杰力科技股份有限公司
Excelliance MOS Corporation

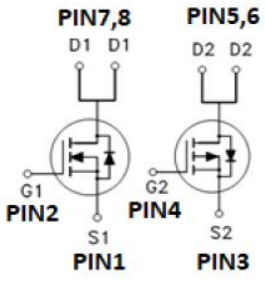
EMF20C02G

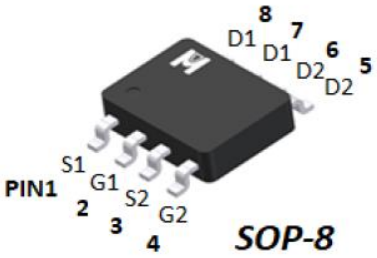
N-Channel + P-Channel Logic Level Enhancement Mode Field Effect Transistor

▪Product Summary:

	N-CH	P-CH
BV_{DSS}	20V	-20V
$R_{DSON\ (MAX.)}$@V_{GS}=4.5V	20mΩ	78mΩ
$R_{DSON\ (MAX.)}$@V_{GS}=2.5V	30mΩ	105mΩ
I_D @T_C=25°C	13A	-5A
I_D @T_A=25°C	6A	-3A

▪ Pin Description:





N + P Channel MOSFET
UIS, Rg 100% Tested
RoHS & Halogen Free & TSCA Compliant

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

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS		UNIT
			N-CH	P-CH	
Gate-Source Voltage		V_{GS}	±12	±12	V
Continuous Drain Current	T_C = 25 °C	I_D	13	-5	A
	T_C = 100 °C		8	-3	
Continuous Drain Current	T_A = 25 °C	I_D	6	-3	
	T_A = 70 °C		5	-2	
Pulsed Drain Current[1]		I_{DM}	22	-10	
Avalanche Current		I_{AS}	21	-16	
Avalanche Energy	L = 0.1mH	EAS	22	12.8	mJ
Repetitive Avalanche Energy[2]	L = 0.05mH	EAR	11	6.4	
Power Dissipation	T_C = 25 °C	P_D	6	4.6	W
	T_C = 100 °C		2.4	1.9	
Power Dissipation	T_A = 25 °C	P_D	1.3	1.5	W
	T_A = 70 °C		0.8	1	
Operating Junction & Storage Temperature Range		T_j, T_{stg}	-55 to 150		°C

▪ 100% UIS testing in condition of VD=25V, L=0.1mH, VG=4.5V, IL= 13A, Rated VDS=20V N-CH

▪ 100% UIS testing in condition of VD=25V, L=0.1mH, VG=4.5V, IL= 10A, Rated VDS=20V P-CH

▪THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE		SYMBOL	TYPICAL	MAXIMUM		UNIT
				N-CH	P-CH	
Junction-to-Case		$R_{\theta JC}$		21	27	°C/W
Junction-to-Ambient[3,4]	t≦10s	$R_{\theta JA}$		76	65	
	Steady-State	$R_{\theta JA}$		95	81	

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle < 1%

[3]The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C.

[4]Guarantee by Engineering test

▪ **N-CH_ELECTRICAL CHARACTERISTICS (T_J = 25 °C, Unless Otherwise Noted)**

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
STATIC						
Drain-Source Breakdown Voltage[4]	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	20			V
Gate Threshold Voltage[4]	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	0.45	0.7	1.2	
Gate-Body Leakage[4]	I_{GSS}	V_{DS} = 0V, V_{GS} = ±12V			±100	nA
Zero Gate Voltage Drain Current[4]	I_{DSS}	V_{DS} = 16V, V_{GS} = 0V			1	μA
		V_{DS} =16V, V_{GS} =0V, T_J = 125 °C			25	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = 5V, V_{GS} = 4.5V	13			A
Drain-Source On-State Resistance[1,4]	$R_{DS(ON)}$	V_{GS} = 4.5V, I_D = 6A		15	20	mΩ
		V_{GS} = 2.5V, I_D = 4A		21	30	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 6A		7		S
DYNAMIC						
Input Capacitance[5]	C_{iss}	V_{GS} = 0V, V_{DS} = 10V, f = 1MHz		711		pF
Output Capacitance[5]	C_{oss}			114		
Reverse Transfer Capacitance[5]	C_{rss}			101		
Gate Resistance[4,5]	R_g	f = 1MHz		1.5		Ω
Total Gate Charge[1,2,5]	Q_g	V_{DS} = 10V, V_{GS} = 4.5V, I_D = 5A		11		nC
Gate-Source Charge[1,2,5]	Q_{gs}			1.5		
Gate-Drain Charge[1,2,5]	Q_{gd}			3.1		
Turn-On Delay Time[1,2,5]	$t_{d(on)}$	V_{DS} = 10V, V_{GS} = 10V, I_D = 5A , Rg = 3Ω		8.7		nS
Rise Time[1,2,5]	t_r			22		
Turn-Off Delay Time[1,2,5]	$t_{d(off)}$			32		
Fall Time[1,2,5]	t_f			29.4		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Continuous Current	I_S				13	A
Pulsed Current[3]	I_{SM}				52	
Forward Voltage[1,4]	V_{SD}	I_F = I_S, V_{GS} = 0V			1.3	V
Reverse Recovery Time[5]	t_{rr}	I_F = I_S, dI_F/dt = 100A / μS		6.6		nS
Peak Reverse Recovery Current[5]	$I_{RM(REC)}$			0.37		A
Reverse Recovery Charge[5]	Q_{rr}			1.4		nC

[1]Pulse test : Pulse Width ≦ 300 usec, Duty Cycle ≦ 2%.

[2]Independent of operating temperature.

[3]Pulse width limited by maximum junction temperature.

[4]Guarantee by FT test Item

[5]Guarantee by Engineering test

EMC will review datasheet by quarter, and update new version.

▪ N-CH_TYPICAL CHARACTERISTICS

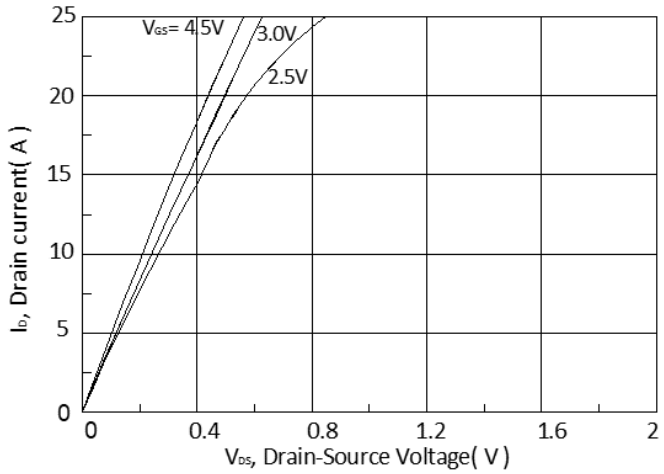


Fig.1 Typical Output Characteristics

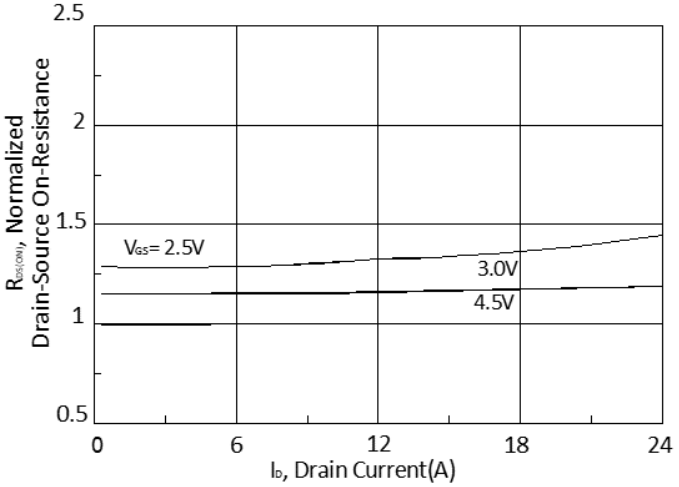


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

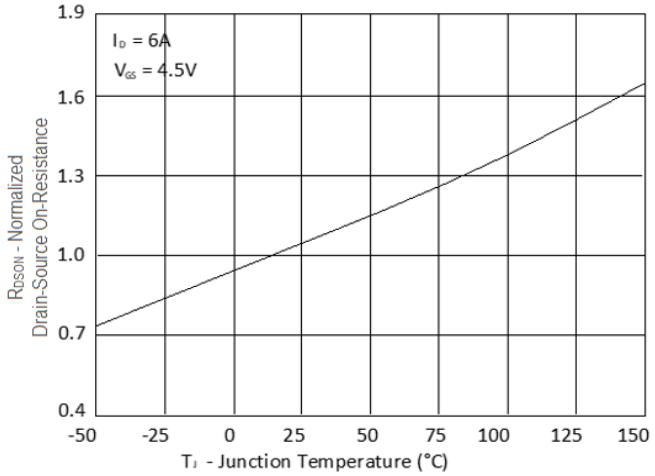


Fig.3 Normalized On-Resistance v.s. Junction Temperature

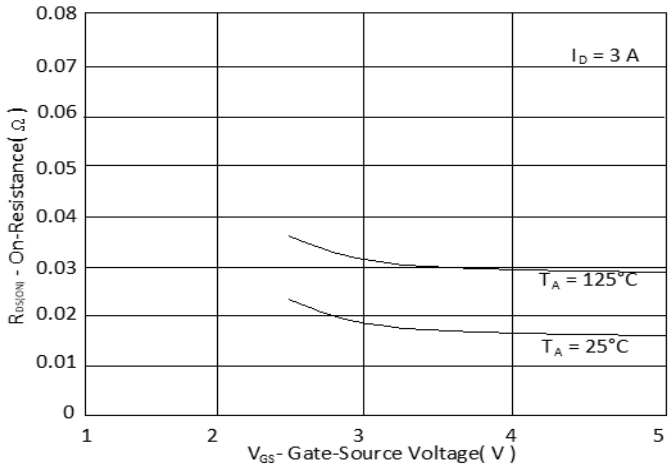


Fig.4 On-Resistance v.s. Gate Voltage

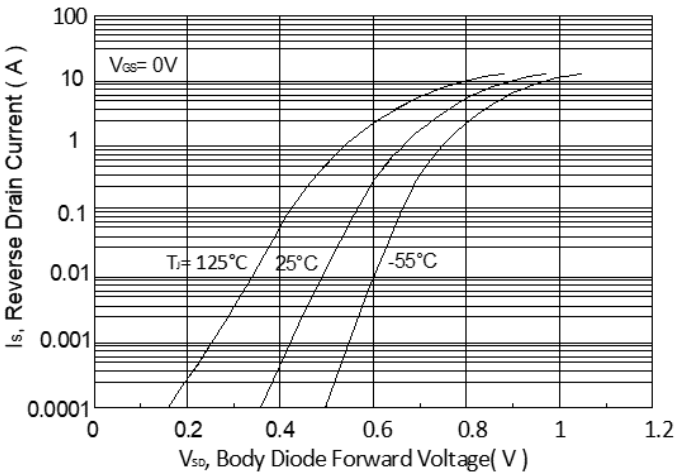


Fig.5 Forward Characteristic of Reverse Diode

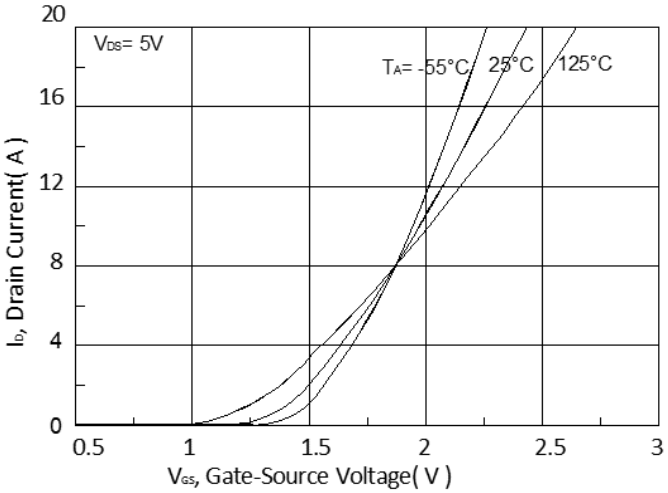


Fig.6 Transfer Characteristics

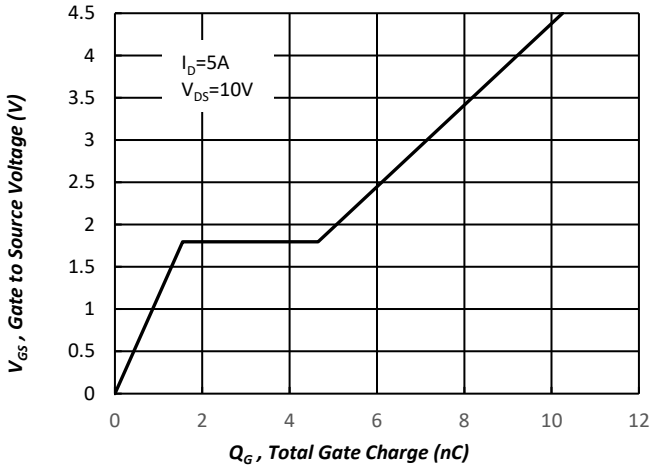


Fig.7 Gate Charge Characteristics

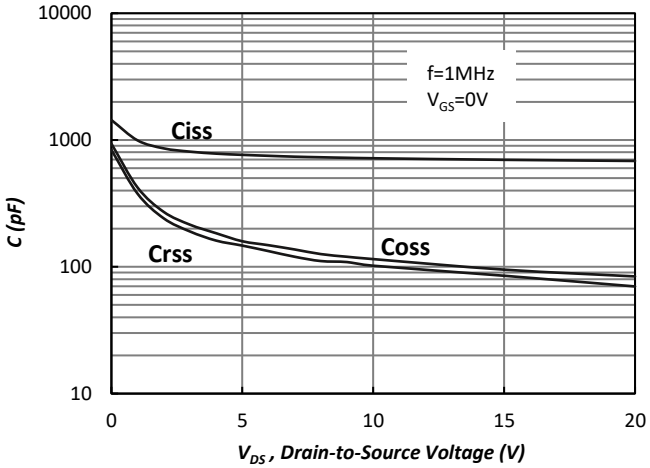


Fig.8 Typical Capacitance Characteristics

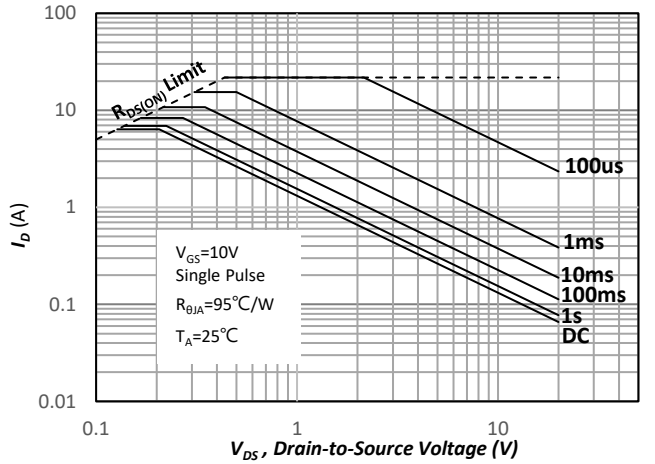


Fig 9. Maximum Safe Operating Area

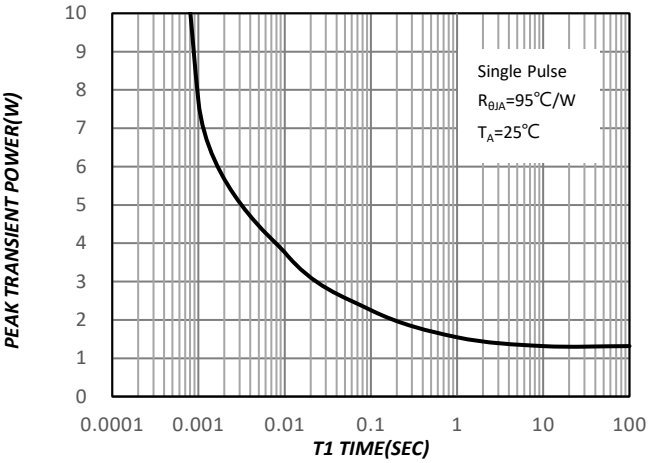


Fig 10. Single Pulse Maximum Power Dissipation

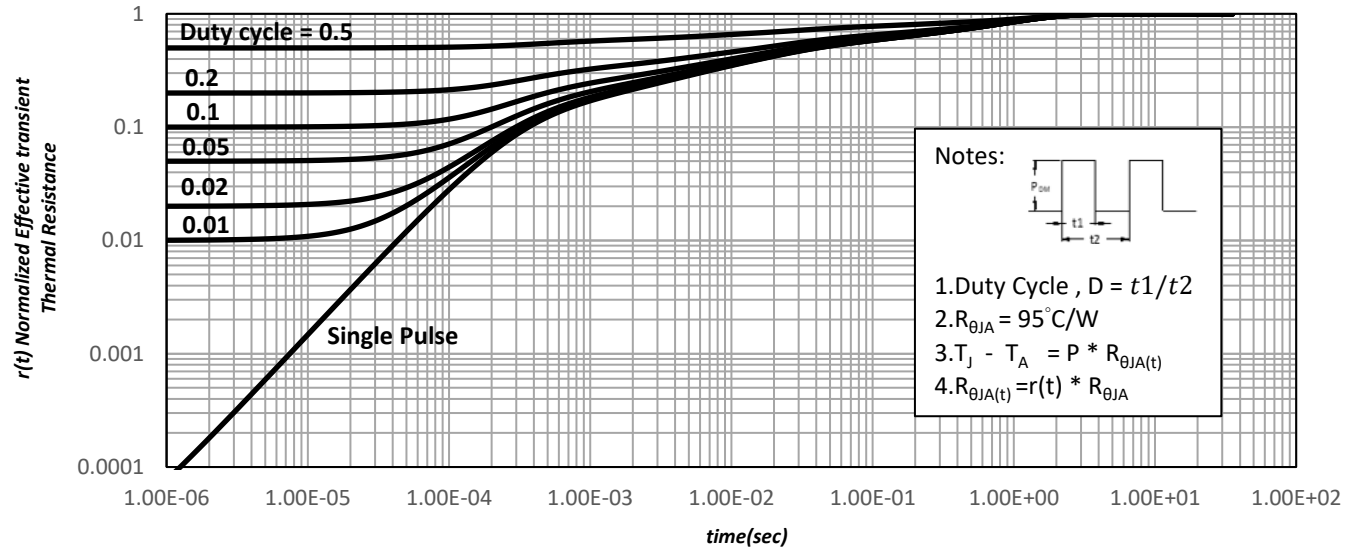


Fig 11. Effective Transient Thermal Impedance

▪ **P-CH_ELECTRICAL CHARACTERISTICS (T_J = 25 °C, Unless Otherwise Noted)**

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
STATIC						
Drain-Source Breakdown Voltage[4]	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-20			V
Gate Threshold Voltage[4]	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-0.45	-0.8	-1.2	
Gate-Body Leakage[4]	I_{GSS}	V_{DS} = 0V, V_{GS} = ±12V			±100	nA
Zero Gate Voltage Drain Current[4]	I_{DSS}	V_{DS} = -16V, V_{GS} = 0V			1	μA
		V_{DS} =-16V, V_{GS} =0V, T_J = 125 °C			25	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = -5V, V_{GS} = -4.5V	-5			A
Drain-Source On-State Resistance[1,4]	$R_{DS(ON)}$	V_{GS} = -4.5V, I_D = -3.5A		60	78	mΩ
		V_{GS} = -2.5V, I_D = -2A		81	105	
Forward Transconductance[1]	g_{fs}	V_{DS} = -5V, I_D = -3.5A		10		S
DYNAMIC						
Input Capacitance[5]	C_{iss}	V_{GS} = 0V, V_{DS} = -10V, f = 1MHz		395		pF
Output Capacitance[5]	C_{oss}			77		
Reverse Transfer Capacitance[5]	C_{rss}			53		
Gate Resistance[4,5]	R_g	f = 1MHz		9.7		Ω
Total Gate Charge[1,2,5]	Q_g	V_{DS} = -10V, V_{GS} = -4.5V, I_D = -5A		4.4		nC
Gate-Source Charge[1,2,5]	Q_{gs}			1.2		
Gate-Drain Charge[1,2,5]	Q_{gd}			1.0		
Turn-On Delay Time[1,2,5]	$t_{d(on)}$	V_{DS} = -10V, V_{GS} = -4.5V, I_D = -5A , Rg = 3Ω		7.5		nS
Rise Time[1,2,5]	t_r			25.5		
Turn-Off Delay Time[1,2,5]	$t_{d(off)}$			23.2		
Fall Time[1,2,5]	t_f			33.6		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Continuous Current	I_S				-5	A
Pulsed Current[3]	I_{SM}				-20	
Forward Voltage[1,4]	V_{SD}	I_F = I_S, V_{GS} = 0V			-1.3	V
Reverse Recovery Time[5]	t_{rr}	I_F = I_S, dI_F/dt = 100A / μS		9.4		nS
Peak Reverse Recovery Current[5]	$I_{RM(REC)}$			0.78		A
Reverse Recovery Charge[5]	Q_{rr}			3.7		nC

[1]Pulse test : Pulse Width ≦ 300 usec, Duty Cycle ≦ 2%.

[2]Independent of operating temperature.

[3]Pulse width limited by maximum junction temperature.

[4]Guarantee by FT test Item

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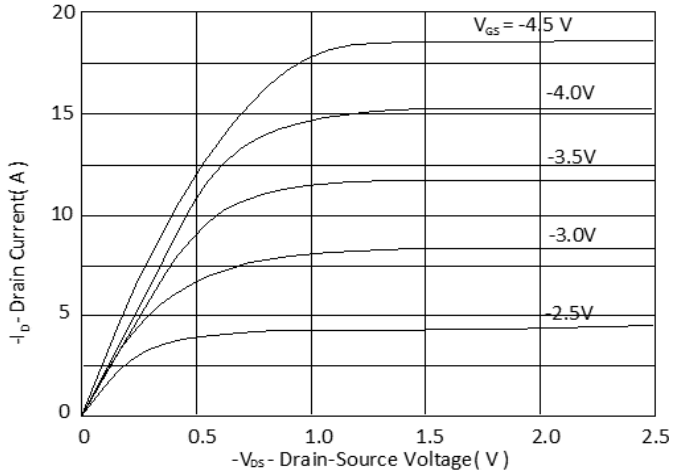


Fig.1 Typical Output Characteristics

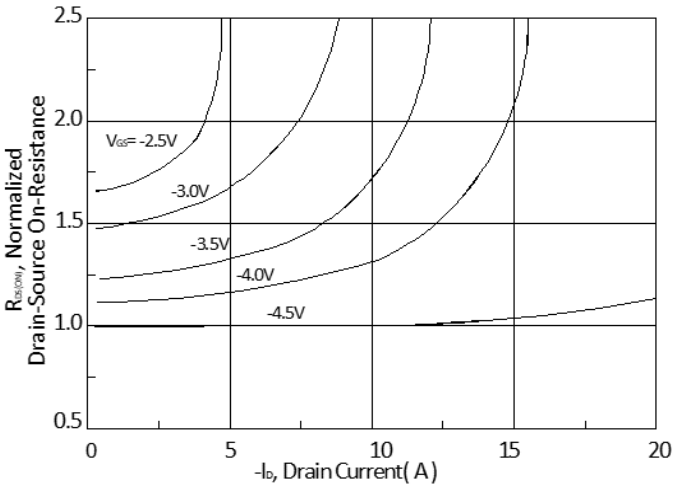


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

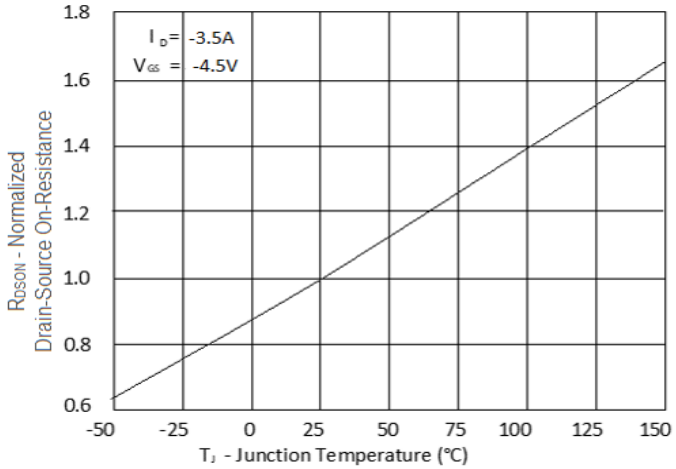
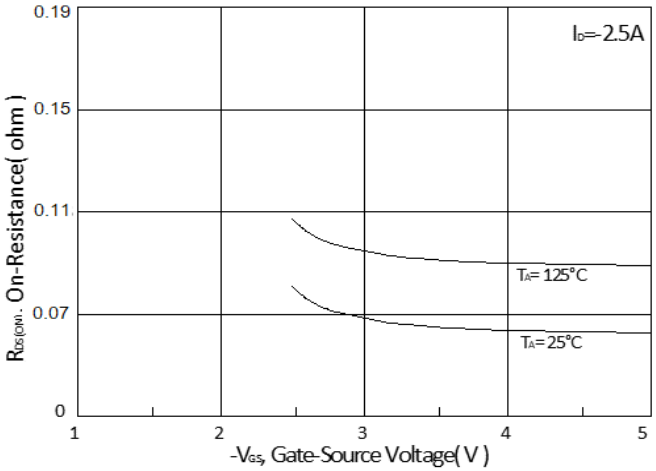


Fig.3 Normalized On-Resistance v.s. Junction Temperature



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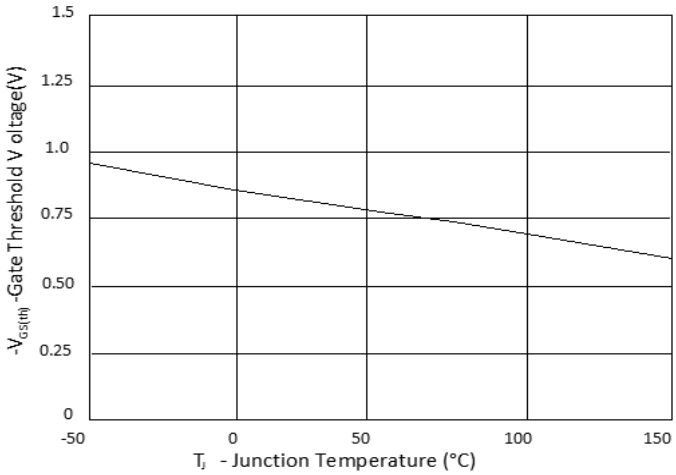

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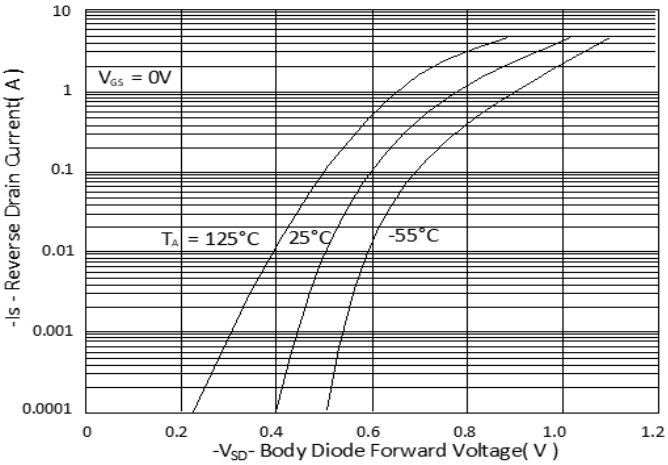


Fig.6 Transfer Characteristics

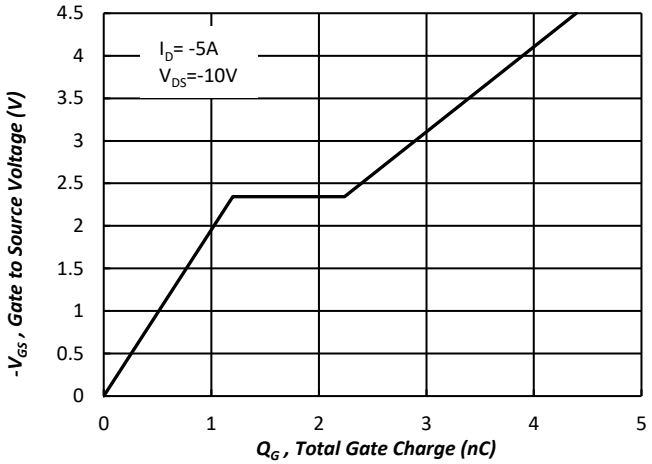


Fig.7 Gate Charge Characteristics

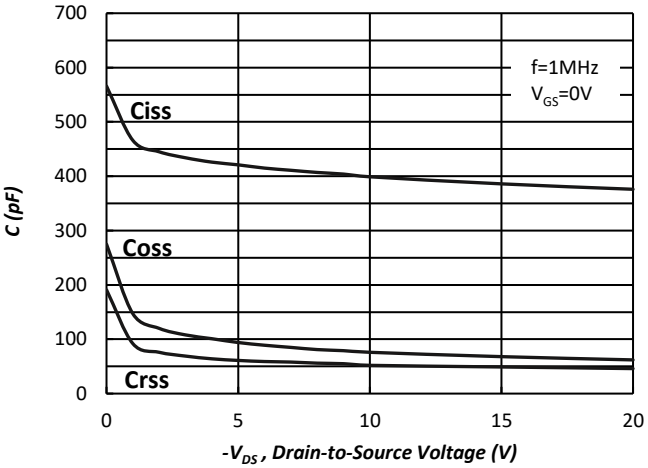
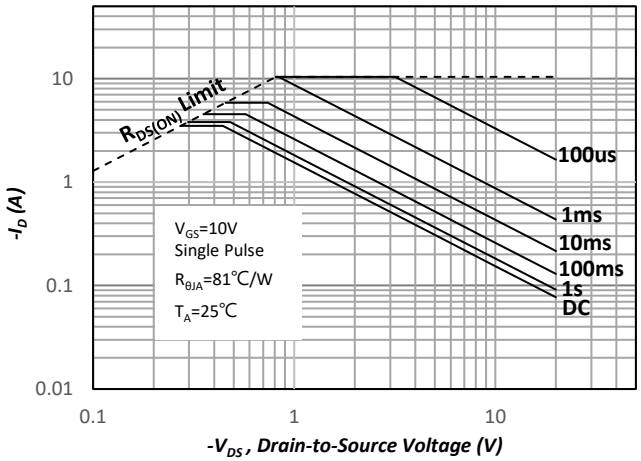


Fig.8 Typical Capacitance Characteristics



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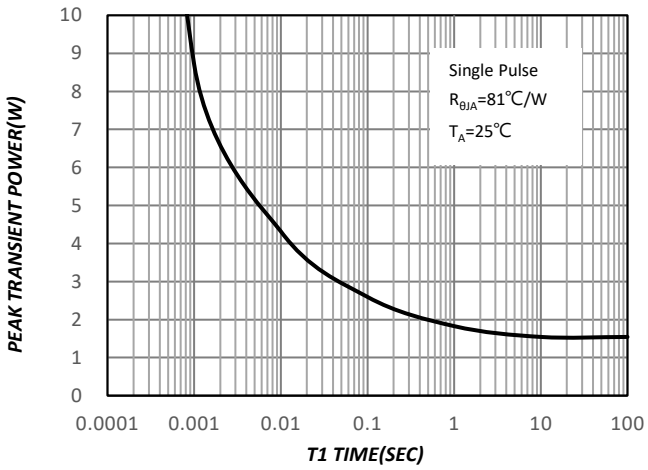

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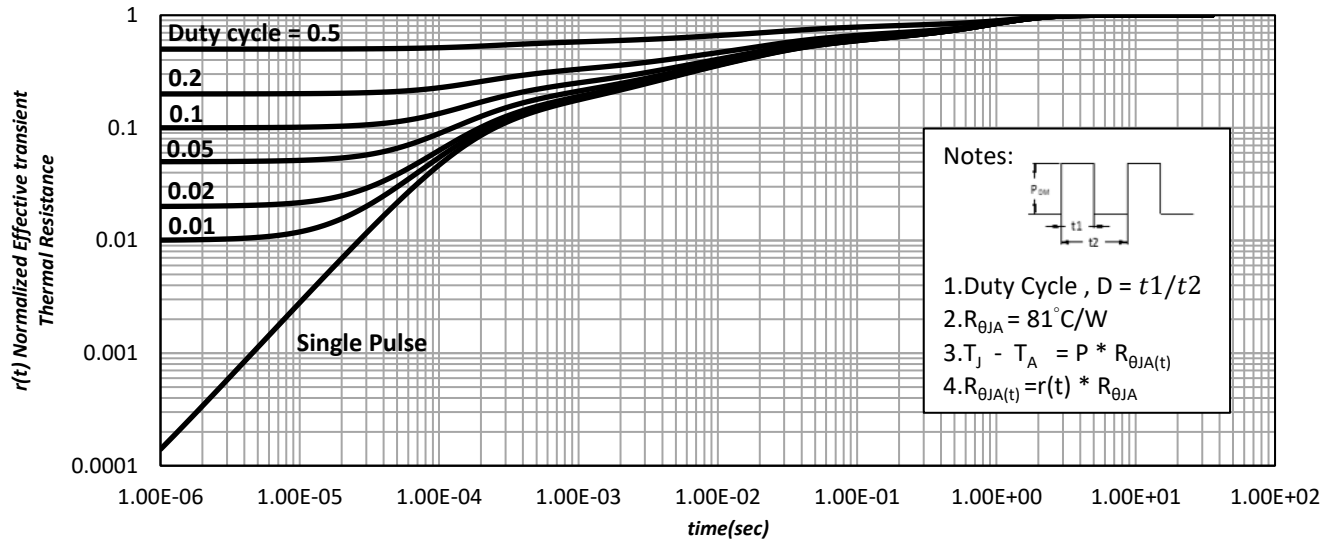
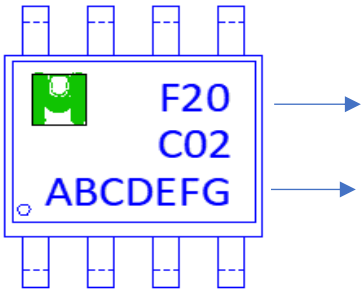


Fig 11. Effective Transient Thermal Impedance

Ordering & Marking Information:

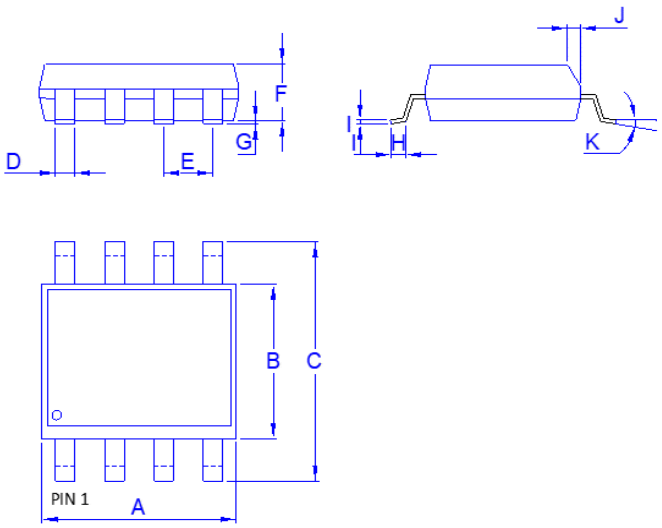
Device Name: EMF20C02G for SOP-8



F20C02: Device Name

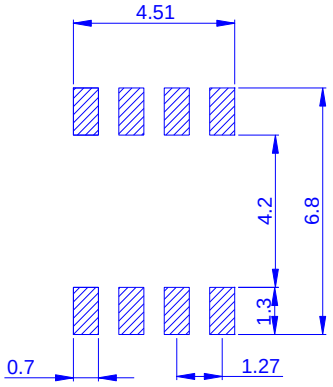
ABCDEFG: Date Code
A: Assembly House
B: Year(A:2008 B:2009 C:2010….)
C: Month(A:01 B:02 C:03 D:04 E:05 F:06 G:07 H:08 I:09 J:10 K:11 L:12)
DEFG: Serial No.

Outline Drawing

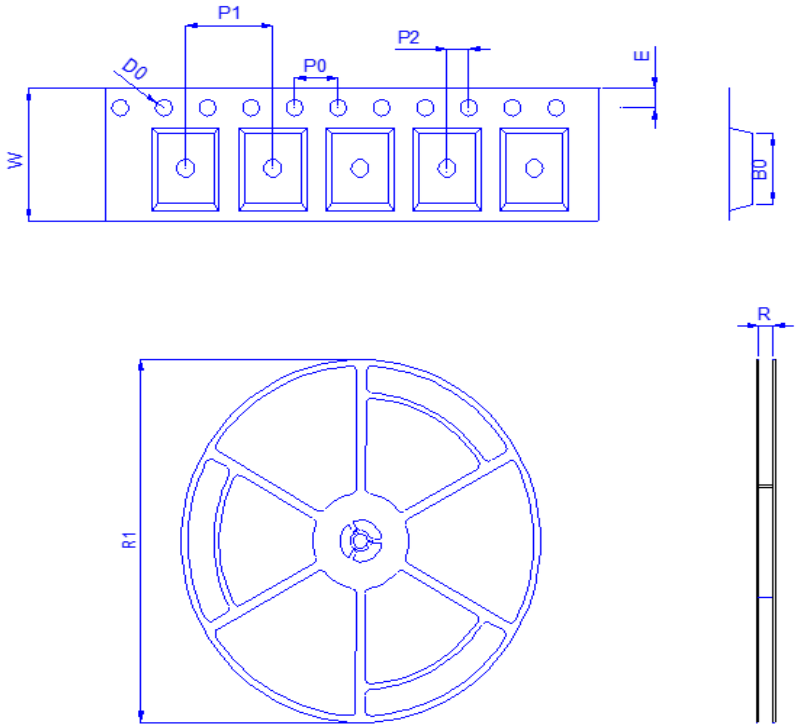


Dimension	A	B	C	D	E	F	G	H	I	J	K
Min.	4.7	3.8	5.8	0.31		1.35	0.01	0.4	0.1	0.25	0°
Typ.	4.9	3.9	6	0.41	1.27	1.55	0.18	0.6	0.2	0.3	
Max.	5.1	4	6.2	0.51		1.75	0.25	1.27	0.25	0.5	8°

Footprint



◆ **Tape&Reel Information:2500pcs/Reel**



產品別	SOP-8
Reel尺寸	13''
編帶方式	FEED DIRECTION

Dimension in mm

Dimension	Carrier tape							Reel	
	B0	D0	E	P0	P1	P2	W	R	R1
Typ.	6.5	1.5	1.75	4	8	2	12	12.4	330
±	0.4	0.2	0.2	0.2	0.2	0.2	0.5	REF	REF