NEC

MOS INTEGRATED CIRCUIT

μPD16823

MONOLITHIC H BRIDGE DRIVER

DESCRIPTION

This IC is a monolithic H bridge driver employing a horizontal N-channel power MOS FET for its driver stage.

It is provided with forward/reverse and brake functions and is ideal as a driver circuit for a motor that winds or rewinds the film in a camera, or a motor for moving a lens.

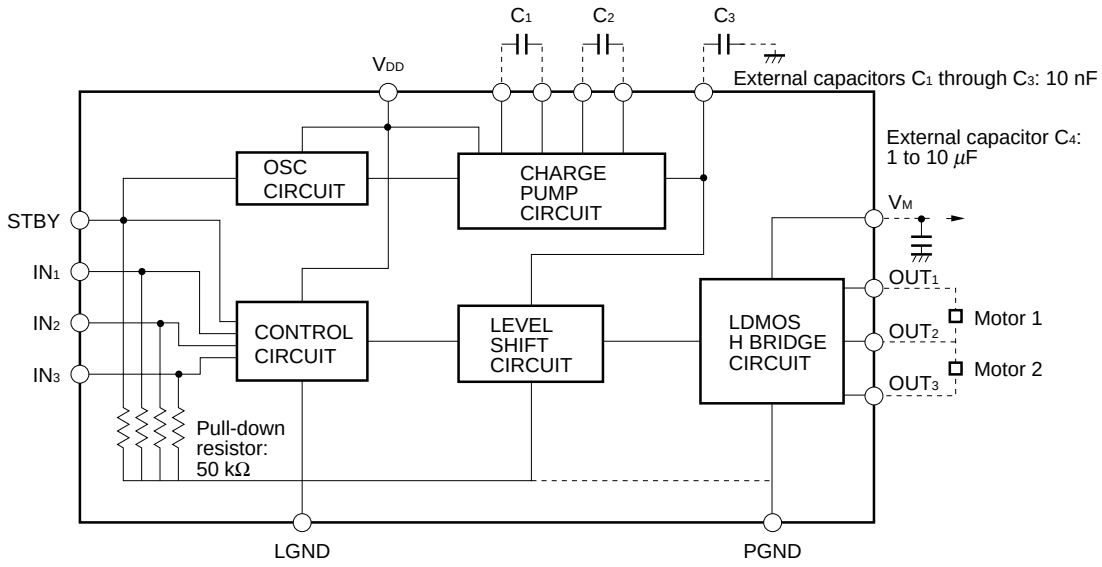
FEATURES

- High drive current I_{DR1} = 0.5 A (DC)
  I_{DR2} = 1 A: at PW ≤ 200 ms, duty cycle ≤ 50%
  I_{DR3} = 3 A: at PW ≤ 200 ms, single pulse
- 1.5ch H bridge circuits
- Low ON resistance (sum of ON resistance of top and bottom FETs)
  R_{ON} = 0.6 Ω TYP. at I_{DR} = 0.5 A
- Standby function that turns OFF charge pump circuit
- Low-voltage drive (2.5 V MIN.)
- Surface-mount mini-mold package: 20-pin plastic SOP (300 mil)

ORDERING INFORMATION

Part Number	Package
μPD16823GS	20-pin plastic SOP (300 mil)

BLOCK DIAGRAM



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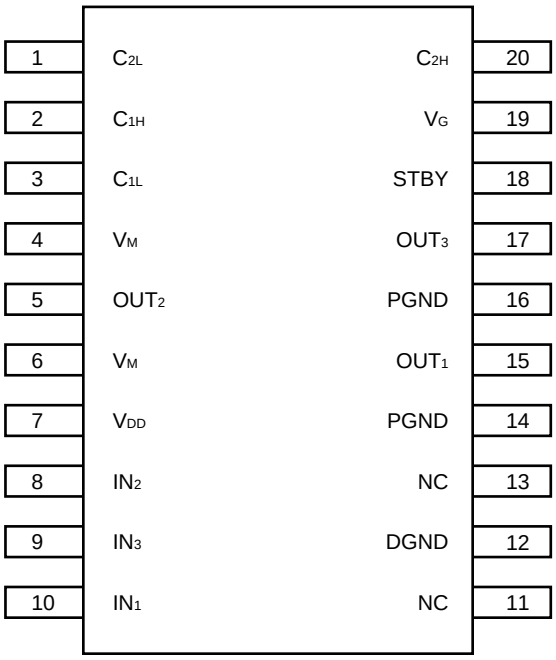
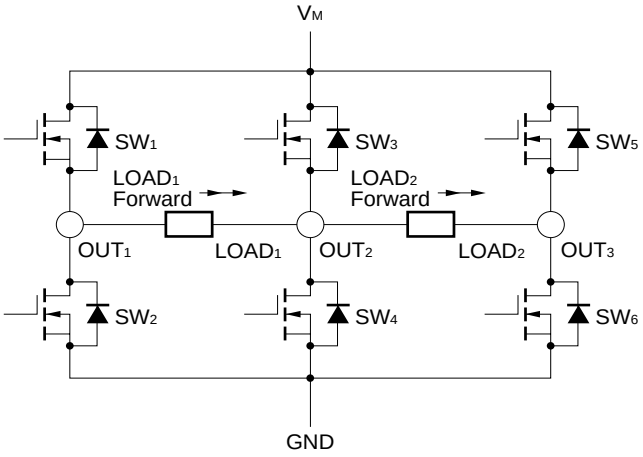
PIN CONFIGURATION



INTERNAL CONNECTION



OUT1 through OUT3 are output pins.

FUNCTION TABLE

Input Signal				Circuit Operation	Current Path
IN1	IN2	IN3	STBY		
L	H	L	H	1 CH forward mode	SW1 →LOAD1 →SW4
L	L	H	H	1 CH reverse mode	SW3 →LOAD1 →SW2
L	H	H	H	1 CH brake mode	SW2 (Di2) →LOAD1 →SW4
H	H	L	H	2 CH forward mode	SW3 →LOAD2 →SW6
H	L	H	H	2 CH reverse mode	SW5 →LOAD2 →SW4
H	H	H	H	2 CH brake mode	SW4 (Di4) →LOAD2 →SW6
×	L	L	H	Stop mode	
×	×	×	L	Standby mode	Charge pump ON/OFF

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Parameter	Symbol	Condition	Ratings	Unit
(Positive) supply voltage	V_{DD}	When charge pump operates	–0.5 to +6.5	V
		When charge pump does not operate	–0.5 to +8.0	V
	V_M		–0.5 to +8.0	V
Gate drive voltage	V_G		15	V
Input voltage	V_{IN}		–0.5 to V_{DD} + 0.5	V
H bridge drive current Positive: MOS output stage forward current Negative: Output stage diode current	I_{DR}	DC	±0.5	A
		PW ≤ 200 ms, duty cycle ≤ 50%	±1.0	A
		PW ≤ 200 ms, single pulse	±3.0	A
Power dissipation	P_D		1.0	W
Operating temperature	T_A		–30 to +60	°C
Junction temperature	$T_{j(peak)}$		150	°C
Storage temperature	T_{stg}		–55 to +150	°C

RECOMMENDED OPERATING CONDITIONS (T_A = 25 °C)

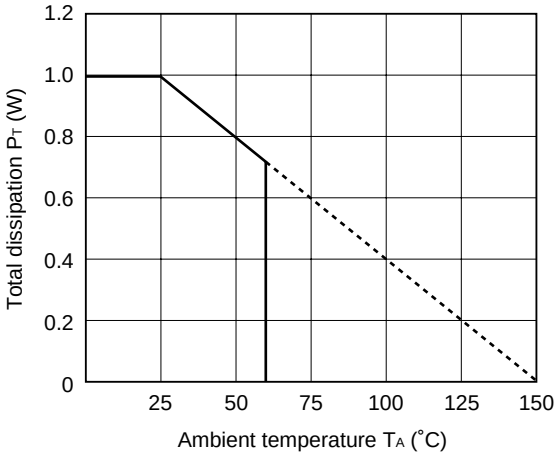
Parameter	Symbol	Condition	Ratings	Unit
(Positive) supply voltage	V_{DD}	When charge pump operates	2.5 to 6.0	V
		When charge pump does not operate	2.5 to 7.5	V
	V_M		–0.5 to +7.5	V
Gate drive voltage	V_G		11 to 14	V
Junction temperature	$T_{j(peak)}$		125	°C

ELECTRICAL CHARACTERISTICS (T_A = –30 °C to +60 °C)

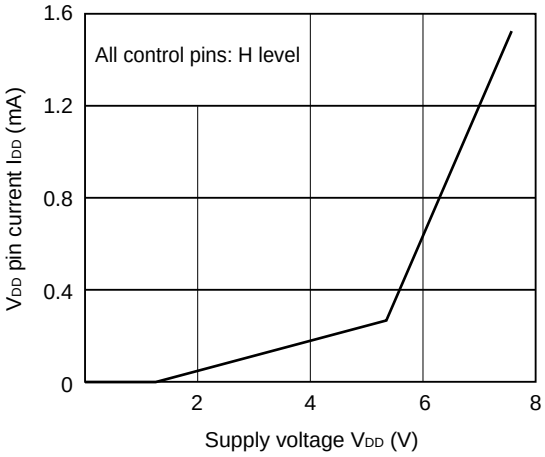
Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
V_{DD} pin current	I_{DD1}	V_{DD} = 5 V, with all control pins at high level			2.0	mA
	I_{DD2}	V_{DD} = 5 V, with all control pins at low level			10	μA
V_M pin current	I_M	T_A = 25 °C, with all control pins at low level			1.0	μA
		With all control pins at low level			10	μA
H bridge ON resistance	R_{ON}	I_{DR} = 0.5 A, V_{DD} = V_M = 5 V, T_A = 25 °C		0.6	0.8	Ω
Control pin high-level input voltage	V_{IH}		V_{DD} × 0.6			V
Control pin low-level input voltage	V_{IL}				V_{DD} × 0.2	V
Charge pump circuit turn-off time	t_{ONC}	V_{DD} = V_M = 5 V C_1 = C_2 = C_2 = 10 nF I_{DR} = 0.5 A			1.0	ms
H bridge circuit turn-ON time	t_{ONH}				10	μs
H bridge circuit turn-OFF time	t_{OFFH}				5.0	μs
Regenerative diode voltage drop	V_F	I_F = 0.5 A		1.0		V
Control pin input pull-down resistance	R_{IN}		25	50	75	kΩ

TYPICAL CHARACTERISTICS (T_A = 25 °C)

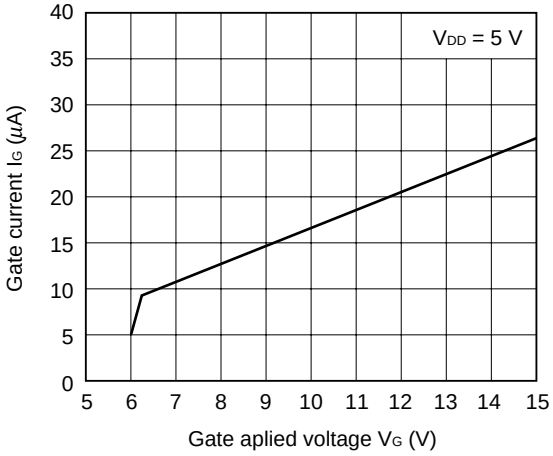
P_T vs. T_A Characteristics



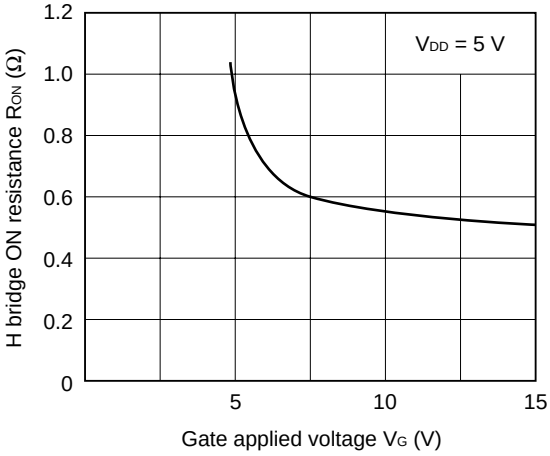
I_{DD} vs. V_{DD} Characteristics



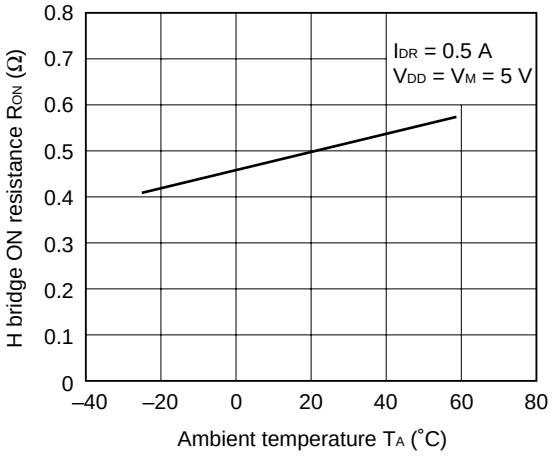
I_G vs. V_G Characteristics



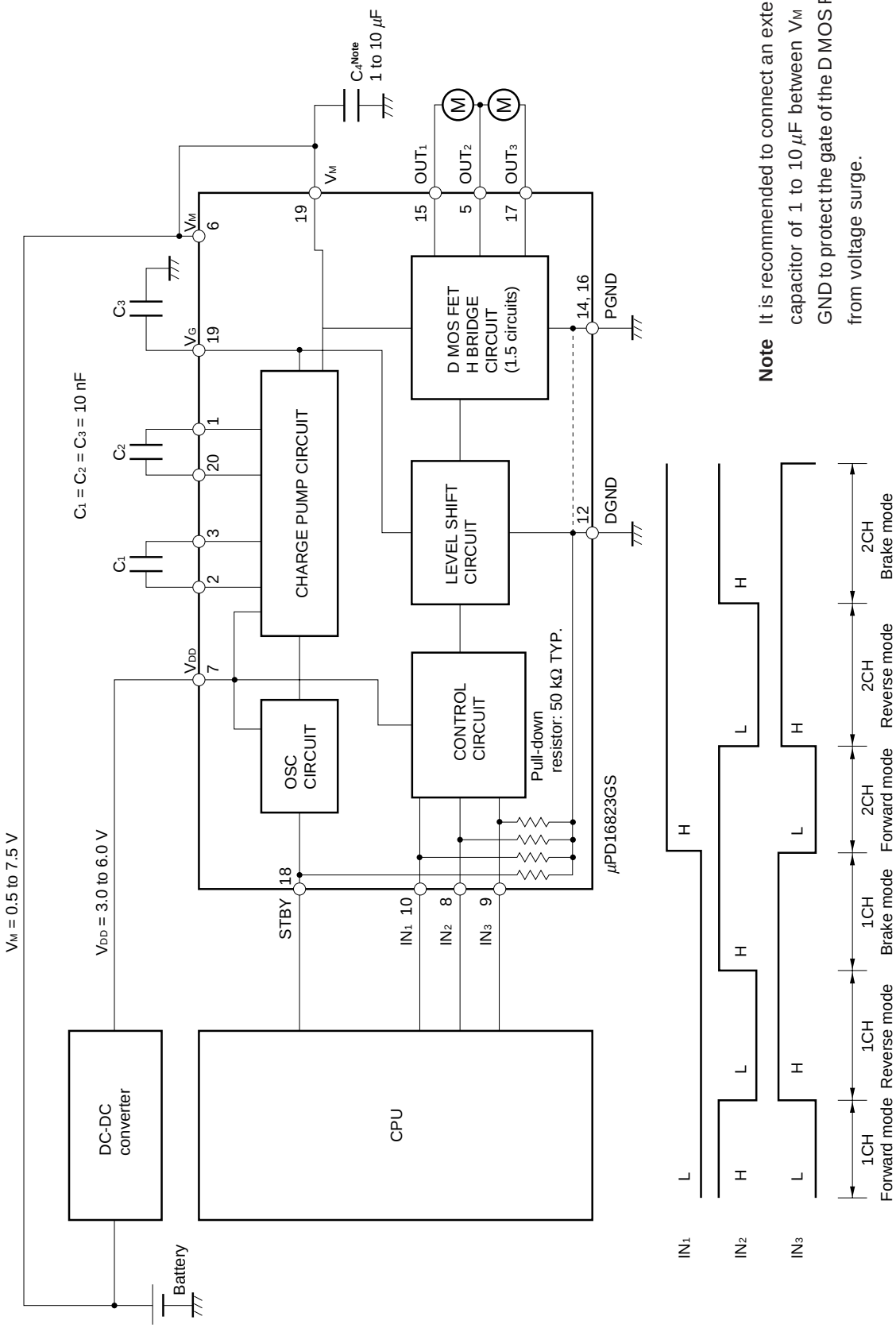
R_{ON} vs. V_G Characteristics



R_{ON} vs. T_A Characteristics



APPLICATION CIRCUIT DIAGRAM

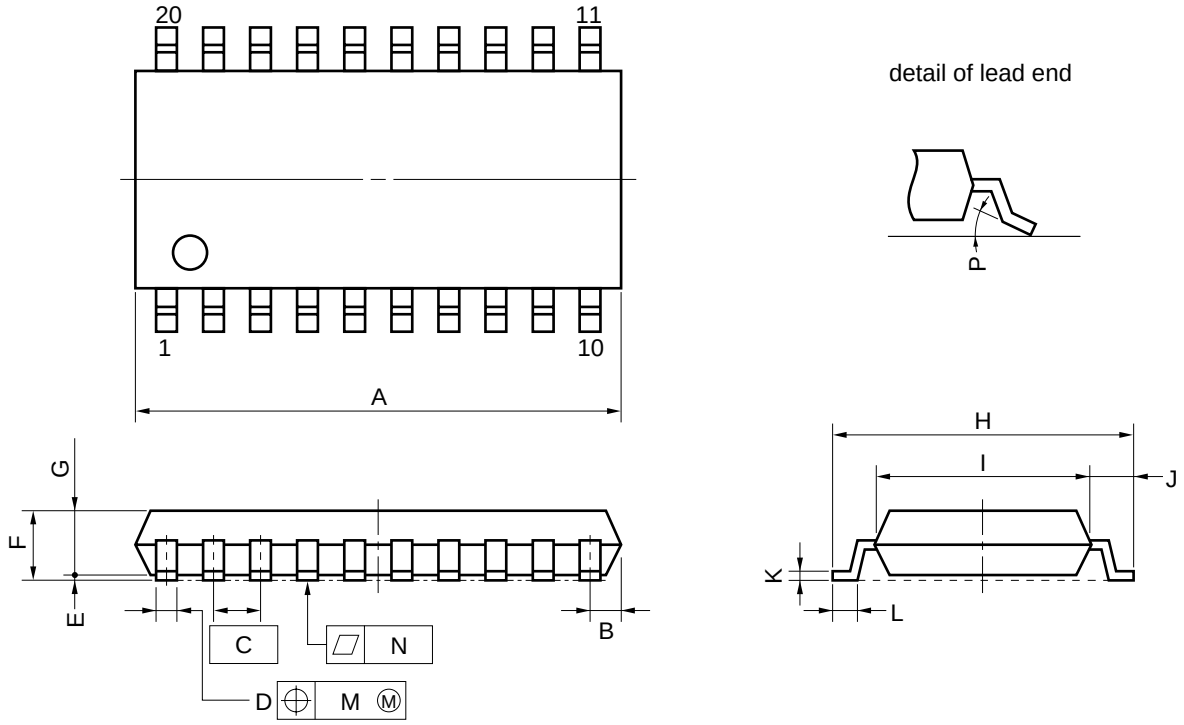


Note It is recommended to connect an external capacitor of 1 to 10 μF between V_M and GND to protect the gate of the D MOS FET from voltage surge.

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

PACKAGE DIMENSION

20 PIN PLASTIC SOP (300 mil)



NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	13.00 MAX.	0.512 MAX.
B	0.78 MAX.	0.031 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071 MAX.
G	1.55	0.061
H	7.7±0.3	0.303±0.012
I	5.6	0.220
J	1.1	0.043
K	$0.20^{+0.10}_{-0.05}$	$0.008^{+0.004}_{-0.002}$
L	0.6±0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.10	0.004
P	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

P20GM-50-300B, C-4

RECOMMENDED SOLDERING CONDITIONS

It is recommended to solder this product under the conditions shown below.

For soldering methods and conditions other than those listed below, consult NEC.

For details of the recommended soldering conditions, refer to Information Document **"Semiconductor Device Mounting Technology Manual" (C10535E)**.

Soldering Method	Soldering Condition	Symbol of Recommended Soldering
Infrared reflow	Package peak temperature: 235 °C, Time: 30 seconds MAX. (210 °C MIN.) Number of times: 2 MAX., Number of days: None[Note], Flux: Rosin-based flux with little chlorine component (chlorine: 0.2 Wt% MAX.)	IR35-00-2
VPS	Package peak temperature: 215 °C, Time: 40 seconds MAX. (200 °C MIN.) Number of times: 2 MAX., Number of days: None[Note], Flux: Rosin-based flux with little chlorine component (chlorine: 0.2 Wt% MAX.)	VP15-00-2
Wave soldering	Package peak temperature: 260 °C, Time: 10 seconds MAX., Preheating temperature: 120 °C MAX., Number of times: 1, Flux: Rosin-based flux with little chlorine component (chlorine: 0.2 Wt% MAX.)	WS60-00-1

Note The number of days during which the product can be stored at 25 °C 65% RH MAX. after the dry pack was opened.

Caution Do not use two or more soldering methods in combination.

REFERENCE DOCUMENTS

Document Name	Document No.
NEC Semiconductor Device Reliability/Quality Control System	C11745E
Guide to Quality Assurance for Semiconductor Devices	MEI-1202
Safe Operating Area of Power MOS FET	TEA-1037

M4 96.5