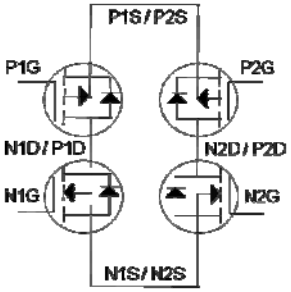
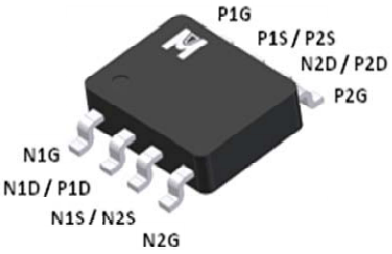
2N & 2P-Channel Logic Level Enhancement Mode Field Effect Transistor

Product Summary:

	N-CH	P-CH
BV_{DSS}	100V	-100V
$R_{DSON\ (MAX.)}$	250mΩ	300mΩ
I_D	2.2A	-1.7A





Pb-Free Lead Plating & Halogen Free

GP
GREEN PRODUCT

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS		UNIT
Gate-Source Voltage		V_{GS}	N-CH	P-CH	V
			±20	±20	
Continuous Drain Current	T_A = 25 °C	I_D	2.2	-1.7	A
	T_A = 100 °C		1.8	-1.4	
Pulsed Drain Current[1]		I_{DM}	8.8	-6.8	
Power Dissipation	T_A = 25 °C	P_D	1.38		W
	T_A = 100 °C		0.75		
Operating Junction & Storage Temperature Range		T_j, T_{stg}	-55 to 150		°C

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Case	$R_{\theta JC}$		36	°C / W
Junction-to-Ambient[3]	$R_{\theta JA}$		90	

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

[3]90°C / W when mounted on a 1 in^2 pad of 2 oz copper.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C, Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS		LIMITS MIN	LIMITS TYP	LIMITS MAX	UNIT
STATIC							
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	N-CH	100			V
		V_{GS} = 0V, I_D = -250μA	P-CH	-100			
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	N-CH	1.0	1.5	3.0	
		V_{DS} = V_{GS}, I_D = -250μA	P-CH	-1.0	-1.5	-3.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V	N-CH			±100	nA
		V_{DS} = 0V, V_{GS} = ±20V	P-CH			±100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 80V, V_{GS} = 0V	N-CH			1	μA
		V_{DS} = -80V, V_{GS} = 0V	P-CH			-1	
		V_{DS} = 70V, V_{GS} = 0V, T_J = 125 °C	N-CH			25	
		V_{DS} = -70V, V_{GS} = 0V, T_J = 125 °C	P-CH			-25	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = 5V, V_{GS} = 10V	N-CH	2.2			A
		V_{DS} = -5V, V_{GS} = -10V	P-CH	-1.7			
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 2.2A	N-CH		210	250	mΩ
		V_{GS} = -10V, I_D = -1.7A	P-CH		250	300	
		V_{GS} = 4.5V, I_D = 1.2A	N-CH		250	300	
		V_{GS} = -4.5V, I_D = -1.0A	P-CH		290	350	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 2.2A	N-CH		4		S
		V_{DS} = -5V, I_D = -1.7A	P-CH		3		
DYNAMIC							
Input Capacitance	C_{iss}	N-CH V_{GS} = 0V, V_{DS} = 25V, f = 1MHz P-CH V_{GS} = 0V, V_{DS} = -25V, f = 1MHz	N-CH		858		pF
			P-CH		1784		
Output Capacitance	C_{oss}		N-CH		38		
			P-CH		54		
Reverse Transfer Capacitance	C_{rss}		N-CH		27		
			P-CH		45		

Total Gate Charge[1,2]	Q_g	N-CH V_{DS} = 50V, V_{GS} = 10V, I_D = 2.2A P-CH V_{DS} = -50V, V_{GS} = -10V, I_D = -1.7A	N-CH		14.3		nC
			P-CH		31		
Gate-Source Charge[1,2]	Q_{gs}		N-CH		2.9		
			P-CH		6.3		
Gate-Drain Charge[1,2]	Q_{gd}		N-CH		3.4		
			P-CH		4.5		
Turn-On Delay Time[1,2]	$t_{d(on)}$	N-CH V_{DS} = 10V, I_D = 1A, V_{GS} = 10V, R_{GS} = 6Ω P-CH V_{DS} = -10V, I_D = -1A, V_{GS} = -10V, R_{GS} = 6Ω	N-CH		20		nS
			P-CH		12		
Rise Time[1,2]	t_r		N-CH		40		
			P-CH		55		
Turn-Off Delay Time[1,2]	$t_{d(off)}$		N-CH		36		
			P-CH		40		
Fall Time[1,2]	t_f		N-CH		30		
			P-CH		40		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25 °C)							
Continuous Current	I_S		N-CH			1.5	A
			P-CH			-1.5	
Pulsed Current[3]	I_{SM}		N-CH			6	
			P-CH			-6	
Forward Voltage[1]	V_{SD}	I_F = I_S, V_{GS} = 0V	N-CH			1.2	V
			P-CH			-1.2	

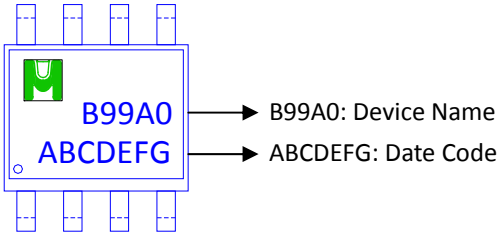
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

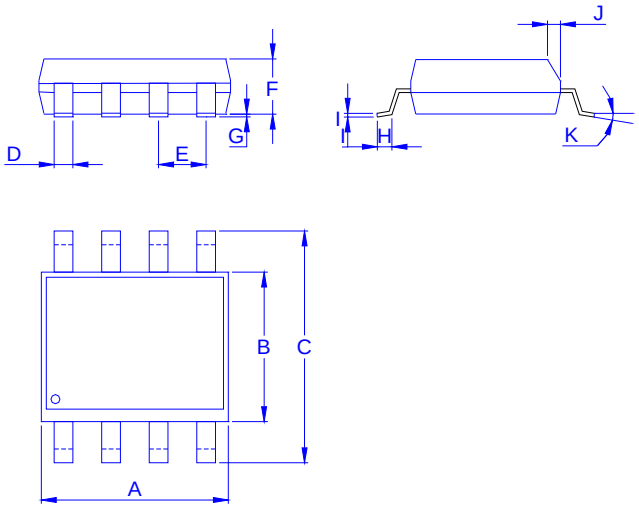
[3]Pulse width limited by maximum junction temperature.

Ordering & Marking Information:

Device Name: EMB99A0G for SOP-8



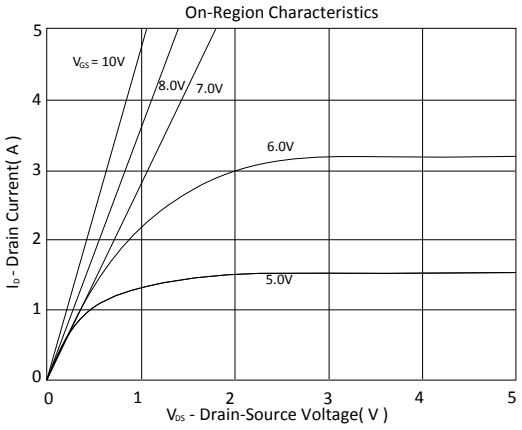
Outline Drawing

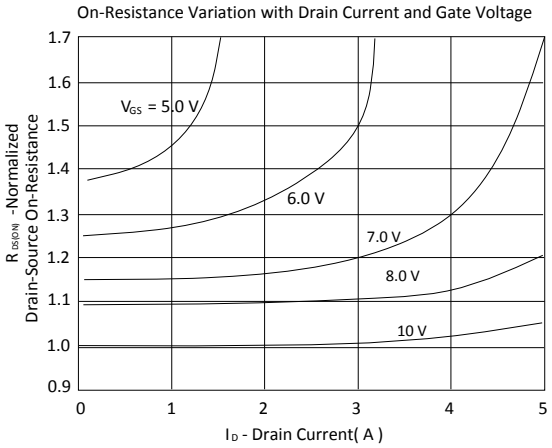


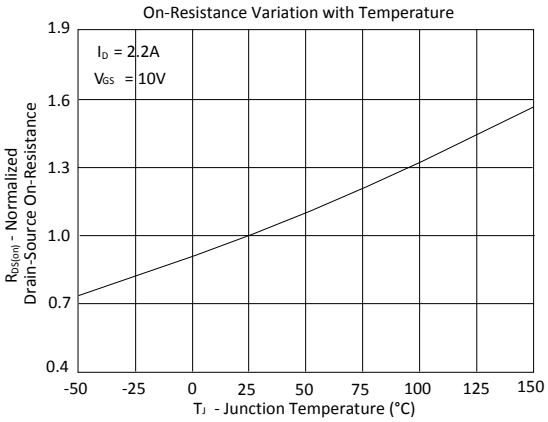
Dimension in mm

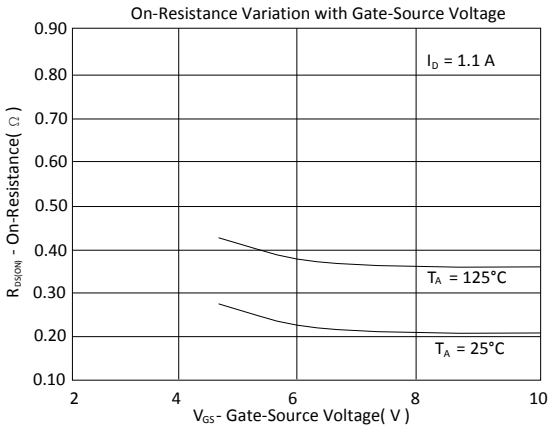
Dimension	A	B	C	D	E	F	G	H	I	J	K
Min.	4.70	3.70	5.80	0.33		1.20	0.08	0.40	0.19	0.25	0°
Typ.					1.27						
Max.	5.10	4.10	6.20	0.51		1.62	0.28	0.83	0.26	0.50	8°

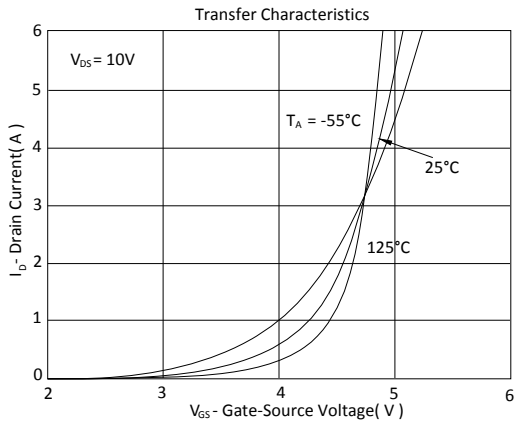
N-Channel

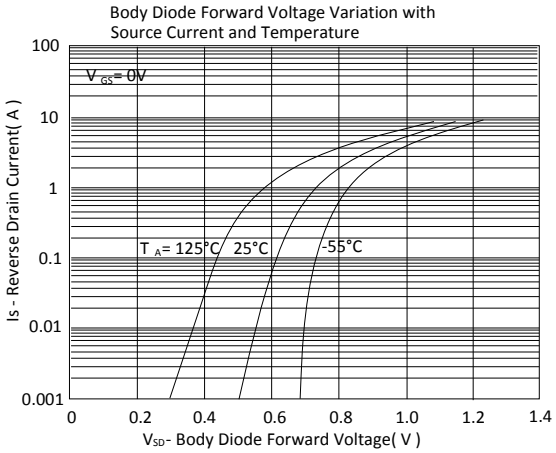

On-Region Characteristics
V_{GS} = 10V
8.0V
7.0V
6.0V
5.0V
I_D - Drain Current(A)
V_{DS} - Drain-Source Voltage(V)


On-Resistance Variation with Drain Current and Gate Voltage
V_{GS} = 5.0 V
6.0 V
7.0 V
8.0 V
10 V
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
I_D - Drain Current(A)

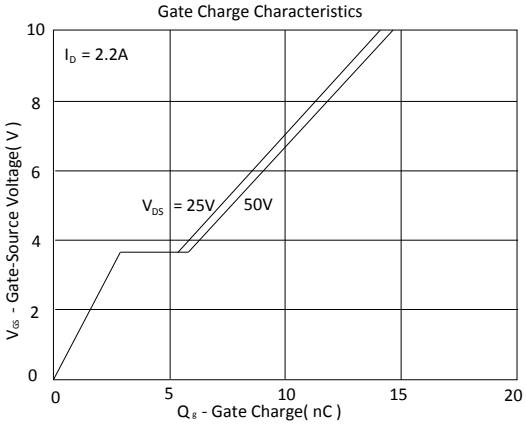

On-Resistance Variation with Temperature
I_D = 2.2A
V_{GS} = 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
T_J - Junction Temperature (°C)


On-Resistance Variation with Gate-Source Voltage
I_D = 1.1 A
T_A = 125°C
T_A = 25°C
$R_{DS(ON)}$ - On-Resistance(Ω)
V_{GS} - Gate-Source Voltage(V)

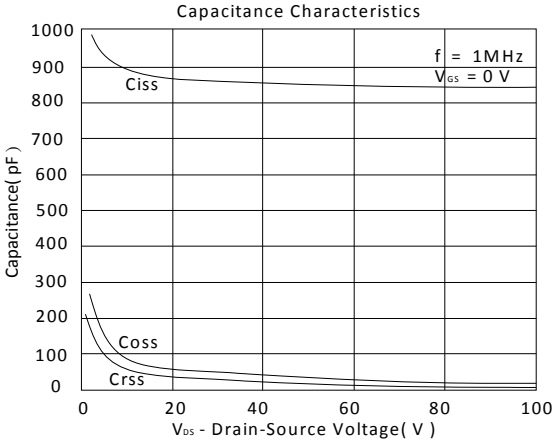

Transfer Characteristics
V_{DS} = 10V
T_A = -55°C
25°C
125°C
I_D - Drain Current(A)
V_{GS} - Gate-Source Voltage(V)


Body Diode Forward Voltage Variation with
Source Current and Temperature
V_{GS} = 0V
T_A = 125°C
25°C
-55°C
Is - Reverse Drain Current(A)
V_{SD} - Body Diode Forward Voltage(V)

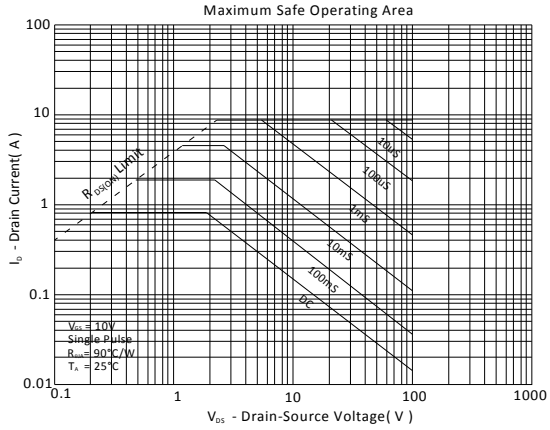
Gate Charge Characteristics



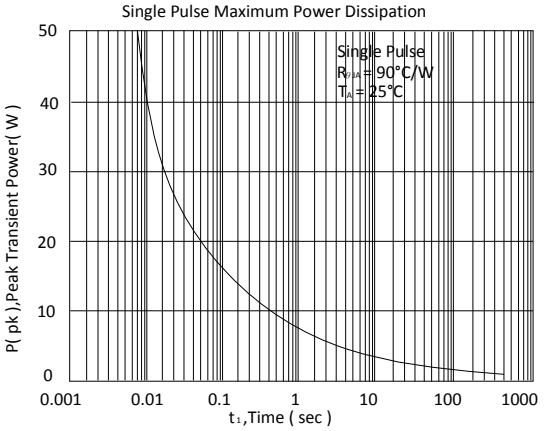
Capacitance Characteristics



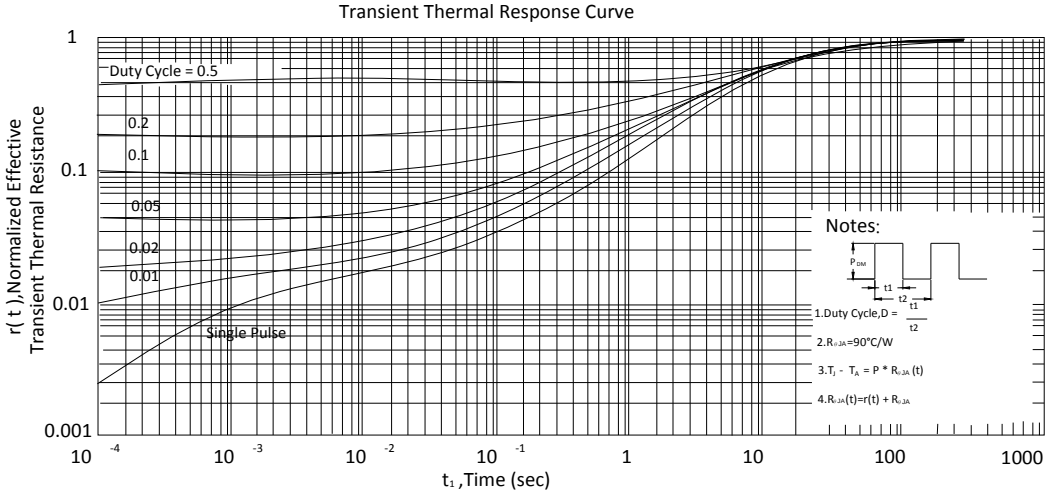
Maximum Safe Operating Area



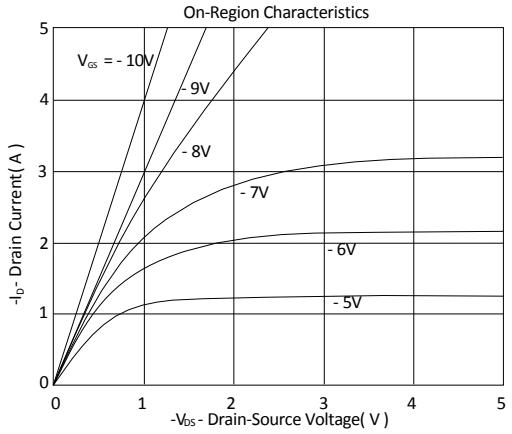
Single Pulse Maximum Power Dissipation

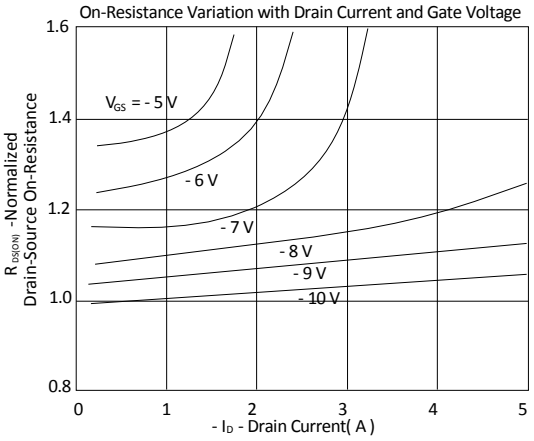


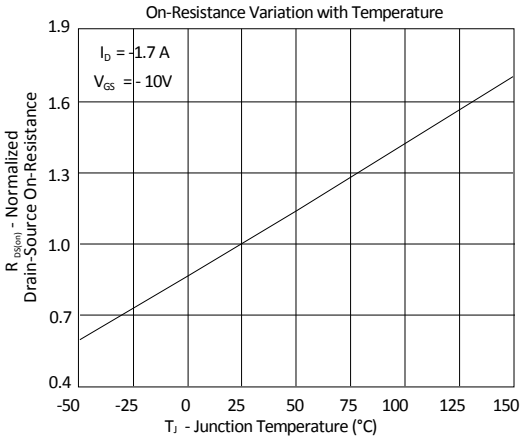
Transient Thermal Response Curve

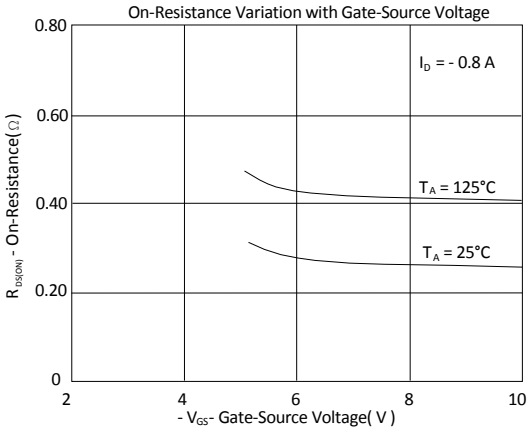


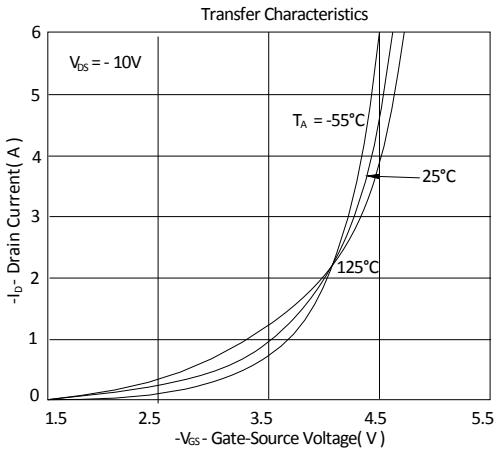
P-Channel

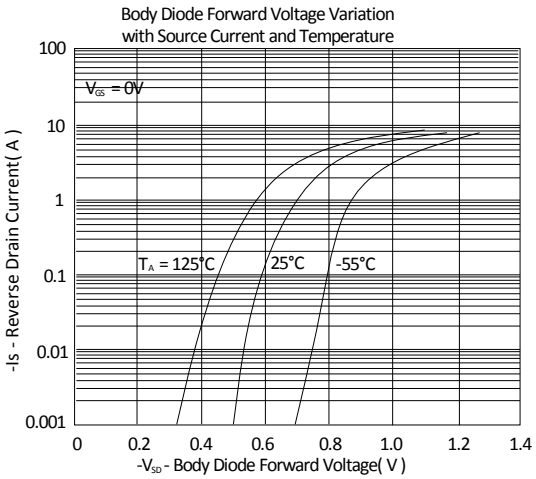

On-Region Characteristics
V_{GS} = - 10V
- 9V
- 8V
- 7V
- 6V
- 5V
$-I_D$ - Drain Current(A)
$-V_{DS}$ - Drain-Source Voltage(V)

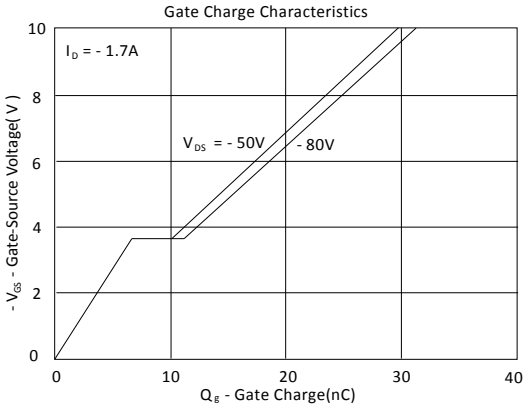

On-Resistance Variation with Drain Current and Gate Voltage
V_{GS} = - 5 V
- 6 V
- 7 V
- 8 V
- 9 V
- 10 V
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
- I_D - Drain Current(A)

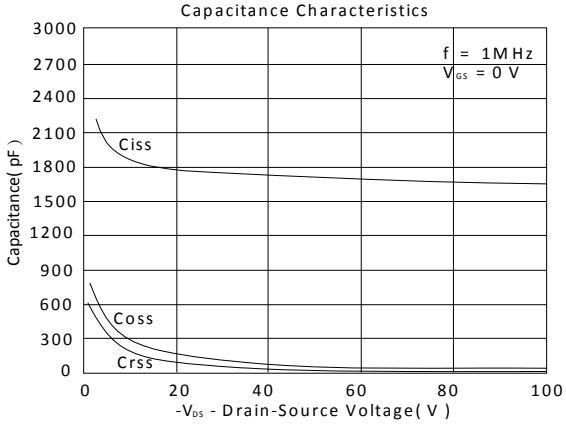

On-Resistance Variation with Temperature
I_D = -1.7 A
V_{GS} = - 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
T_J - Junction Temperature (°C)

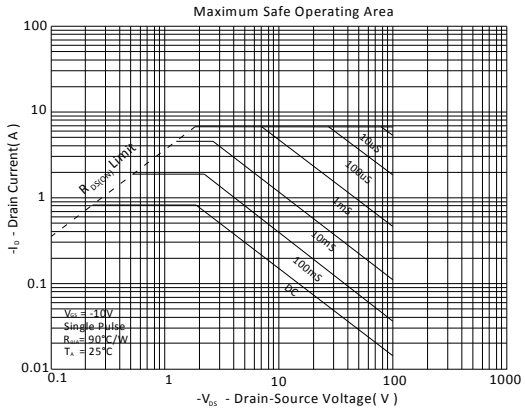

On-Resistance Variation with Gate-Source Voltage
I_D = - 0.8 A
T_A = 125°C
T_A = 25°C
$R_{DS(ON)}$ - On-Resistance(Ω)
- V_{GS} - Gate-Source Voltage(V)

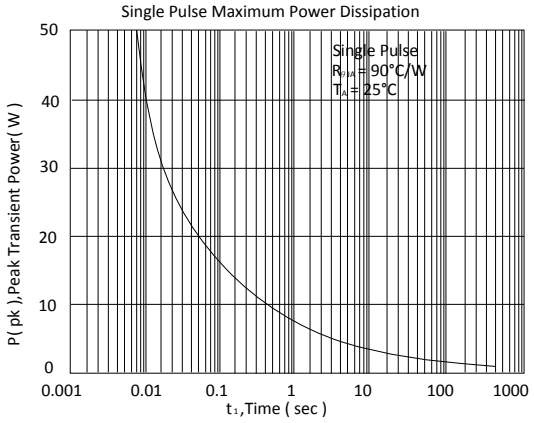

Transfer Characteristics
V_{DS} = - 10V
T_A = -55°C
25°C
125°C
$-I_D$ - Drain Current(A)
$-V_{GS}$ - Gate-Source Voltage(V)

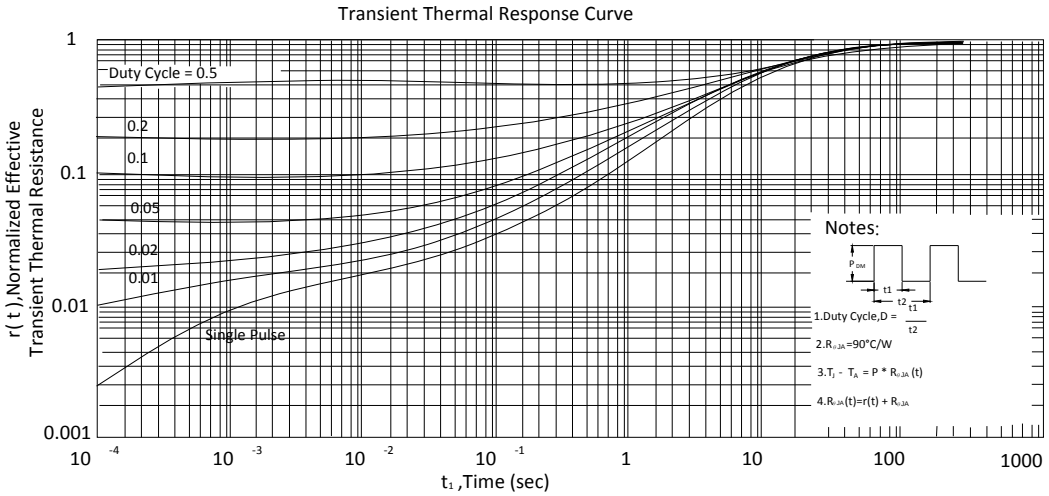

Body Diode Forward Voltage Variation
with Source Current and Temperature
V_{GS} = 0V
T_A = 125°C
25°C
-55°C
-Is - Reverse Drain Current(A)
$-V_{SD}$ - Body Diode Forward Voltage(V)


Gate Charge Characteristics
I D = - 1.7A
V DS = - 50V
- 80V
- V GS - Gate-Source Voltage(V)
Q g - Gate Charge(nC)


Capacitance Characteristics
f = 1MHz
V GS = 0 V
Ciss
Coss
Crss
Capacitance(pF)
-V DS - Drain-Source Voltage(V)


Maximum Safe Operating Area
R DS(ON) Limit
10ms
100ms
1s
10s
100s
DC
V GS = -10V
Single Pulse
R θJA = 90°C/W
T A = 25°C
-I D - Drain Current(A)
-V DS - Drain-Source Voltage(V)


Single Pulse Maximum Power Dissipation
Single Pulse
R θJA = 90°C/W
T A = 25°C
P(pk),Peak Transient Power(W)
t 1 ,Time (sec)


Transient Thermal Response Curve
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Notes:
1.Duty Cycle,D = t1/t2
2.R θJA =90°C/W
3.T J - T A = P * R θJA (t)
4.R θJA (t)=r(t) + R θJA
r(t),Normalized Effective Transient Thermal Resistance
t 1 ,Time (sec)