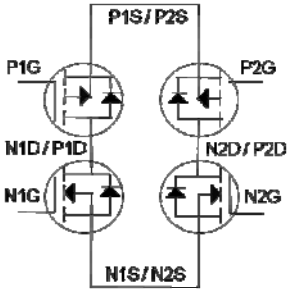
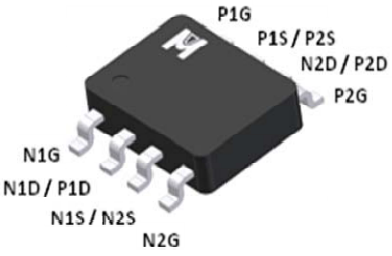
2N & 2P-Channel Logic Level Enhancement Mode Field Effect Transistor

Product Summary:

	N-CH	P-CH
BV_{DSS}	30V	-30V
$R_{DSON\ (MAX.)}$	40mΩ	45mΩ
I_D	5.5A	-4.5A





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	5.5	-4.5	A
	T_A = 100 °C		4.6	-3.8	
Pulsed Drain Current[1]		I_{DM}	22	-18	
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			UNIT
				MIN	TYP	MAX	
STATIC							
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	N-CH	30			V
		V_{GS} = 0V, I_D = -250μA	P-CH	-30			
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} = 24V, V_{GS} = 0V	N-CH			1	μA
		V_{DS} = -24V, V_{GS} = 0V	P-CH			-1	
		V_{DS} = 20V, V_{GS} = 0V, T_J = 125 °C	N-CH			25	
		V_{DS} = -20V, 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	5.5			A
		V_{DS} = -5V, V_{GS} = -10V	P-CH	-4.5			
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 5.5A	N-CH		35	40	mΩ
		V_{GS} = -10V, I_D = -4.5A	P-CH		39	45	
		V_{GS} = 4.5V, I_D = 3.5A	N-CH		50	62	
		V_{GS} = -4.5V, I_D = -3A	P-CH		65	80	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 5.5A	N-CH		6		S
		V_{DS} = -5V, I_D = -4.5A	P-CH		5		
DYNAMIC							
Input Capacitance	C_{iss}	N-CH	N-CH		323		pF
		V_{GS} = 0V, V_{DS} = 15V, f = 1MHz	P-CH		820		
Output Capacitance	C_{oss}	P-CH	N-CH		75		
		V_{GS} = 0V, V_{DS} = -15V, f = 1MHz	P-CH		122		
Reverse Transfer Capacitance	C_{rss}		N-CH		53		
			P-CH		97		

Total Gate Charge[1,2]	Q_g	N-CH V_{DS} = 15V, V_{GS} = 10V, I_D = 6.5A P-CH V_{DS} = -15V, V_{GS} = -10V, I_D = -6A	N-CH		7.1		nC
			P-CH		9		
Gate-Source Charge[1,2]	Q_{gs}		N-CH		1.1		
			P-CH		2.2		
Gate-Drain Charge[1,2]	Q_{gd}		N-CH		2.1		
			P-CH		2.5		
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		8		nS
			P-CH		12		
Rise Time[1,2]	t_r		N-CH		12		
			P-CH		16		
Turn-Off Delay Time[1,2]	$t_{d(off)}$		N-CH		28		
			P-CH		34		
Fall Time[1,2]	t_f		N-CH		15		
			P-CH		20		
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	

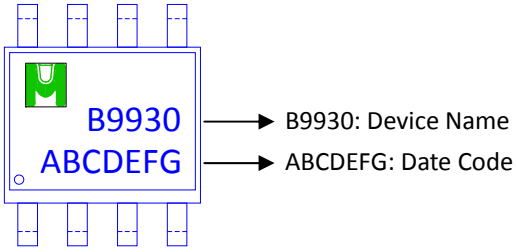
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

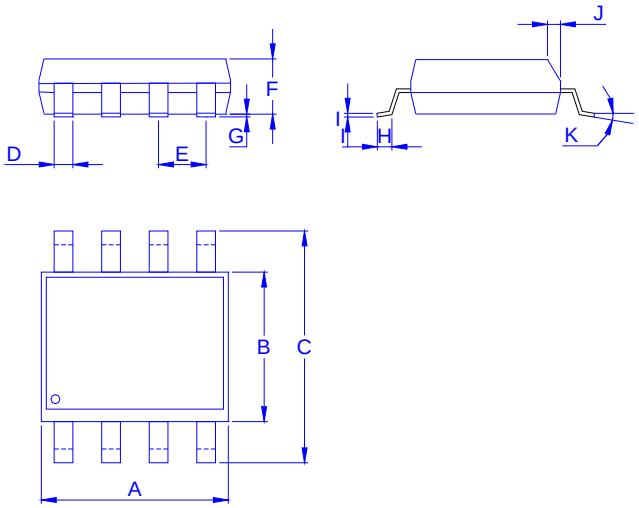
[3]Pulse width limited by maximum junction temperature.

Ordering & Marking Information:

Device Name: EMB9930G for SOP-8



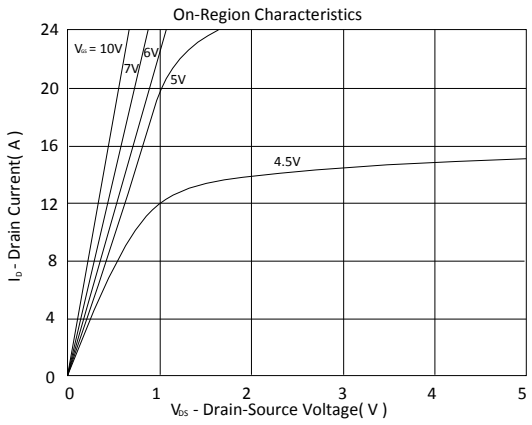
Outline Drawing

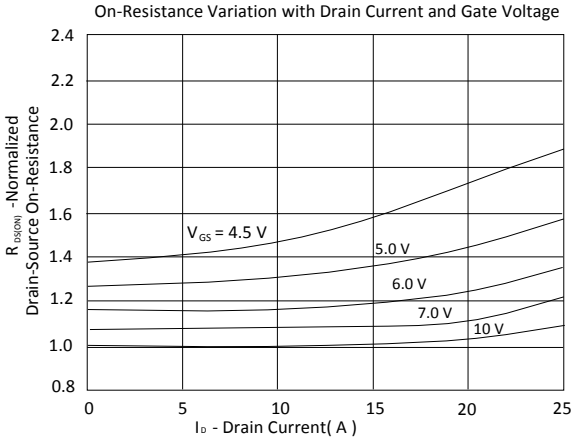


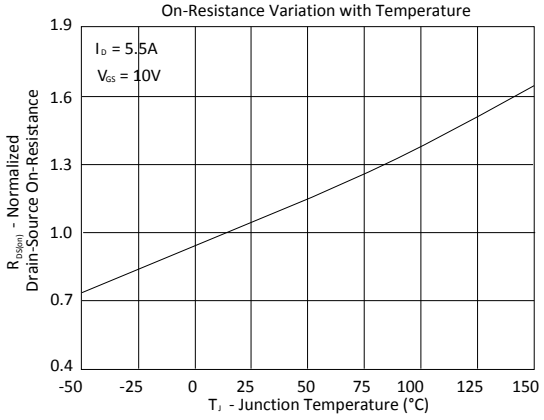
Dimension in mm

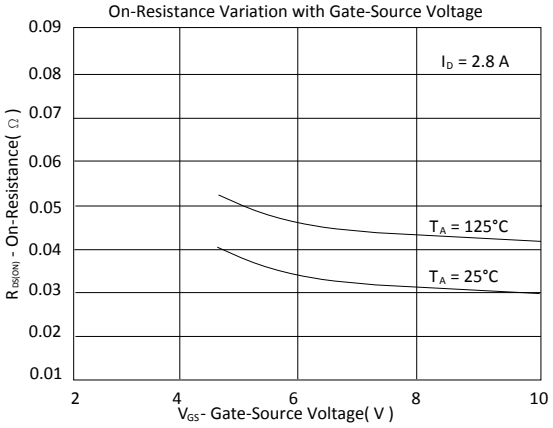
Dimension	A	B	C	D	E	F	G	H	I	J	K
Min.	4.70	3.70	5.80	0.33		1.20	0.08	0.40	0.19	0.25	0°
Typ.					1.27						
Max.	5.10	4.10	6.20	0.51		1.62	0.28	0.83	0.26	0.50	8°

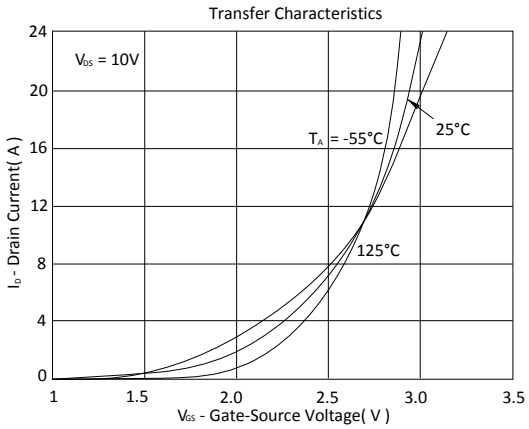
N-Channel

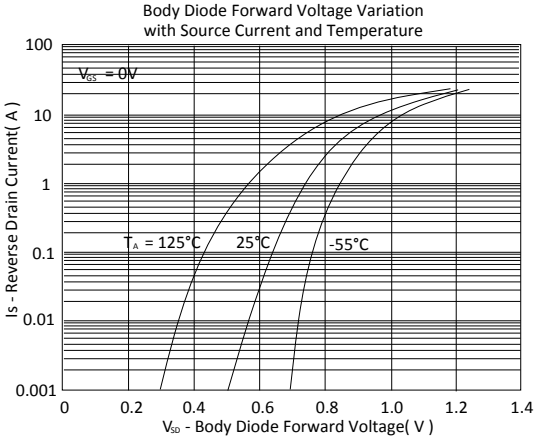

On-Region Characteristics
V_{GS} = 10V
7V
6V
5V
4.5V
I_D - Drain Current(A)
V_{DS} - Drain-Source Voltage(V)


On-Resistance Variation with Drain Current and Gate Voltage
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
V_{GS} = 4.5 V
5.0 V
6.0 V
7.0 V
10 V
I_D - Drain Current(A)

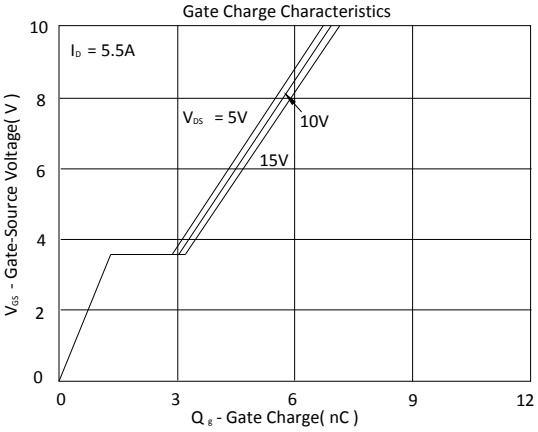

On-Resistance Variation with Temperature
I_D = 5.5A
V_{GS} = 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
T_J - Junction Temperature (°C)


On-Resistance Variation with Gate-Source Voltage
I_D = 2.8 A
T_A = 125°C
T_A = 25°C
$R_{DS(ON)}$ - On-Resistance(Ω)
V_{GS}- Gate-Source Voltage(V)

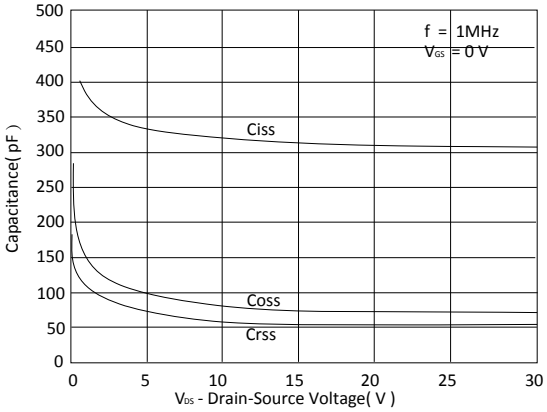

Transfer Characteristics
V_{DS} = 10V
T_A = -55°C
25°C
125°C
I_D - Drain Current(A)
V_{GS} - Gate-Source Voltage(V)


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)

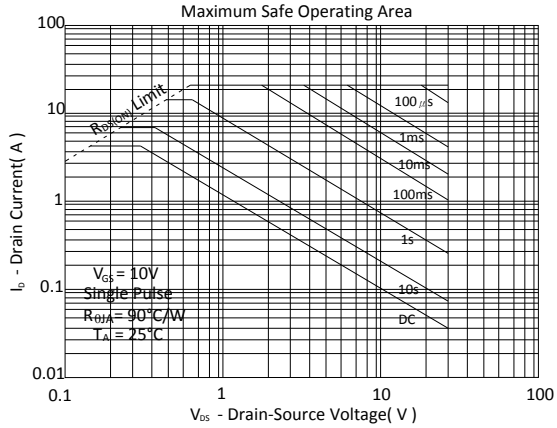
Gate Charge Characteristics



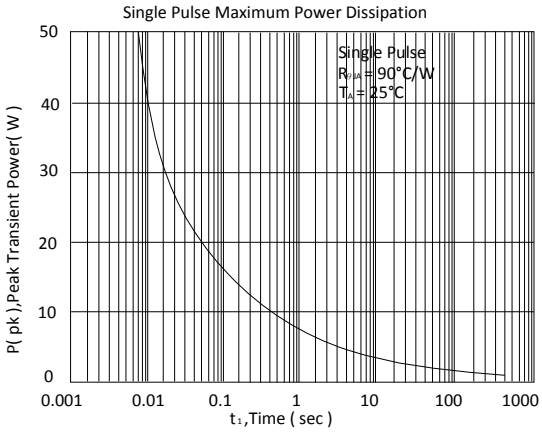
Capacitance Characteristics



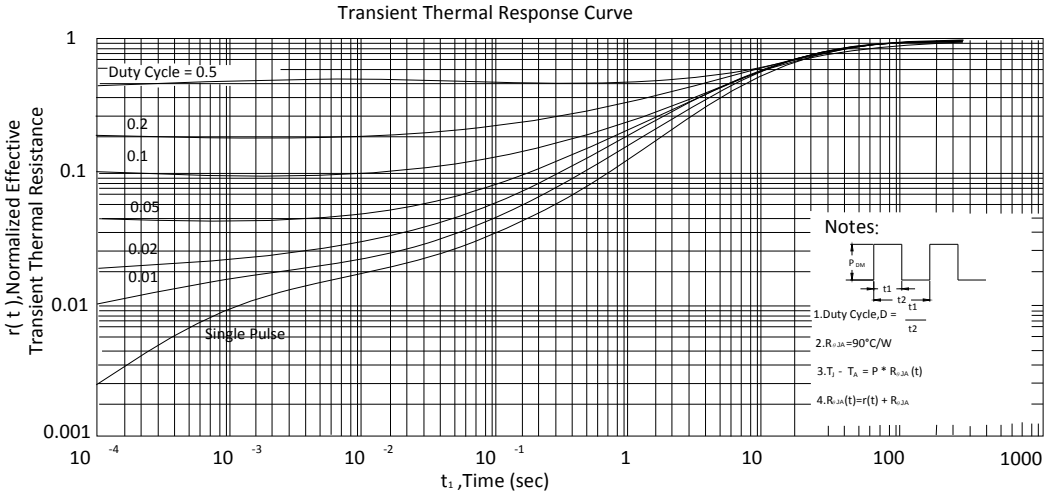
Maximum Safe Operating Area



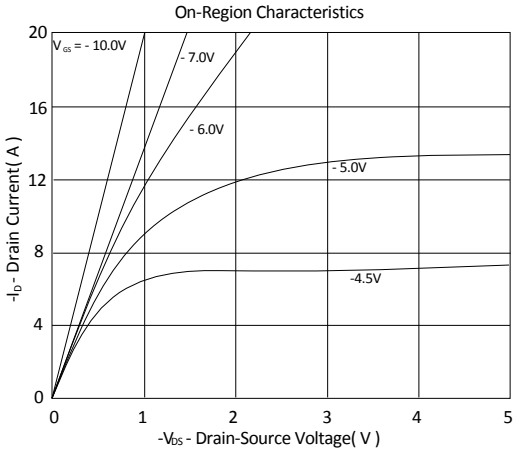
Single Pulse Maximum Power Dissipation

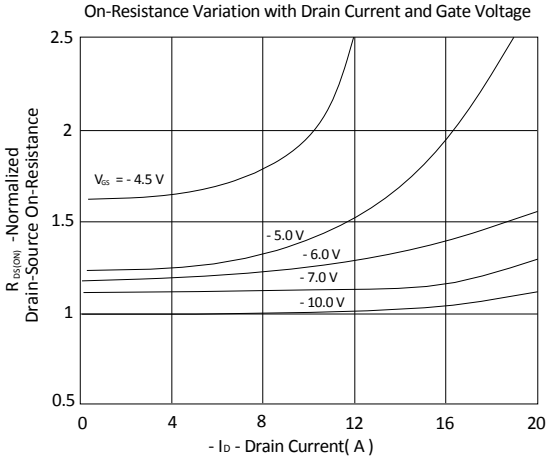


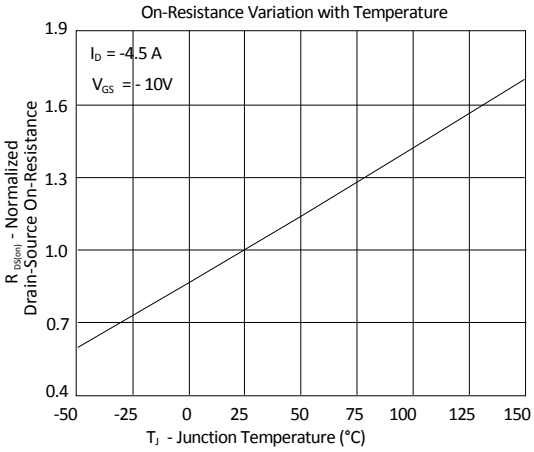
Transient Thermal Response Curve

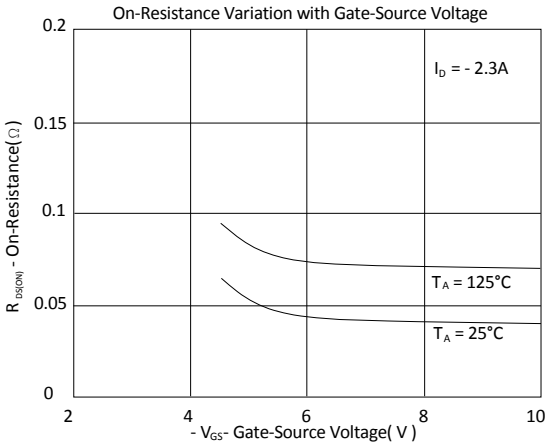


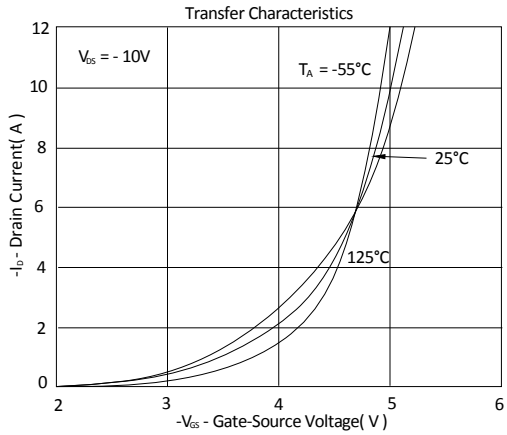
P-Channel

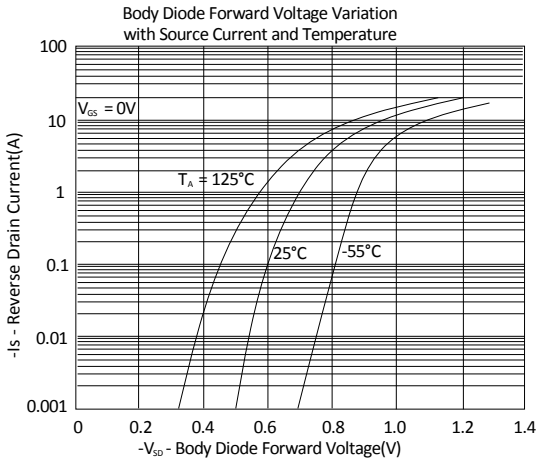

On-Region Characteristics
V_{GS} = - 10.0V
- 7.0V
- 6.0V
- 5.0V
-4.5V
$-I_D$ - Drain Current(A)
$-V_{DS}$ - Drain-Source Voltage(V)


On-Resistance Variation with Drain Current and Gate Voltage
V_{GS} = - 4.5 V
- 5.0 V
- 6.0 V
- 7.0 V
- 10.0 V
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
- I_D - Drain Current(A)

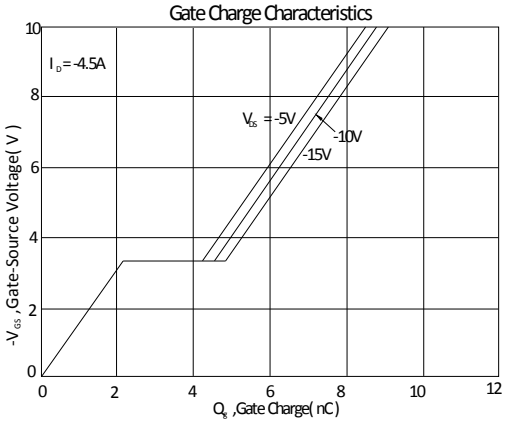

On-Resistance Variation with Temperature
I_D = -4.5 A
V_{GS} = - 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
T_J - Junction Temperature (°C)


On-Resistance Variation with Gate-Source Voltage
I_D = - 2.3A
T_A = 125°C
T_A = 25°C
$R_{DS(ON)}$ - On-Resistance(Ω)
- V_{GS}- Gate-Source Voltage(V)

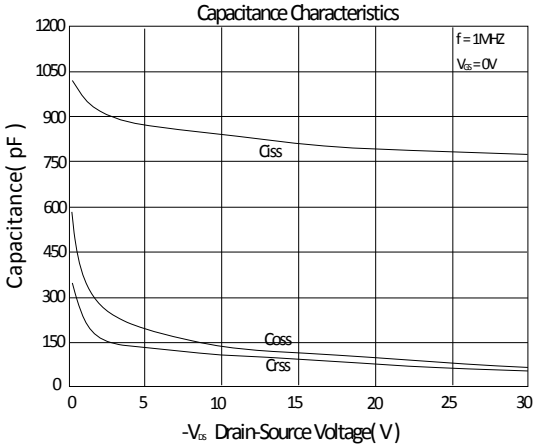

Transfer Characteristics
V_{DS} = - 10V
T_A = -55°C
25°C
125°C
$-I_D$ - Drain Current(A)
$-V_{GS}$ - Gate-Source Voltage(V)


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

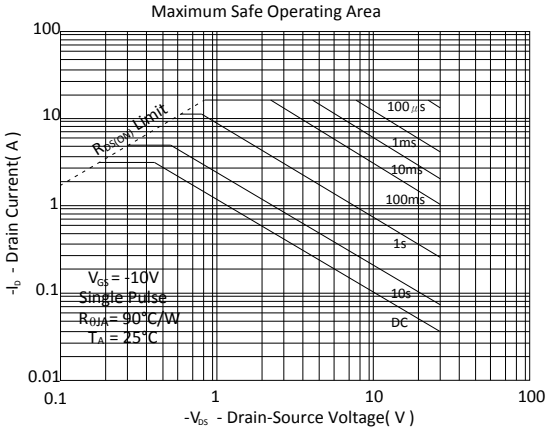
Gate Charge Characteristics



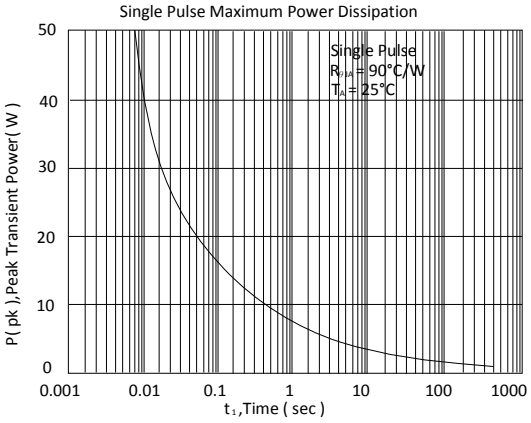
Capacitance Characteristics



Maximum Safe Operating Area



Single Pulse Maximum Power Dissipation



Transient Thermal Response Curve