

MDS9651

Complementary N-P Channel Trench MOSFET

General Description

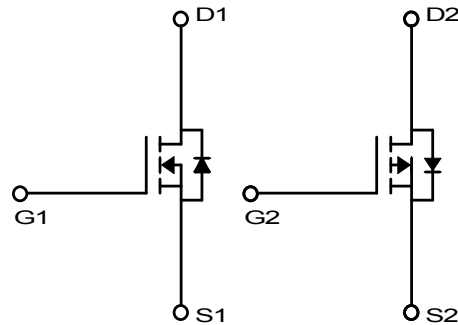
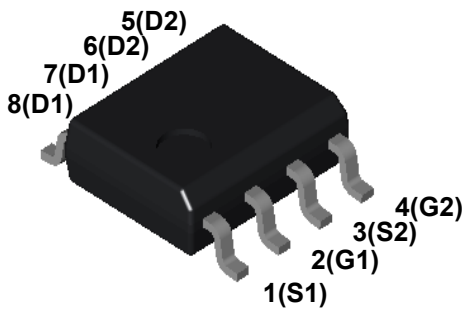
The MDS9651 uses advanced MagnaChip's MOSFET Technology to provide low on-state resistance, high switching performance and excellent reliability

Features

- | | |
|--|---|
| <p>N-Channel</p> <ul style="list-style-type: none"> ▫ $V_{DS} = 30V$ ▫ $I_D = 6.9A @ V_{GS} = 10V$ ▫ $R_{DS(ON)} < 28m\Omega @ V_{GS} = 10V$ ▫ $R_{DS(ON)} < 42m\Omega @ V_{GS} = 4.5V$ | <p>P-Channel</p> <ul style="list-style-type: none"> $V_{DS} = -30V$ $I_D = -6.0A @ V_{GS} = -10V$ $R_{DS(ON)} < 35m\Omega @ V_{GS} = -10V$ $R_{DS(ON)} < 55m\Omega @ V_{GS} = -4.5V$ |
|--|---|

Applications

- Inverters
- General purpose applications



Absolute Maximum Ratings ($T_a = 25^\circ C$ unless otherwise noted)

Characteristics	Symbol	Rating		Unit	
		N-Ch	P-Ch		
Drain-Source Voltage	V_{DSS}	30	-30	V	
Gate-Source Voltage	V_{GSS}	± 20	± 20	V	
Continuous Drain Current	I_D	$T_a = 25^\circ C$	6.9	-6.0	A
		$T_a = 100^\circ C$	4.3	-4.1	A
Pulsed Drain Current	I_{DM}	30	-30	A	
Power Dissipation ⁽¹⁾	P_D	$T_a = 25^\circ C$	2	2	W
		$T_a = 100^\circ C$	0.8	0.8	W
Single Pulse Avalanche Energy ⁽²⁾	E_{AS}	18	60.5	mJ	
Junction and Storage Temperature Range	T_J, T_{stg}	-55~150		$^\circ C$	

Thermal Characteristics

Characteristics	Device	Symbol	Rating	Unit
Thermal Resistance, Junction-to-Ambient(Steady-State) ⁽¹⁾	N-Ch	$R_{\theta JA}$	62.5	$^\circ C/W$
Thermal Resistance, Junction-to-Case	N-Ch	$R_{\theta JC}$	60	
Thermal Resistance, Junction-to-Ambient(Steady-State) ⁽¹⁾	P-Ch	$R_{\theta JA}$	62.5	
Thermal Resistance, Junction-to-Case	P-Ch	$R_{\theta JC}$	40	

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDS9651URH	-55~150°C	SOIC-8	Tape & Reel	Halogen Free

N-channel Electrical Characteristics (T_a = 25°C unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D = 250μA, V _{GS} = 0V	30	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	1.0	1.9	3.0	
Drain Cut-Off Current	I _{DSS}	V _{DS} = 24V, V _{GS} = 0V	-	-	1.0	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V	-	-	0.1	
Drain-Source ON Resistance	R _{DS(on)}	V _{GS} = 10V, I _D = 6.9A	-	21.5	28.0	mΩ
		V _{GS} = 4.5V, I _D = 5.0A	-	31.5	42.0	
Forward Transconductance	g _{FS}	V _{DS} = 5V, I _D = 6.9A	-	15.4	-	S
Dynamic Characteristics						
Total Gate Charge	Q _g	V _{DS} = 15V, I _D = 6.9A, V _{GS} = 10V	-	6.94	-	nC
Gate-Source Charge	Q _{gs}		-	1.54	-	
Gate-Drain Charge	Q _{gd}		-	1.96	-	
Input Capacitance	C _{iss}	V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz	-	334	-	pF
Reverse Transfer Capacitance	C _{rss}		-	48	-	
Output Capacitance	C _{oss}		-	83	-	
Turn-On Delay Time	t _{d(on)}	V _{GS} = 10V, V _{DS} = 15V, R _L = 2.2Ω, R _{GEN} = 3Ω	-	3.5	-	ns
Turn-On Rise Time	t _r		-	25.4	-	
Turn-Off Delay Time	t _{d(off)}		-	14.2	-	
Turn-Off Fall Time	t _f		-	10.5	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	V _{SD}	I _S = 1A, V _{GS} = 0V	-	0.75	1.0	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 6.9A, di/dt = 100A/μs	-	16.5	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	7.8	-	nC

Note :

1. Surface mounted FR-4 board with 2oz. Copper.
2. Starting T_J = 25°C, L = 1mH, I_{AS} = 6A, V_{DD} = 15V, V_{GS} = 10V

P-channel Electrical Characteristics (T_a = 25°C unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D = -250μA, V _{GS} = 0V	-30	-	-	V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250μA	-1.0	-1.9	-3.0	
Drain Cut-Off Current	I _{DSS}	V _{DS} = -24V, V _{GS} = 0V	-	-	-1.0	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V	-	-	±0.1	
Drain-Source ON Resistance	R _{DS(ON)}	V _{GS} = -10V, I _D = -6.0A	-	30.5	35.0	mΩ
		V _{GS} = -4.5V, I _D = -5.0A	-	41.5	55.0	
Forward Transconductance	g _{FS}	V _{DS} = -5V, I _D = -6.0A	-	13	-	S
Dynamic Characteristics						
Total Gate Charge	Q _g	V _{DS} = -15V, I _D = -6.0A, V _{GS} = -10V	-	18.4	-	nC
Gate-Source Charge	Q _{gs}		-	3.1	-	
Gate-Drain Charge	Q _{gd}		-	3.6	-	
Input Capacitance	C _{iss}	V _{DS} = -15V, V _{GS} = 0V, f = 1.0MHz	-	874	-	pF
Reverse Transfer Capacitance	C _{rss}		-	103	-	
Output Capacitance	C _{oss}		-	166	-	
Turn-On Delay Time	t _{d(on)}	V _{GS} = -10V, V _{DS} = -15V, R _L = 2.7Ω, R _{GEN} = 3Ω	-	9.8	-	ns
Turn-On Rise Time	t _r		-	29.8	-	
Turn-Off Delay Time	t _{d(off)}		-	26.3	-	
Turn-Off Fall Time	t _f		-	8.6	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	V _{SD}	I _S = -1A, V _{GS} = 0V	-	-0.75	-1.0	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = -6.0A, di/dt = 100A/μs	-	20	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	12.3	-	nC

Note :

1. Surface mounted RF4 board with 2oz. Copper.
2. Starting T_J = 25°C, L = 1mH, I_{AS} = -11A, V_{DD} = -15V, V_{GS} = -10V

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

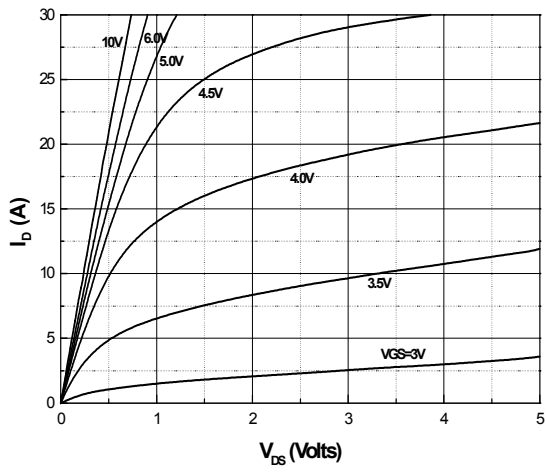


Fig.1 On-Region Characteristics

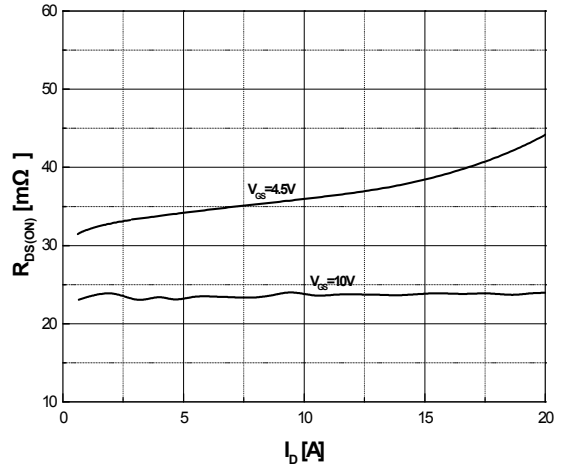


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

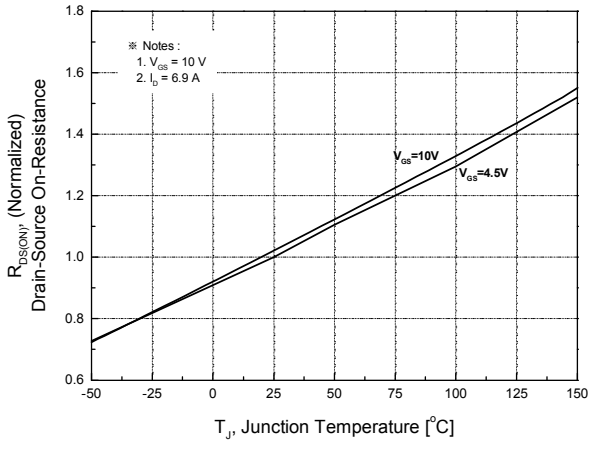


Fig.3 On-Resistance Variation with Temperature

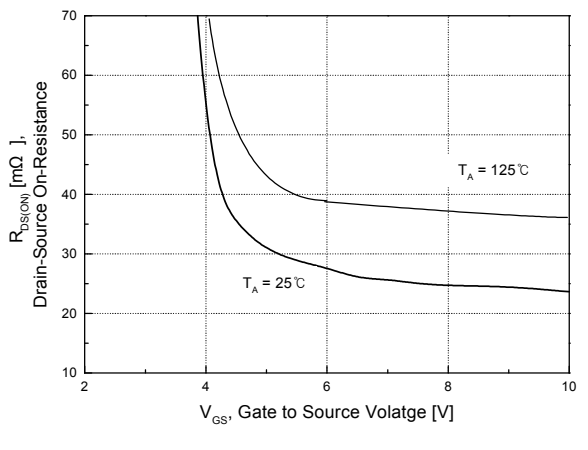


Fig.4 On-Resistance Variation with Gate to Source Voltage

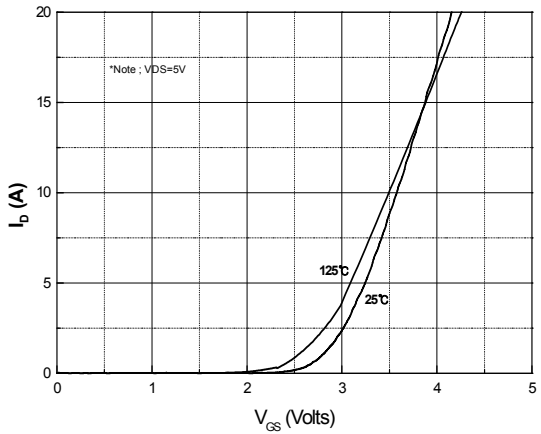


Fig.5 Transfer Characteristics

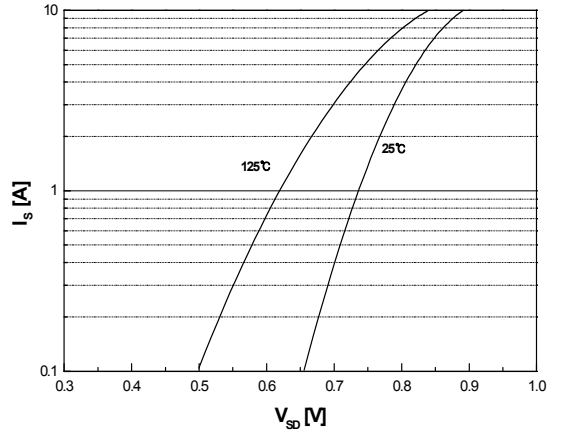


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

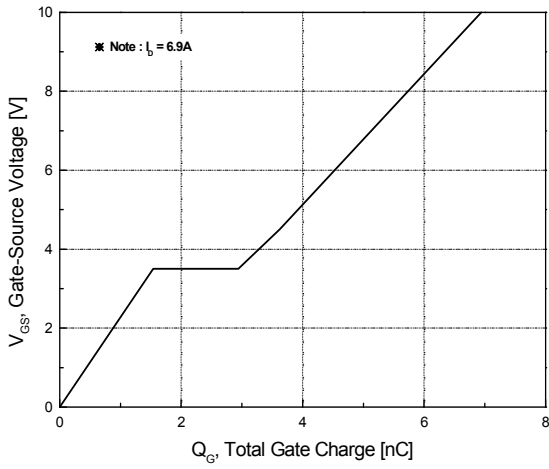


Fig.7 Gate Charge Characteristics

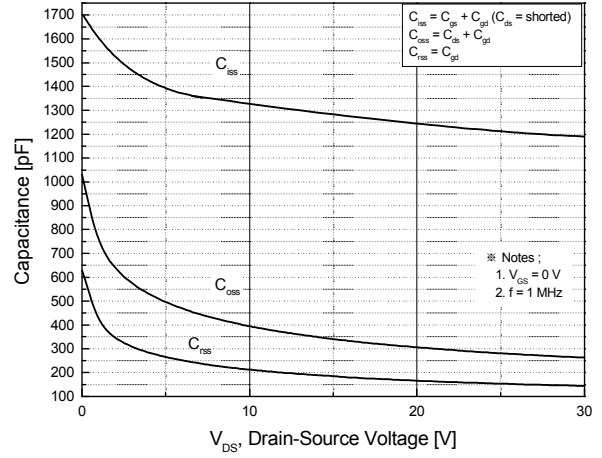


Fig.8 Capacitance Characteristics

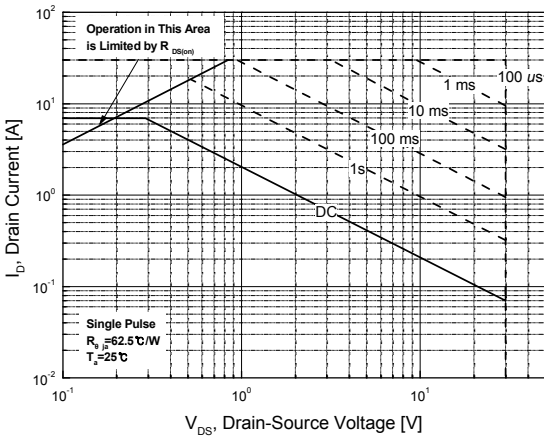


Fig.9 Maximum Safe Operating Area

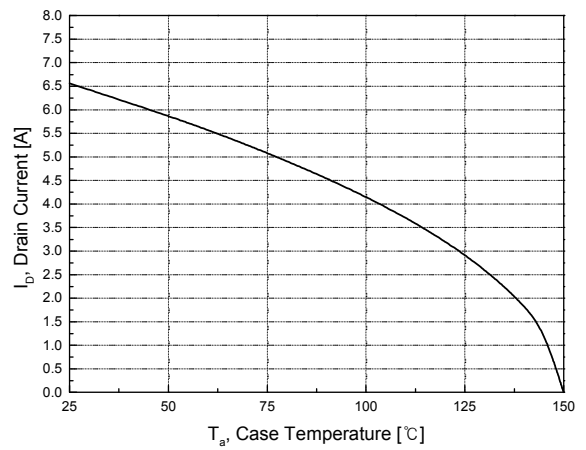


Fig.10 Maximum Drain Current Vs. Case Temperature

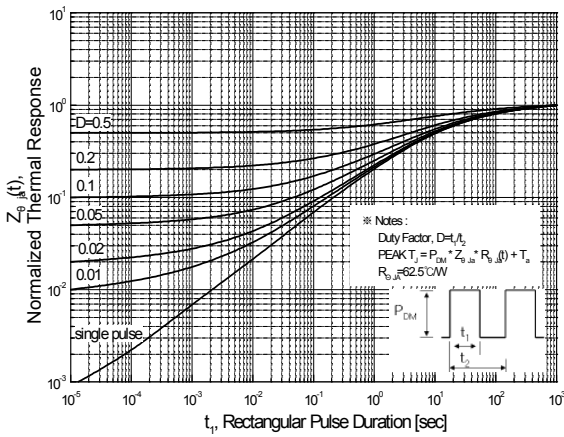


Fig.11 Transient Thermal Response Curve

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

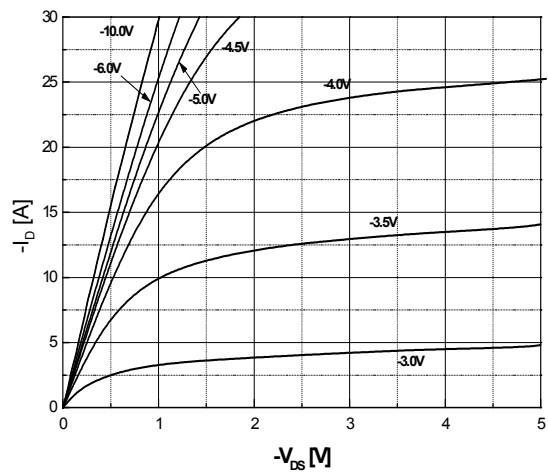


Fig.1 On-Region Characteristics

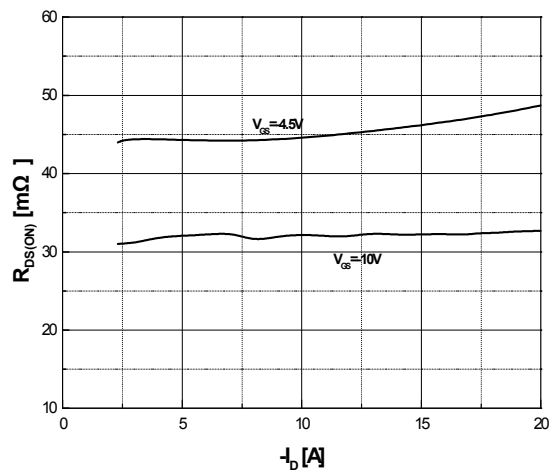


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

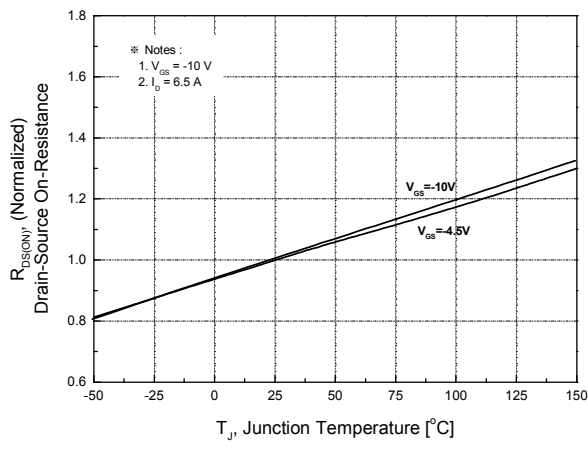


Fig.3 On-Resistance Variation with Temperature

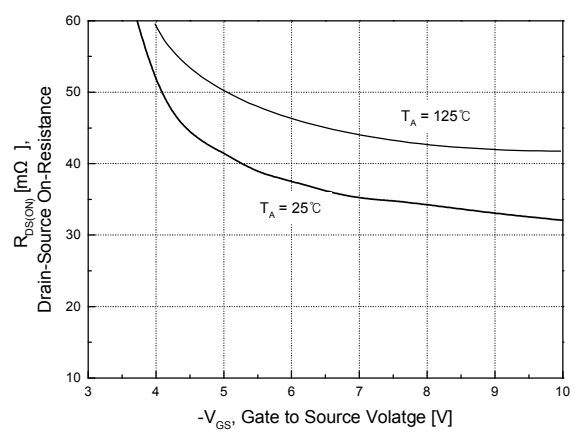


Fig.4 On-Resistance Variation with Gate to Source Voltage

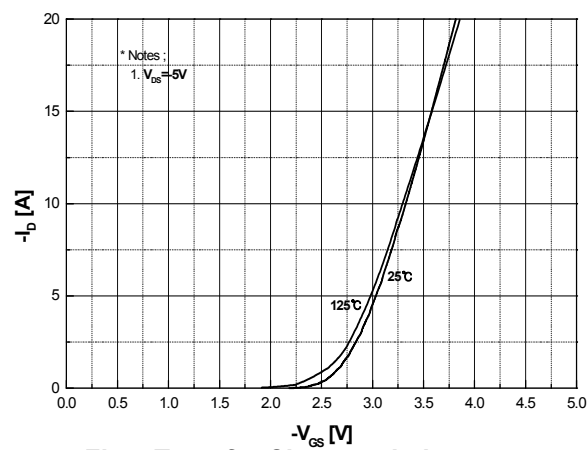


Fig.5 Transfer Characteristics

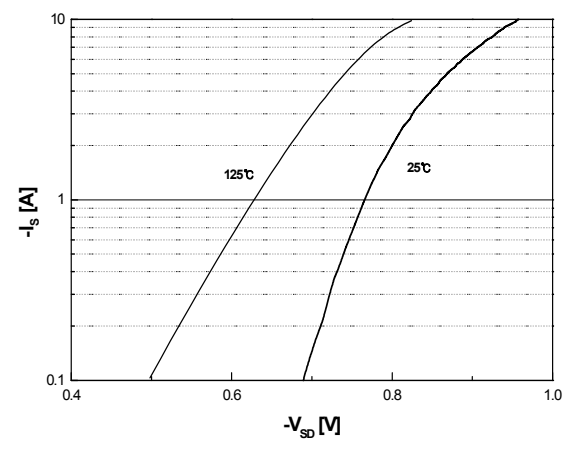


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

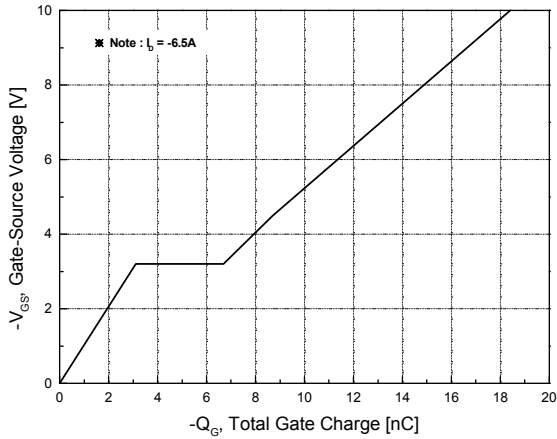


Fig.7 Gate Charge Characteristics

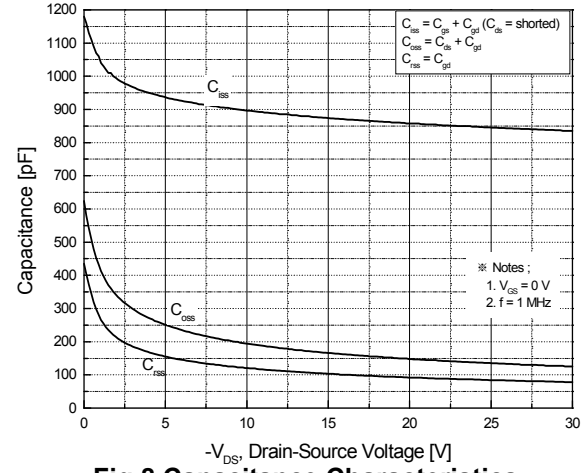


Fig.8 Capacitance Characteristics

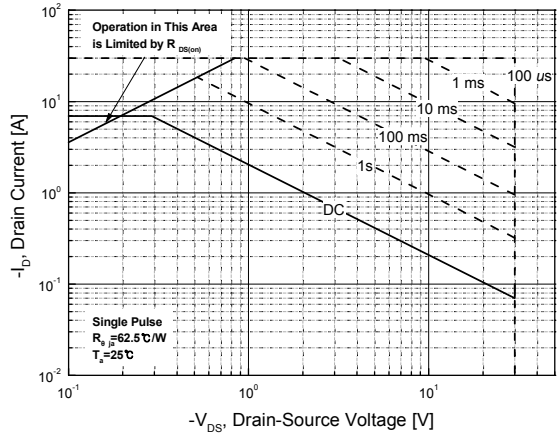


Fig.9 Maximum Safe Operating Area

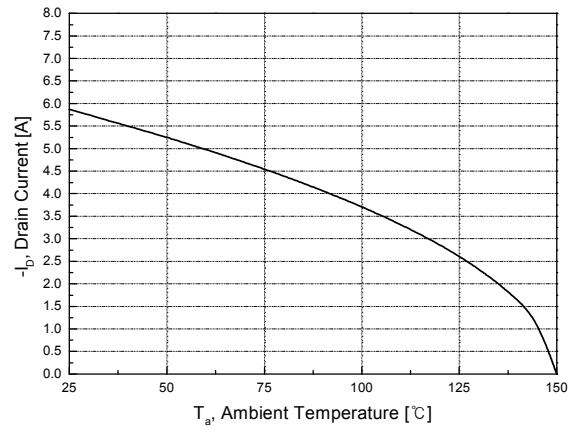


Fig.10 Maximum Drain Current vs. Case Temperature

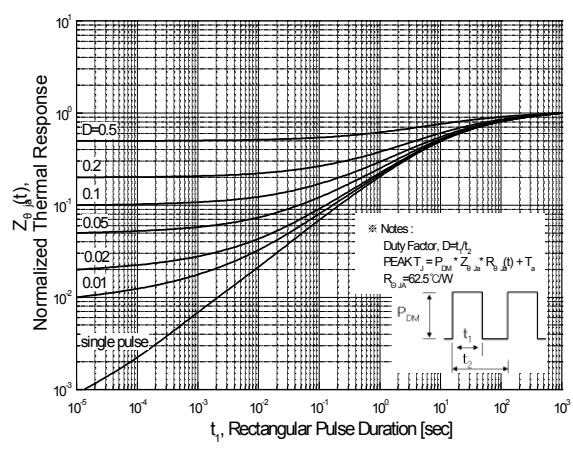
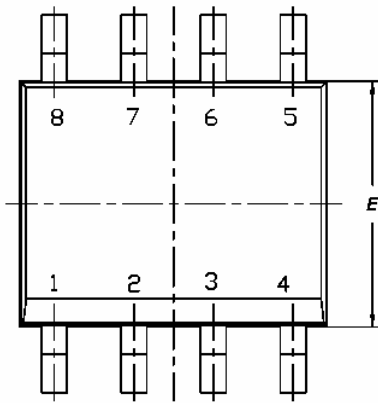


Fig.11 Transient Thermal Response Curve

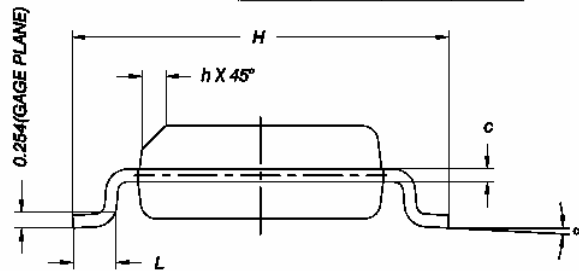
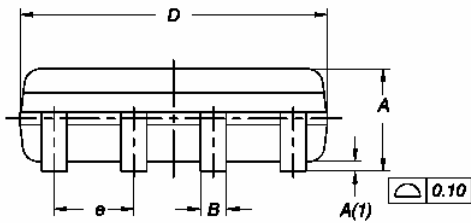
Physical Dimensions

8 Leads SOIC

Dimensions are in millimeters unless otherwise specified



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.35	1.55	1.75
A(1)	0.10	0.175	0.25
B	0.38	0.445	0.51
C	0.19	0.22	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
e	1.27 BSC		
H	5.80	6.00	6.20
L	0.50	0.715	0.93
α	0°	4°	8°
h	0.25	0.375	0.50



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