T-39-13

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

IRF840
IRF841
IRF842
IRF843

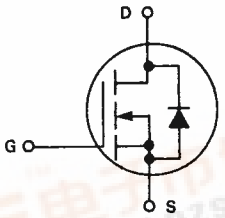
Part Number	V_{DSS}	$r_{DS(on)}$	I_D
IRF840	500 V	0.85 Ω	8.0 A
IRF841	450 V	0.85 Ω	8.0 A
IRF842	500 V	1.10 Ω	7.0 A
IRF843	450 V	1.10 Ω	7.0 A

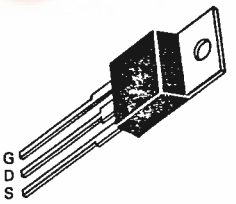
N-CHANNEL ENHANCEMENT-MODE SILICON GATE TMOS POWER FIELD EFFECT TRANSISTOR

These TMOS Power FETs are designed for high voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

- Silicon Gate for Fast Switching Speeds
- Low $r_{DS(on)}$ to Minimize On-Losses. Specified at Elevated Temperature
- Rugged — SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads

TMOS™





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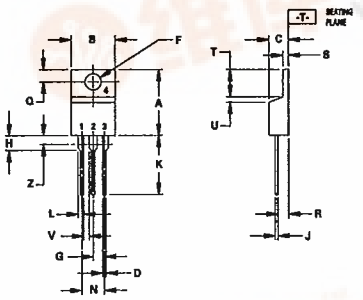

STYLE 5
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.48	15.75	0.570	0.620
B	9.66	10.28	0.380	0.405
C	4.07	4.82	0.160	0.190
D	0.64	0.88	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.42	2.66	0.095	0.105
H	2.80	3.93	0.110	0.155
J	0.36	0.55	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.00	1.27	0.000	0.050
V	1.15	—	0.045	—
Z	—	2.04	—	0.080

CASE 221A-04
TO-220AB

MAXIMUM RATINGS

Rating	Symbol	IRF 840	IRF 841	IRF 842	IRF 843	Unit
Drain-Source Voltage	V_{DSS}	500	450	500	450	Vdc
Drain-Gate Voltage (R_{GS} = 1.0 mΩ)	V_{DGR}	500	450	500	450	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Drain Current Continuous Pulsed	I_D I_{DM}	8.0 32		7.0 28		Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	125 1.0				Watts W/°C
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 150				°C

THERMAL CHARACTERISTICS

Thermal Resistance Junction to Case Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.0 62.5	°C/W
Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 Seconds	T_L	275	°C

See the MTP8N45 Designer's Data Sheet for a complete set of design curves for the product on this data sheet.

The Designer's Data Sheet permits the design of most circuits entirely from the information presented. Limit curves — representing boundaries on device characteristics — are given to facilitate "worst case" design.

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (V_{GS} = 0, I_D = 0.25 mA)	IRF841, IRF843 IRF840, IRF842	$V_{(BR)DSS}$	450 500	— —	Vdc
Zero Gate Voltage Drain Current (V_{DS} = Rated V_{DSS}, V_{GS} = 0) (V_{DS} = 0.8 Rated V_{DSS}, V_{GS} = 0, T_J = 125°C)		I_{DSS}	— —	0.25 1.00	mAdc
Gate-Body Leakage Current, Forward (V_{GSF} = 20 Vdc, V_{DS} = 0)		I_{GSSF}	—	500	nAdc
Gate-Body Leakage Current, Reverse (V_{GSR} = 20 Vdc, V_{DS} = 0)		I_{GSSR}	—	500	nAdc
ON CHARACTERISTICS*					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 0.25 mA)		$V_{GS(th)}$	2.0	4.0	Vdc
Static Drain-Source On-Resistance (V_{GS} = 10 Vdc, I_D = 4.0 Adc)	IRF840, IRF841 IRF842, IRF843	$r_{DS(on)}$	— —	0.85 1.0	Ohm
On-State Drain Current (V_{GS} = 10 V) (V_{DS} ≥ 6 8 Vdc) (V_{DS} ≥ 7.0 Vdc)	IRF840, IRF841 IRF842, IRF843	$I_{D(on)}$	8.0 7.0	— —	Adc
Forward Transconductance (V_{DS} ≥ 6.8 V, I_D = 4.0 A) (V_{DS} ≥ 7.0 V, I_D = 4.0 A)	IRF840, IRF841 IRF842, IRF843	g_{FS}	4.0 4.0	— —	mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	—	1600	pF
Output Capacitance		C_{oss}	—	350	
Reverse Transfer Capacitance		C_{rss}	—	150	
SWITCHING CHARACTERISTICS*					
Turn-On Delay Time	(V_{DD} ≈ 200 V, I_D = 4.0 Apk, R_{gen} = 4.7 Ohms)	$t_{d(on)}$	—	35	ns
Rise Time		t_r	—	15	
Turn-Off Delay Time		$t_{d(off)}$	—	90	
Fall Time		t_f	—	30	
Total Gate Charge	(V_{GS} = 10 V, V_{DS} = 0.8 × Rated V_{DSS}, I_D = Rated I_D)	Q_g	40 (Typ)	60	nC
Gate-Source Charge		Q_{gs}	20 (Typ)	—	
Gate-Drain Charge		Q_{gd}	20 (Typ)	—	
SOURCE DRAIN DIODE CHARACTERISTICS*					
Forward On-Voltage	(I_S = Rated I_D, V_{GS} = 0)	V_{SD}	—	1.9 (1)	Vdc
Forward Turn-On Time		t_{on}	Limited by stray inductance		
Reverse Recovery Time		t_{rr}	600 (Typ)	—	ns
INTERNAL PACKAGE INDUCTANCE (TO-220)					
Internal Drain Inductance (Measured from the contact screw on tab to center of die) (Measured from the drain lead 0.25" from package to center of die)		L_d	3.5 (Typ) 4.5 (Typ)	— —	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad)		L_s	7.5 (Typ)	—	

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
(1) Add 0.1 V for IRF840 and IRF841.