

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
 - RoHS compliant package

Applications

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

Package type : SO-8

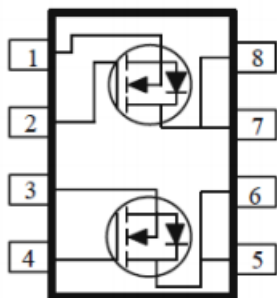
Packing & Order Information

3,000/Reel

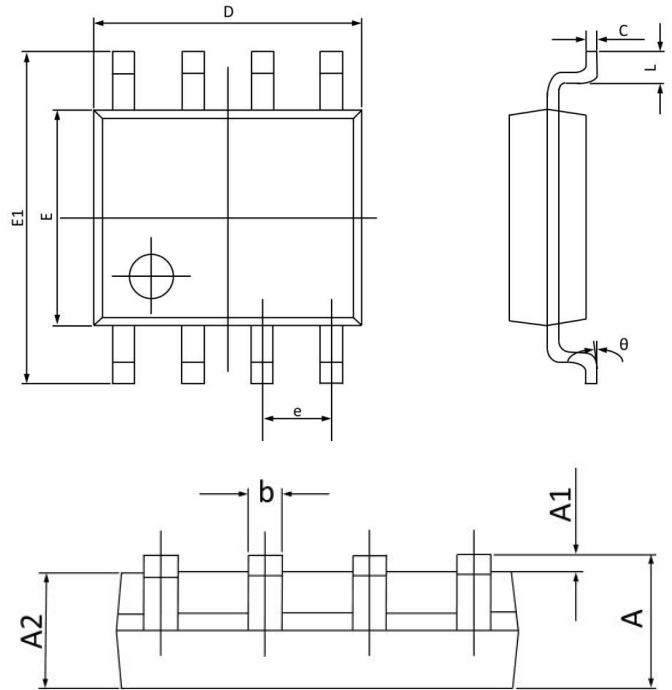


**RoHS
COMPLIANT**

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 ($T_A=25^\circ\text{C}$ unless otherwise specified)

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

Thermal Resistance Ratings

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

N-CH Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise)

Off Characteristics

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

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 6\text{A}$		45	54	m Ω
		$V_{GS} = 4.5\text{V}, I_D = 3\text{A}$		52	63	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1.2	1.8	2.5	V
$\Delta V_{GS(th)}$	Temperature Coefficient			-4.2		mV/ $^\circ\text{C}$
g_{fs}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 4\text{A}$		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}	$V_{DS} = 30\text{ V}$, $I_D = 4\text{ A}$, $V_{GS} = 10\text{ V}$	--	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}	$I_D = 1\text{ A}$, $R_G = 3.3\ \Omega$, $V_{GS} = 10\text{ V}$, $V_{DD} = 30\text{ V}$	--	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
t_f	Fall Time ^{2,3}		--	6.7	13	ns
C_{ISS}	Input Capacitance	$V_{DS} = 15\text{ V}$ $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	--	800	1160	pF
C_{OSS}	Output Capacitance		--	380	550	pF
C_{RSS}	Reverse Transfer Capacitance		--	115	170	pF
R_g	Total Gate Charge	$V_{DS} = 0\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	--	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	$V_G = V_D = 0\text{ V}$, Force Current	--	--	4.5	A
I_{SM}	Pulsed Source Current		--	--	9	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 1\text{ A}$, $T_J = 25^\circ\text{C}$	--	--	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
3. Essentially independent of operating temperature.

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■ Typical Electrical Characteristics - N-channel

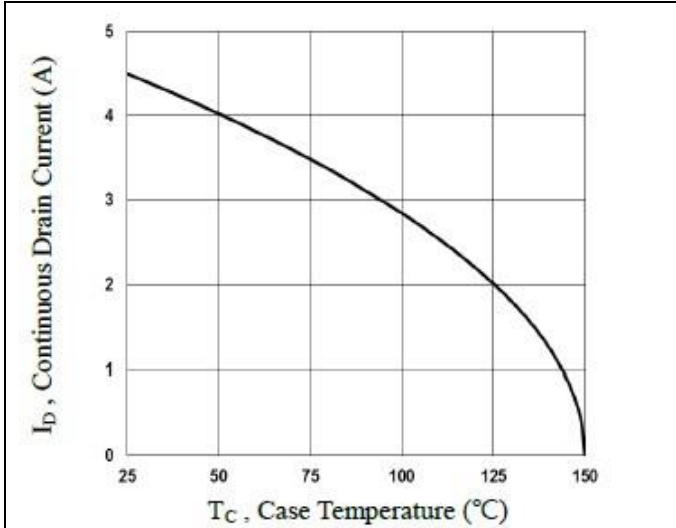


FIG.1-CONTINUOUS DRAIN CURRENT VS. T_C

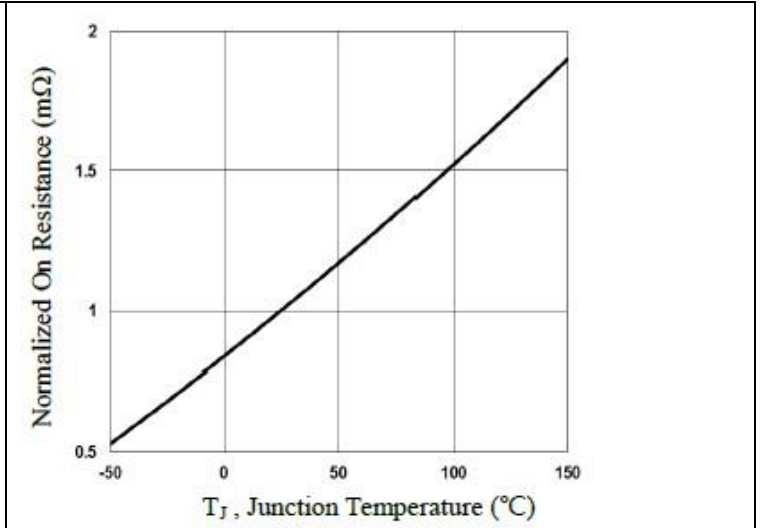


FIG.2-NORMALIZED RDSON VS. T_J

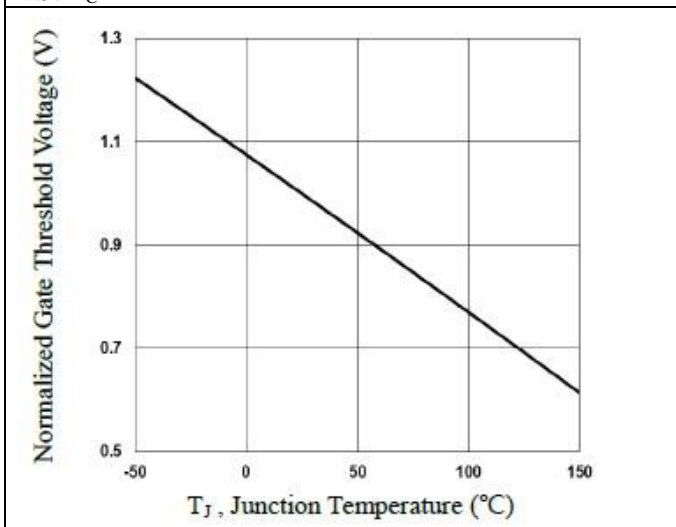


FIG.3-NORMALIZED VTH VS. T_J

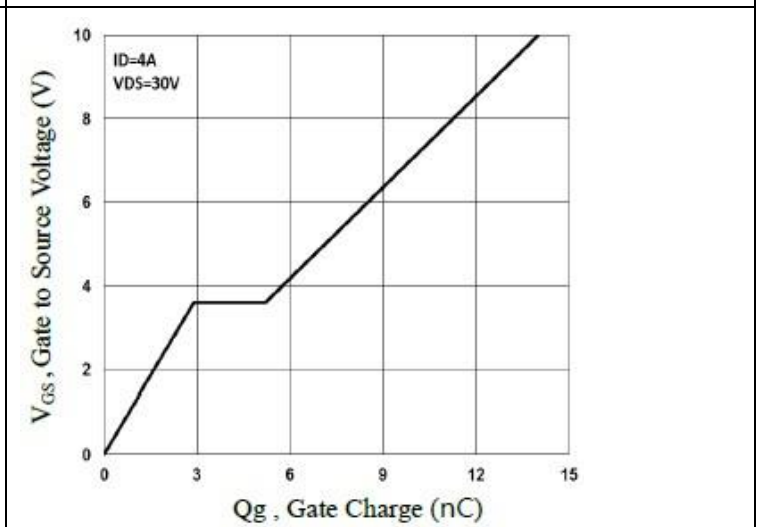


FIG.4-GATE CHARGE WAVEFORM

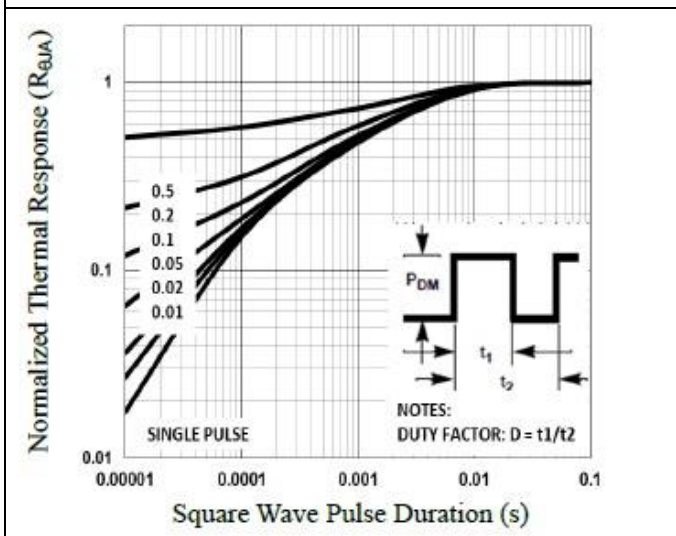


FIG.5-NORMALIZED TRANSIENT IMPEDANCE

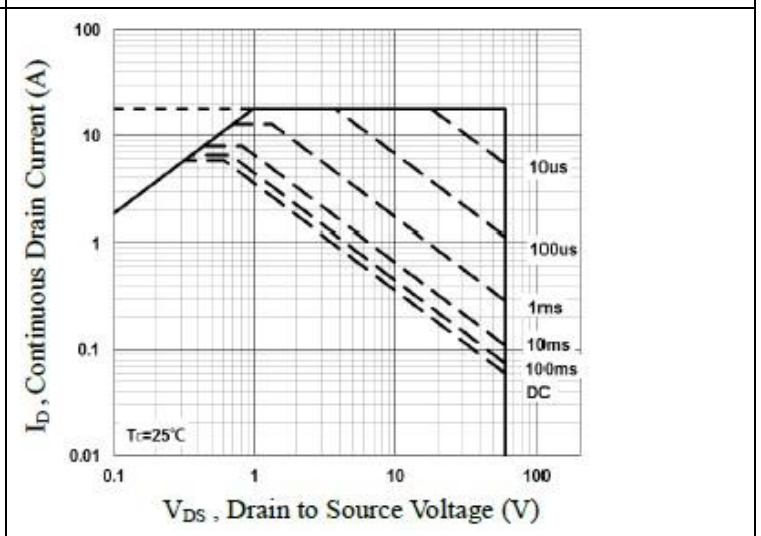


FIG.6-MAXIMUM SAFE OPERATION AREA

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P-CH Electrical Characteristics (T_J=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} /ΔT _J	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, T _J =25°C V _{DS} = -48 V, V _{GS} = 0 V, T _J =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
ΔV _{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
t _f	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, T _J = 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

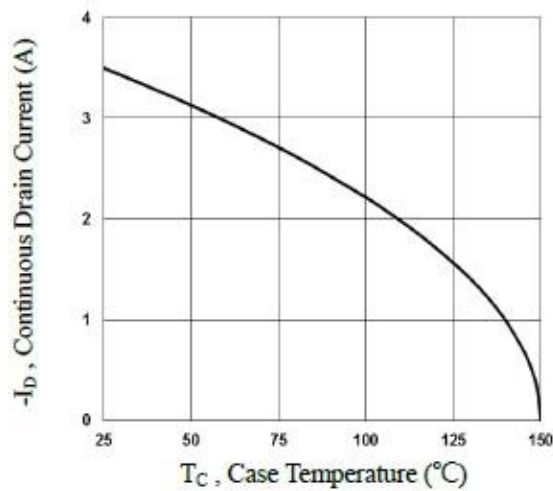


FIG.7-CONTINUOUS DRAIN CURRENT VS. T_C

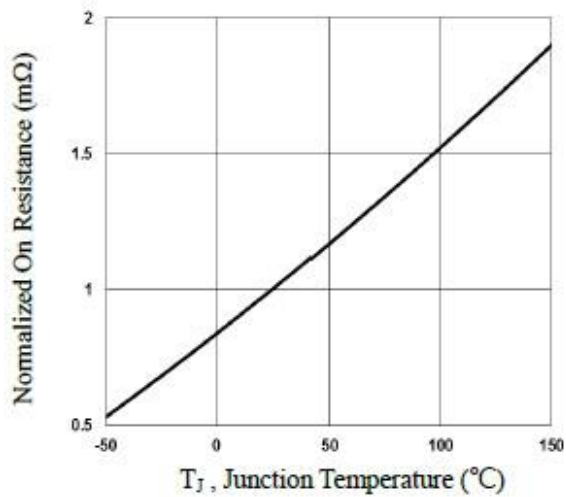


FIG.8-NORMALIZED $R_{DS(on)}$ VS. T_J

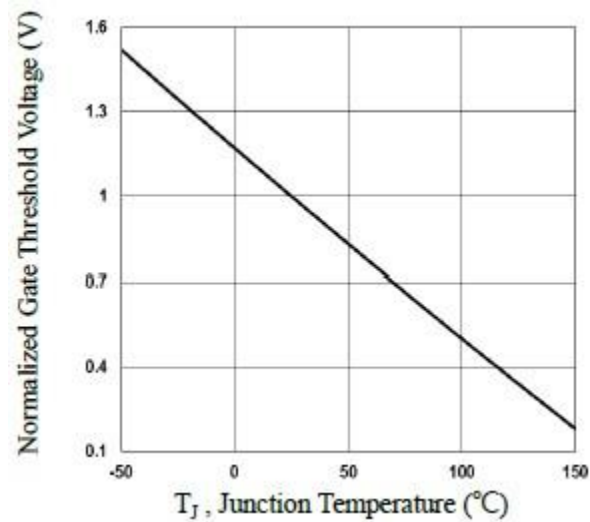


FIG.9-NORMALIZED V_{TH} VS. T_J

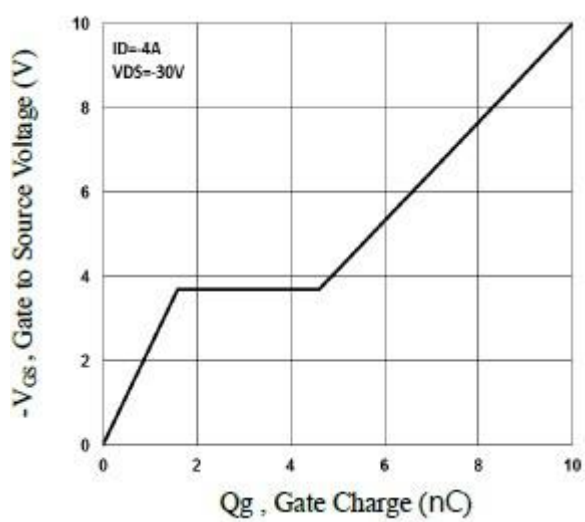


FIG.10-GATE CHARGE WAVEFORM

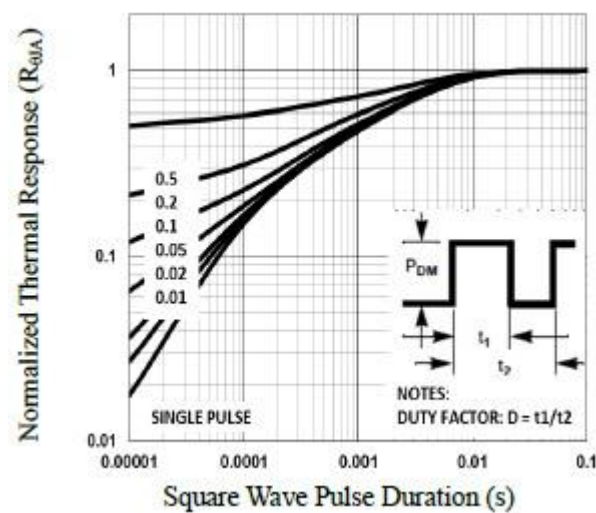


FIG.11-NORMALIZED TRANSIENT IMPEDANCE

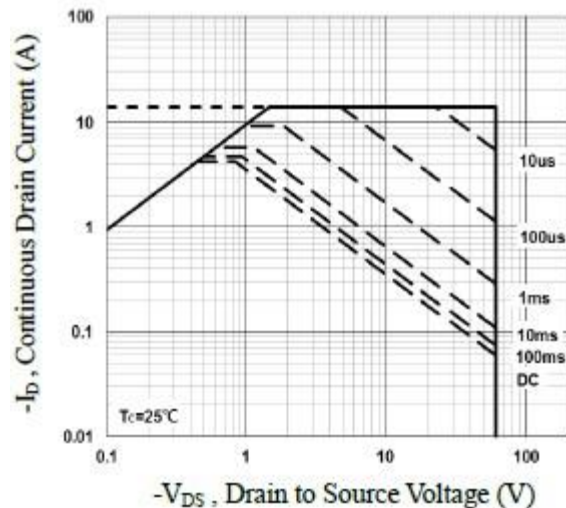


FIG.12-MAXIMUM SAFE OPERATION AREA

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Disclaimer

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