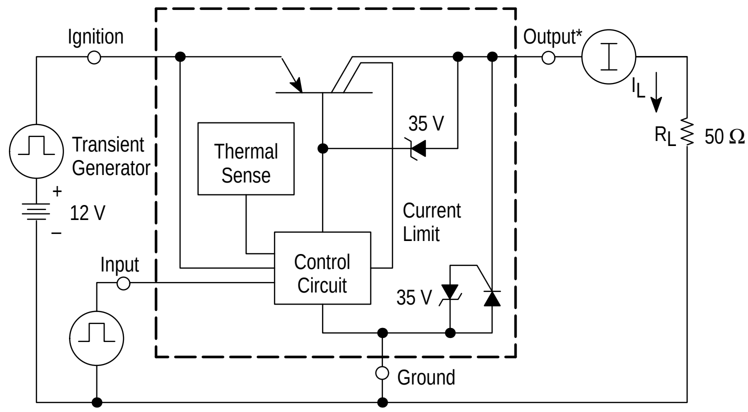
Rating	Symbol	Value	Unit
Ignition Input Voltage (Continuous) Forward Reverse	V_{IGN}	 25 –16	Vdc
Ignition Input Voltage (Transient)	V_{IGN}	 ±60 ±100	V
Input Voltage	V_{in}	–0.3 to +7.0	V
Output Current	I_O	Internally Limited	A
Thermal Resistance Plastic Power Package (Case 314D) Junction–to–Ambient Junction–to–Tab SOP(8+8)L Plastic Package (Case 751G) Junction–to–Ambient Junction–to–Lead 12	 $R_{\theta JA1}$ $R_{\theta JT}$ $R_{\theta JA2}$ $R_{\theta JL}$	 65 5.0 138 52	°C/W
Soldering Temperature (for 10 Seconds)	T_{solder}	260	°C
Junction Temperature	T_J	–40 to +150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

ELECTRICAL CHARACTERISTICS (V_{IGN} = 12 V, I_L = 150 mA, –40°C ≤ T_A = +125°C, V Input = “1”, unless otherwise noted.)(1)

Characteristic	Symbol	Min	Typ	Max	Unit
Operating Voltage	$V_{IGN(min)}$	4.5	–	–	V
Switch Voltage Drop (Saturation) V_{IGN} = 4.5 V I_O = 150 mA, T_A = 25°C I_O = 200 mA, T_A = –40°C I_O = 125 mA, T_A = 125°C V_{IGN} = 12 V I_O = 425 mA, T_A = 25°C I_O = 550 mA, T_A = –40°C V_{IGN} = 16 V I_O = 375 mA, T_A = 125°C	$V_{IGN}–V_O$	 – – – – – –	 0.2 0.3 0.3 0.3 0.3 0.4	 0.5 0.5 0.5 0.7 0.7 0.7	V
Quiescent Current V_{IGN} = 12 V I_O = 150 mA, T_A = 25°C I_O = 550 mA, T_A = –40°C I_O = 300 mA, T_A = 125°C	I_{GND}	 – – –	 12 25 10	 50 100 50	mA
Output Current Limit (V_O = 0 V)	I_{SC}	–	1.6	2.5	A
Output Leakage Current (V_{IGN} = 12 V, Input = “0”)	I_{Leak}	–	10	150	µA
Input Voltage High Logic State Low Logic State	 V_{IH} V_{IL}	 2.0 –	 – –	– 0.8	V
Input Current High Logic State (V_{IH} = 5.5 V) Low Logic State (V_{IL} = 0.4 V)	 I_{IH} I_{IL}	 – –	 120 20	 – –	µA
Output Turn–On Delay Time Input = “0” → “1”, T_A = +25°C (Figures 1 and 3)	$t_{DLY(on)}$	–	50	–	µs
Output Turn–Off Delay Time Input = “1” → “0”, T_A = +25°C (Figures 1 and 3)	$t_{DLY(off)}$	–	5.0	–	µs
Overvoltage Shutdown Threshold	$V_{in(OV)}$	26	31	36	V
Output Turn–Off Delay Time (T_A = + 25°C) to Overvoltage Condition, V_{in} stepped from 12 V to 40 V, V ≤ 0.9 V_O (Figures 1 and 3)	t_{DLY}	–	2.0	–	µs
Output Recovery Delay Time (T_A = + 25°C) V_{IGN} stepped from 40 V to 12 V, V ≥ 0.9 V_O (Figures 1 and 3)	t_{RCVY}	–	5.0	–	µs

NOTES: 1. Typical values represent characteristics of operation at T_A = 25°C.

Figure 1. Transient Response Test Circuit



NOTE: * Depending on load current and transient duration, an output capacitor (C_O) of sufficient value may be used to hold up output voltage during the transient, and absorb turn–off delay voltage overshoot.

Figure 2. Timing Diagram

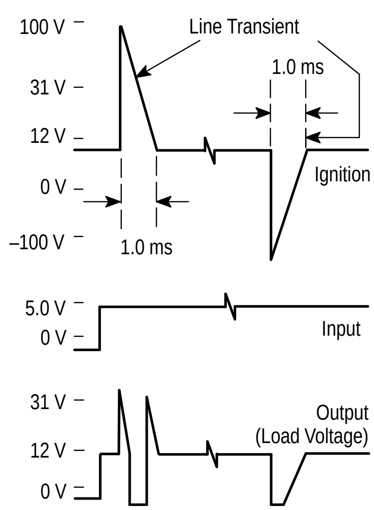


Figure 3. Response Time Diagram

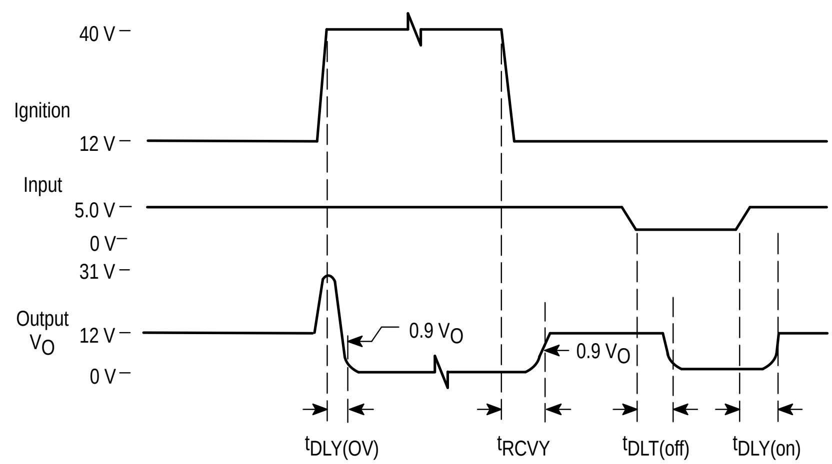


Figure 4. Switch Voltage Drop versus Load Current

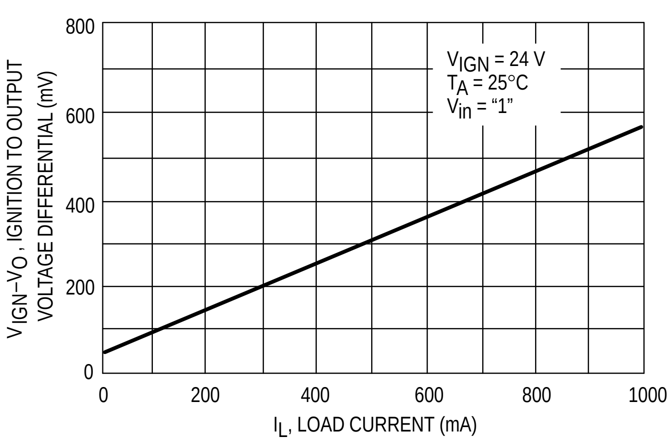
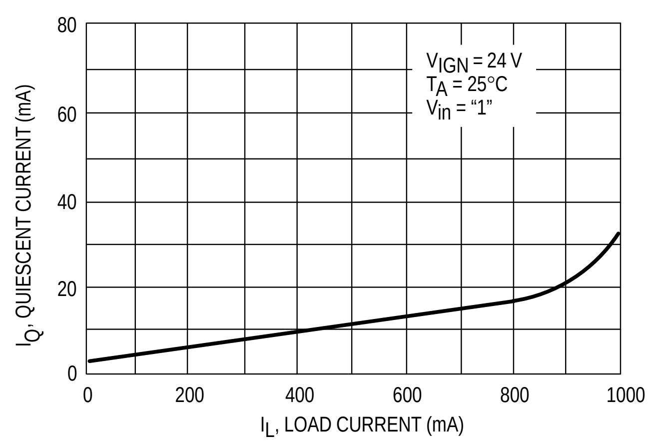
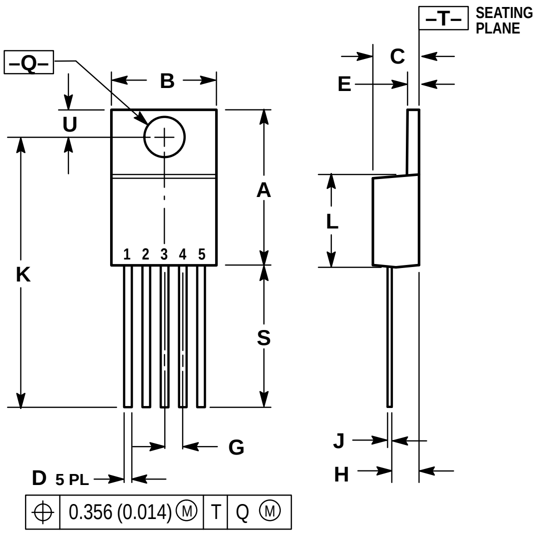


Figure 5. Quiescent Current versus Load Current



OUTLINE DIMENSIONS

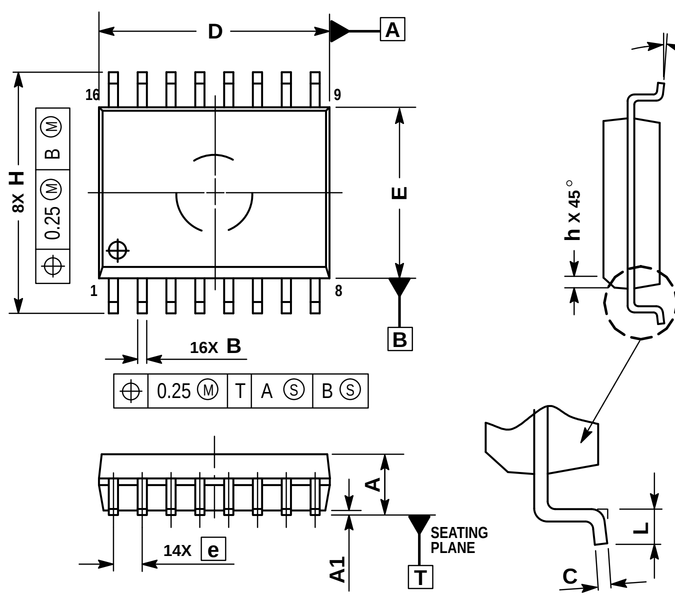
T SUFFIX
PLASTIC PACKAGE
CASE 314D–03
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION D DOES NOT INCLUDE INTERCONNECT BAR (DAMBAR) PROTRUSION. DIMENSION D INCLUDING PROTRUSION SHALL NOT EXCEED 10.92 (0.043) MAXIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.572	0.613	14.529	15.570
B	0.390	0.415	9.906	10.541
C	0.170	0.180	4.318	4.572
D	0.025	0.038	0.635	0.965
E	0.048	0.055	1.219	1.397
G	0.067 BSC		1.702 BSC	
H	0.087	0.112	2.210	2.845
J	0.015	0.025	0.381	0.635
K	1.020	1.065	25.908	27.051
L	0.320	0.365	8.128	9.271
Q	0.140	0.153	3.556	3.886
U	0.105	0.117	2.667	2.972
S	0.543	0.582	13.792	14.783

DW SUFFIX
PLASTIC PACKAGE
CASE 751G–03
(SOP(8+8)L)
ISSUE B



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INLCUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	10.15	10.45
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0 °	7 °

How to reach us:
USA / EUROPE / Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1–303–675–2140 or 1–800–441–2447

JAPAN: Nippon Motorola Ltd.: SPD, Strategic Planning Office, 141,
4–32–1 Nishi–Gotanda, Shagawa–ku, Tokyo, Japan. 03–5487–8488

Customer Focus Center: 1–800–521–6274

MfaxTM: RMFAX0@email.sps.mot.com – TOUCHTONE 1–602–244–6609
Motorola Fax Back System – US & Canada ONLY 1–800–774–1848
– http://sps.motorola.com/mfax/

ASIA / PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298

HOME PAGE: http://motorola.com/sps/