MS67C10

N & P Channel 60-V Dual MOSFETs

Description

These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications

Applications

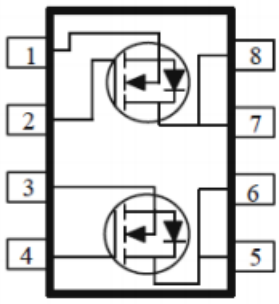
- DC Fan
- Motor Drive Applications
- Networking
- Half / Full Bridge Topology

Packing & Order Information

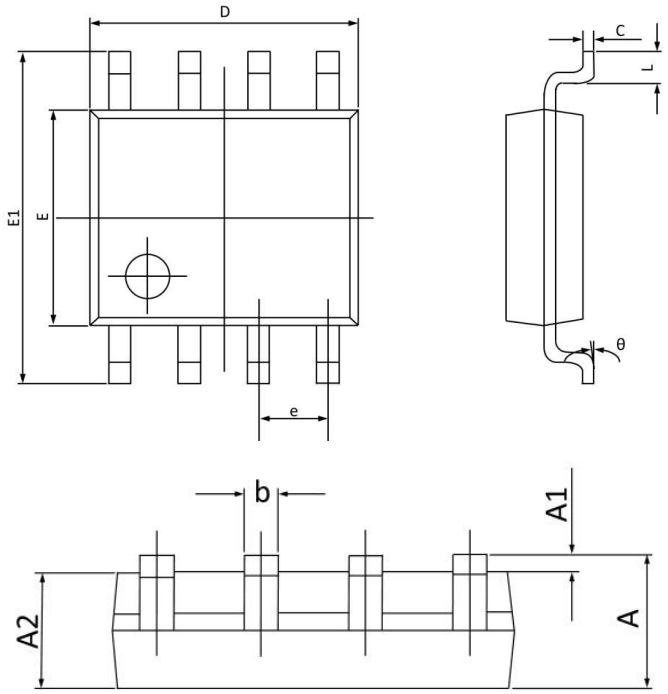
3,000/Reel

RoHS
COMPLIANT

Graphic symbol



SO-8 Package information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.750	1.350	0.069	0.053
A1	0.250	0.100	0.010	0.004
A2	1.500	1.300	0.059	0.051
b	0.490	0.350	0.019	0.014
C	0.260	0.190	0.010	0.007
D	5.100	4.700	0.201	0.185
E	4.100	3.700	0.161	0.146
E1	6.200	5.800	0.244	0.228
e	1.27BSC		0.05BSC	
L	0.900	0.400	0.035	0.016
θ	8°	0°	8°	0°

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MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Symbol	Parameter	Rating		Unit
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D	Drain Current - Continuous (T_C =25°C)	4.5	-3.5	A
	Drain Current - Continuous (T_C =70°C)	2.85	-2.21	A
I_{DM}	Drain Current - Pulsed[1]	18	-14	A
P_D	Power Dissipation (T_C =25°C)	3.57		W
	Power Dissipation - Derate above 25°C	0.028		W/°C
T_J	Storage Temperature Range	-55 to 150		°C
T_{STG}	Operating Junction Temperature Range	-55 to 150		°C

Thermal Resistance Ratings

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Thermal Resistance Junction to ambient	--	75	°C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	--	35	

N-CH Electrical Characteristics (TJ=25 °C, unless otherwise)

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = V_{GS}, I_D = 250uA	60			V
ΔBV_{DSS} /ΔTJ	BV_{DSS} Temperature Coefficient	Reference to 25°C , I_D = 1mA		0.05		V/°C
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V , V_{GS} = ±20 V			±100	nA
I_{DSS}	Drain-Source Leakage Current	V_{DS} = 60 V , V_{GS} = 0 V , TJ=25°C V_{DS} = 48 V , V_{GS} = 0 V , TJ=125°C			1 10	uA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 6 A V_{GS} = 4.5 V, I_D = 3 A		45 52	54 63	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS} , I_D = 250uA	1.2	1.8	2.5	V
$\Delta V_{GS(th)}$	Temperature Coefficient			-4.2		mV/°C
g_{fs}	Forward Transconductance	V_{DS} = 10 V, I_D = 4 A		4.2		S

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Dynamic and switching Characteristics						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ.**	**Max.**	**Units**
Q_g	Total Gate Charge[2,3]	V_{DS} = 30 V , I_D = 4 A, V_{GS} = 10 V	--	14	21	nC
Q_{gs}	Gate-Source Charge[2,3]		--	2.9	5	nC
Q_{gd}	Gate-Drain Charge[2,3]		--	2.3	4	nC
$t_{d(on)}$	Turn-On Delay Time[2,3]	I_D = 1 A , R_G = 3.3 Ω, V_{GS} = 10 V , V_{DD} = 30 V	--	3.9	7	ns
t_r	Rise Time[2,3]		--	12.6	24	ns
$t_{d(off)}$	Turn-Off Delay Time[2,3]		--	23.1	44	ns
tf	Fall Time[2,3]		--	6.7	13	ns
C_{ISS}	Input Capacitance	V_{DS} = 15 V f = 1 MHz , V_{GS} = 0 V	--	800	1160	pF
C_{OSS}	Output Capacitance		--	380	550	pF
C_{RSS}	Reverse Transfer Capacitance		--	115	170	pF
Rg	Total Gate Charge	V_{DS} = 0 V , f = 1 MHz , V_{GS} = 0 V	--	1.7	3.4	Ω

Drain-Source Diode Characteristics and Maximum Ratings						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ.**	**Max.**	**Units**
I_S	Continuous Source Current	V_G = V_D = 0 V , Force Current	--	--	4.5	A
I_{SM}	Pulsed Source Current		--	--	9	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0 V , I_S = 1 A , TJ = 25°C	--	--	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

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■Typical Electrical Characteristics - N-channel

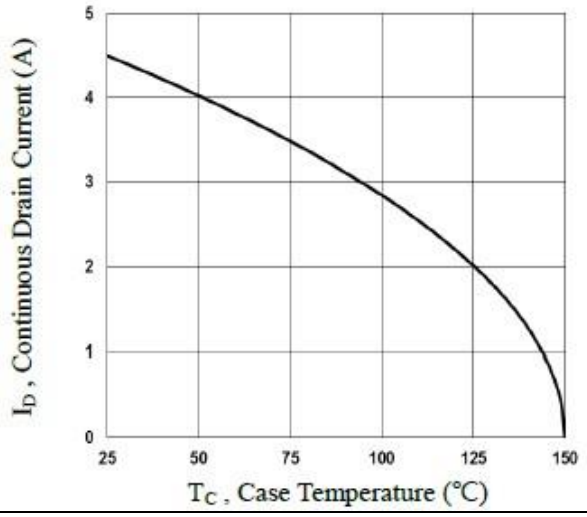

FIG.1-CONTINUOUS DRAIN CURRENT VS. T_C

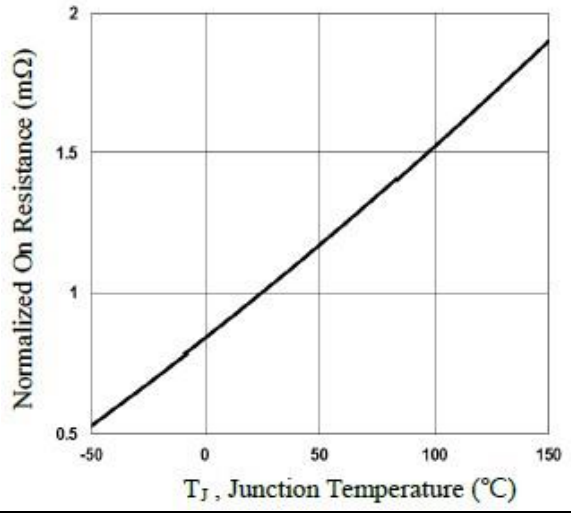

FIG.2-NORMALIZED RDSON VS. T_J

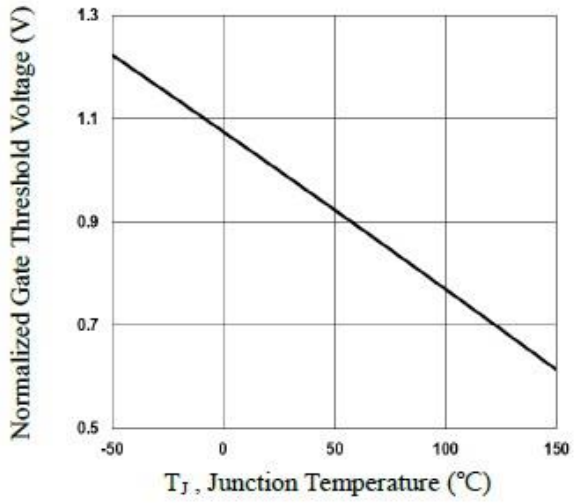

FIG.3-NORMALIZED VTH VS. T_J

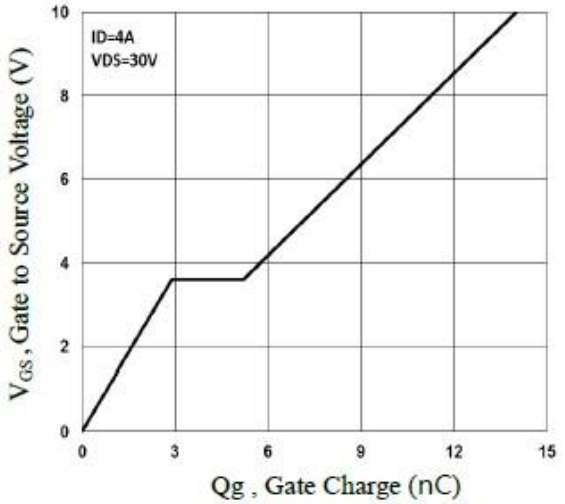

FIG.4-GATE CHARGE WAVEFORM

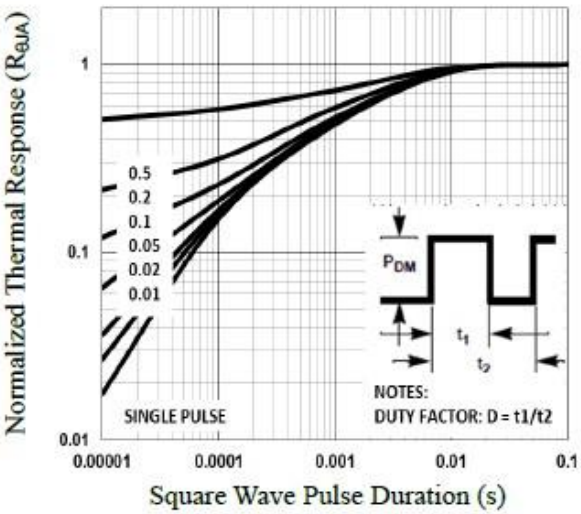

FIG.5-NORMALIZED TRANSIENT IMPEDANCE

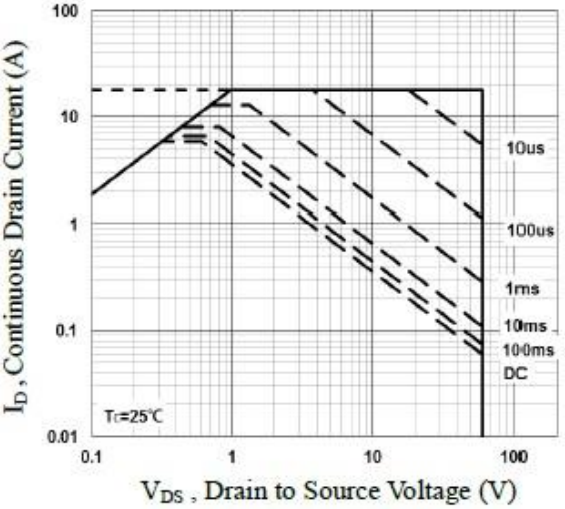

FIG.6-MAXIMUM SAFE OPERATION AREA

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P-CH Electrical Characteristics (TJ=25 °C, unless otherwise)

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = V_{GS}, I_D = 250uA	-60			V
ΔBV_{DSS} /ΔTJ	BV_{DSS} Temperature Coefficient	Reference to 25°C , I_D = 1mA		-0.05		V/°C
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V , V_{GS} = ±20 V			±100	nA
I_{DSS}	Drain-Source Leakage Current	V_{DS} = -60 V , V_{GS} = 0 V , TJ=25°C V_{DS} = -48 V , V_{GS} = 0 V , TJ=125°C			-1 10	uA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -6 A V_{GS} = -4.5 V, I_D = -3 A		87 120	105 145	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS} , I_D = 250uA	-1.0	-1.6	-2.5	V
$\Delta V_{GS(th)}$	Temperature Coefficient			3		mV/°C
g_{fs}	Forward Transconductance	V_{DS} = -10 V, I_D = -6 A		5.5		S

Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
Q_g	Total Gate Charge[2,3]	V_{DS} = -30 V , I_D = -4 A, V_{GS} = -10 V	--	10	15	nC
Q_{gs}	Gate-Source Charge[2,3]		--	1.6	3.2	nC
Q_{gd}	Gate-Drain Charge[2,3]		--	3	6	nC
$t_{d(on)}$	Turn-On Delay Time[2,3]	I_D = 1 A , R_G = 6 Ω, V_{GS} = -30 V , V_{DD} = -30 V	--	8	16	ns
t_r	Rise Time[2,3]		--	15.4	30	ns
$t_{d(off)}$	Turn-Off Delay Time[2,3]		--	42.5	80	ns
tf	Fall Time[2,3]		--	8.4	16	ns
C_{ISS}	Input Capacitance	V_{DS} = -30 V f = 1 MHz , V_{GS} = 0 V	--	785	1300	pF
C_{OSS}	Output Capacitance		--	175	300	pF
C_{RSS}	Reverse Transfer Capacitance		--	112	220	pF

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
I_S	Continuous Source Current	V_G = V_D = 0 V , Force Current	--	--	-3.5	A
I_{SM}	Pulsed Source Current		--	--	-7	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0 V , I_S = -1 A , TJ = 25°C	--	--	-1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

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■Typical Electrical Characteristics - P-channel

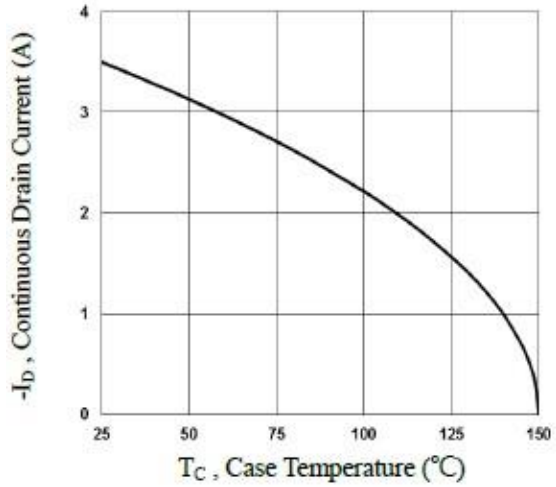

FIG.7-CONTINUOUS DRAIN CURRENT VS. T_C

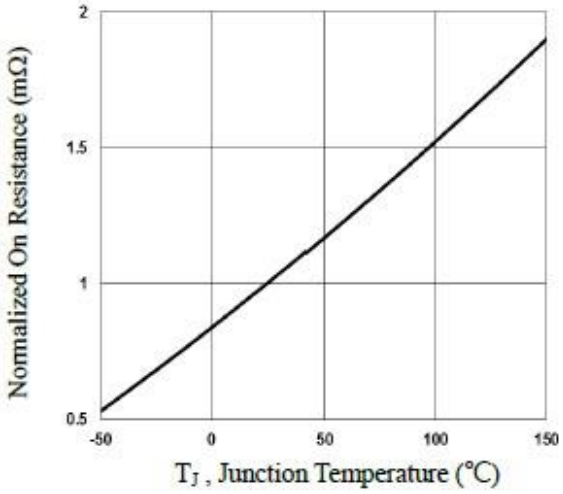

FIG.8-NORMALIZED RDSON VS. T_J

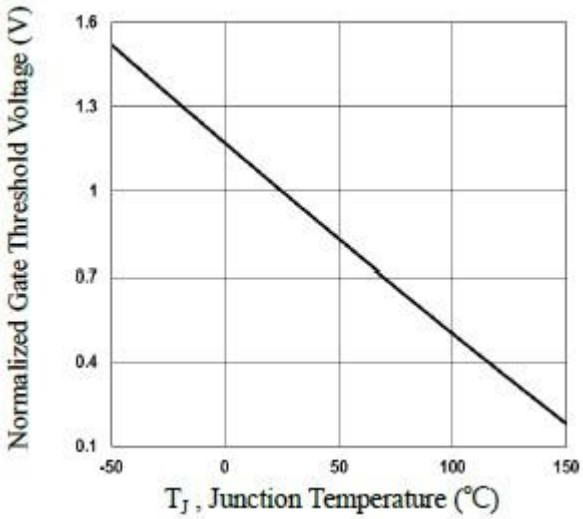

FIG.9-NORMALIZED VTH VS. T_J

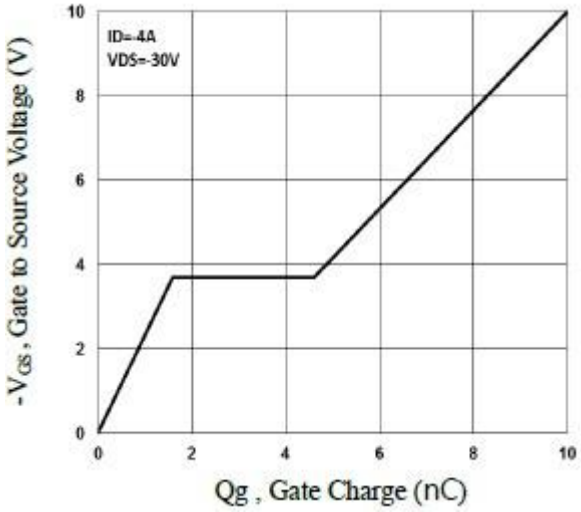

FIG.10-GATE CHARGE WAVEFORM

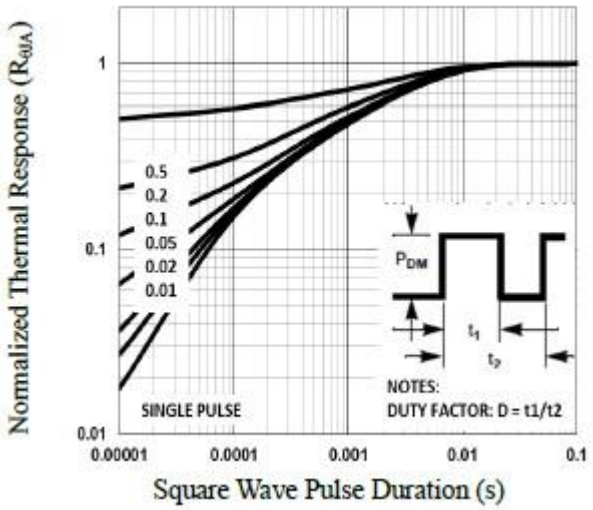

FIG.11-NORMALIZED TRANSIENT IMPEDANCE

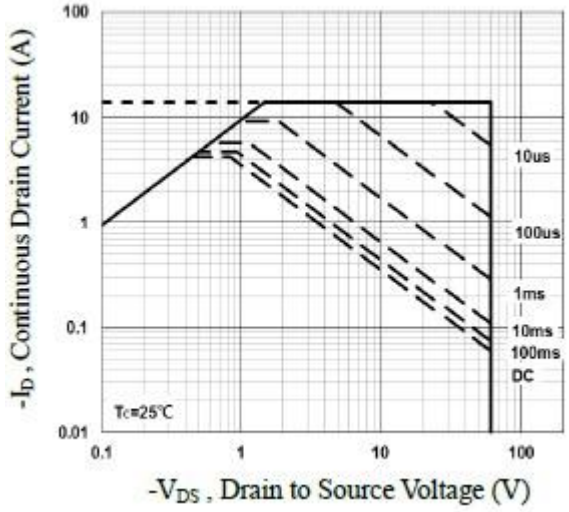

FIG.12-MAXIMUM SAFE OPERATION AREA

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