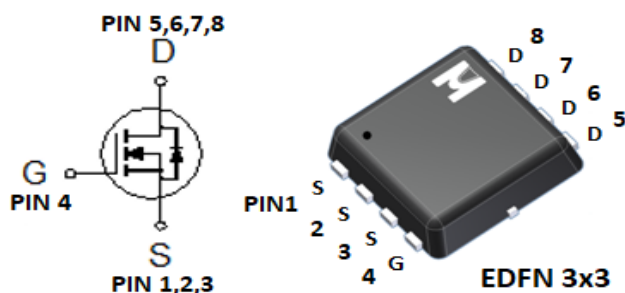


Single N-Channel Logic Level Enhancement Mode Field Effect Transistor

▪Product Summary:

	N-CH
BVDSS	40V
$R_{DS(on)} (MAX.) @ V_{GS}=10V$	12.8mΩ
$R_{DS(on)} (MAX.) @ V_{GS}=4.5V$	25.0mΩ
$I_D @ T_C=25^{\circ}C$	44.0A
$I_D @ T_A=25^{\circ}C$	10.0A

▪ Pin Description:



Single N Channel MOSFET

UIS, Rg 100% Tested

Pb-Free Lead Plating & Halogen Free

▪ABSOLUTE MAXIMUM RATINGS ($T_C = 25^{\circ}C$ Unless Otherwise Noted)



PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNIT
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	$T_C = 25^{\circ}C$	I_D	44	A
	$T_C = 100^{\circ}C$		34	
Continuous Drain Current	$T_A = 25^{\circ}C$	I_D	10	
	$T_A = 70^{\circ}C$		8	
Pulsed Drain Current ¹		I_{DM}	91.9	mJ
Avalanche Current		I_{AS}	30	
Avalanche Energy	$L = 0.1mH$	EAS	45.0	
Repetitive Avalanche Energy ²	$L = 0.05mH$	EAR	22.5	W
Power Dissipation	$T_C = 25^{\circ}C$	P_D	62.5	
	$T_C = 100^{\circ}C$		25	W
Power Dissipation	$T_A = 25^{\circ}C$	P_D	2.1	
	$T_A = 70^{\circ}C$		1.3	
Operating Junction & Storage Temperature Range		T_j, T_{stg}	-55 to 150	$^{\circ}C$

▪ 100% UIS testing in condition of $V_D=15V$, $L=0.1mH$, $V_G=10V$, $I_L=18A$, Rated $V_{DS}=40V$ N-CH

▪THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Case	$R_{\theta JC}$		2	$^{\circ}C/W$
Junction-to-Ambient ³	$R_{\theta JA}$		60	

¹Pulse width limited by maximum junction temperature.

²Duty cycle $< 1\%$

³60 $^{\circ}C$ / W when mounted on a 1 in² pad of 2 oz copper.

⁴Guarantee by Engineering test

▪ 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 = 250uA	40			V
Gate Threshold Voltage ⁴	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250uA	1.2	1.6	2.5	
Gate-Body Leakage ⁴	I _{GSS}	V _{DS} = 0V, V _{GS} = ±20V			±100	nA
Zero Gate Voltage Drain Current ⁴	I _{DSS}	V _{DS} = 30V, V _{GS} = 0V			1	uA
		V _{DS} =30V, V _{GS} =0V, T _J = 125 °C			100	
On-State Drain Current ¹	I _{D(ON)}	V _{DS} = 10V, V _{GS} = 10V	44			A
Drain-Source On-State Resistance ^{1,4}	R _{DS(ON)}	V _{GS} = 10V, I _D = 12A		10.8	12.8	mΩ
		V _{GS} = 4.5V, I _D = 7A		20	25	
Forward Transconductance ¹	g _{fs}	V _{DS} = 5V, I _D = 12A		25		S
DYNAMIC						
Input Capacitance ⁵	C _{iss}	V _{GS} = 0V, V _{DS} = 20V, f = 1MHz		939		pF
Output Capacitance ⁵	C _{oss}			114		
Reverse Transfer Capacitance ⁵	C _{rss}			76		
Gate Resistance ^{4,5}	R _g	f = 1MHz		1.0		Ω
Total Gate Charge ^{1,2,5}	Q _g (V _{GS} =10V)	V _{DS} = 20V, V _{GS} = 10V, I _D = 12A		16.7		nC
	Q _g (V _{GS} =4.5V)			8.4		
Gate-Source Charge ^{1,2,5}	Q _{gs}			3.0		
Gate-Drain Charge ^{1,2,5}	Q _{gd}			4.3		
Turn-On Delay Time ^{1,2,5}	t _{d(on)}	V _{DS} = 20V, V _{GS} = 10V, I _D = 5A , R _g = 6Ω		6.6		nS
Rise Time ^{1,2,5}	t _r			6.9		
Turn-Off Delay Time ^{1,2,5}	t _{d(off)}			13.0		
Fall Time ^{1,2,5}	t _f			1.8		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Continuous Current	I _S				44	A
Pulsed Current ³	I _{SM}				92	
Forward Voltage ^{1,4}	V _{SD}	I _F =15A, V _{GS} = 0V			1.2	V
Reverse Recovery Time ⁵	t _{rr}	I _F = 15A, dI _F /dt = 100A / uS		10.0		nS
Peak Reverse Recovery Current ⁵	I _{RM(REC)}			0.81		A
Reverse Recovery Charge ⁵	Q _{rr}			4.4		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.

▪ TYPICAL CHARACTERISTICS

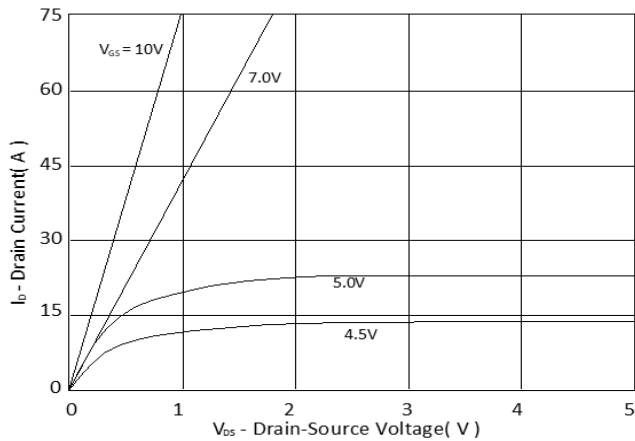


Fig.1 Typical Output Characteristics

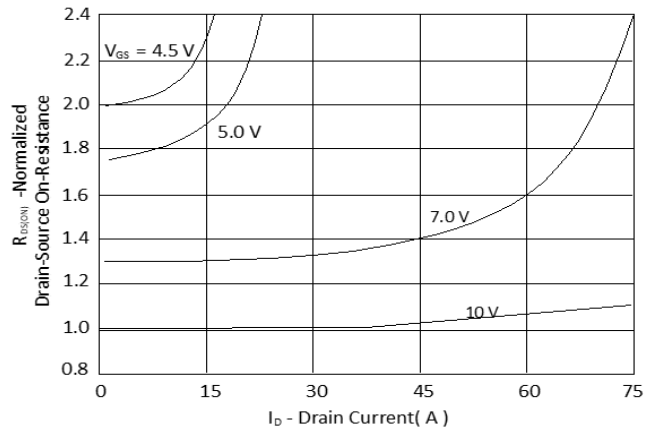


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

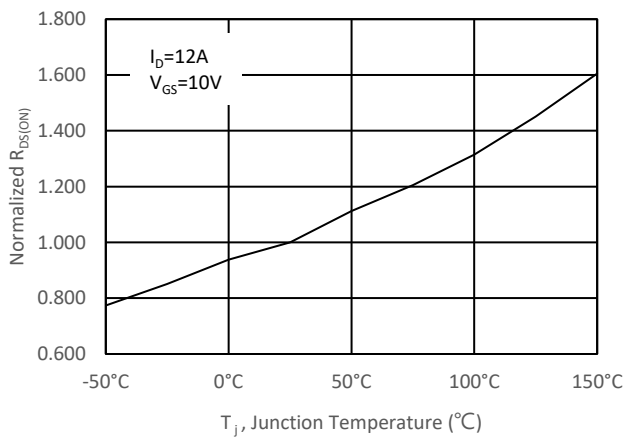


Fig.3 Normalized On-Resistance v.s. Junction Temperature

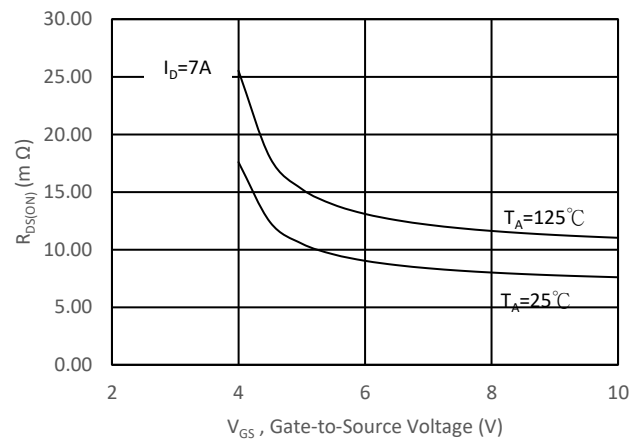


Fig.4 On-Resistance v.s. Gate Voltage

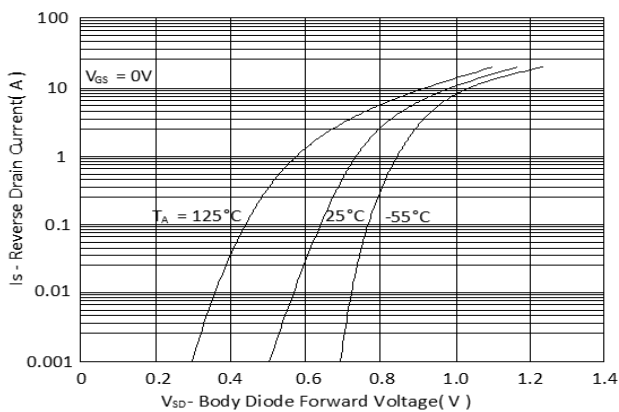


Fig.5 Forward Characteristic of Reverse Diode

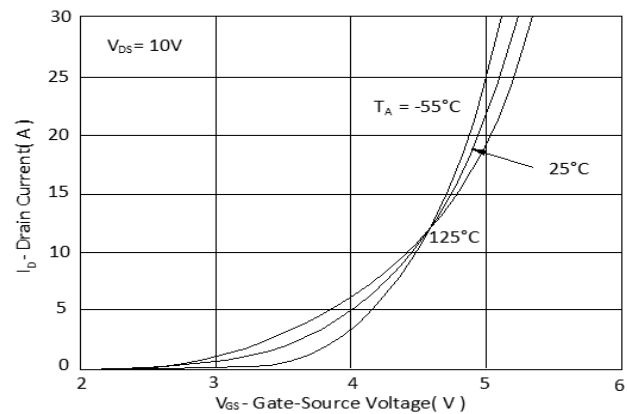


Fig.6 Transfer Characteristics

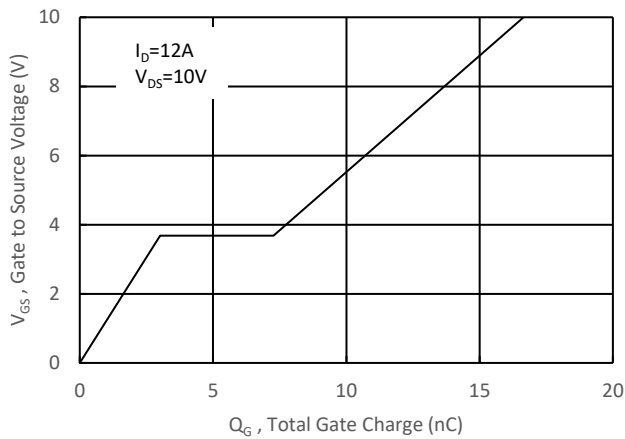


Fig.7 Gate Charge Characteristics

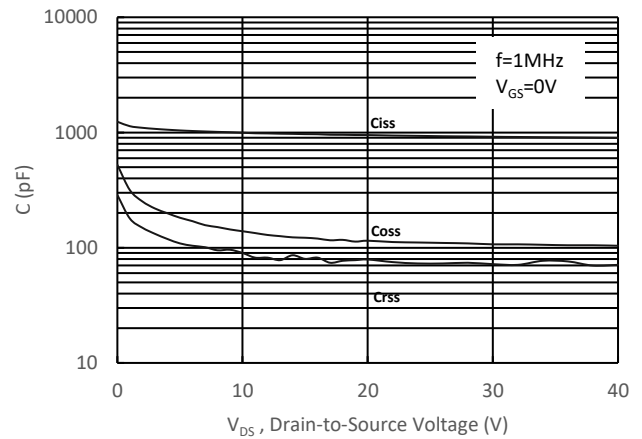


Fig.8 Typical Capacitance Characteristics

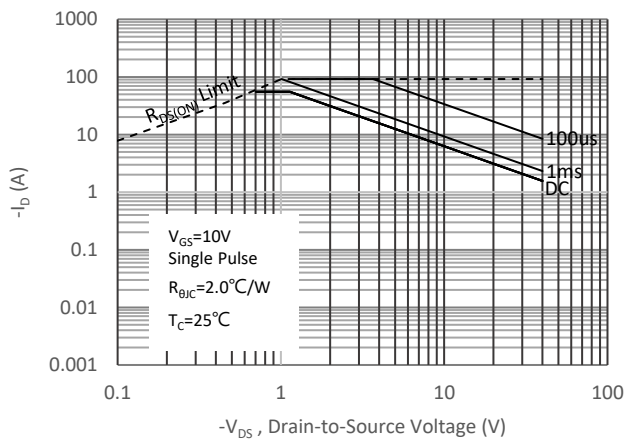


Fig.9. Maximum Safe Operating Area

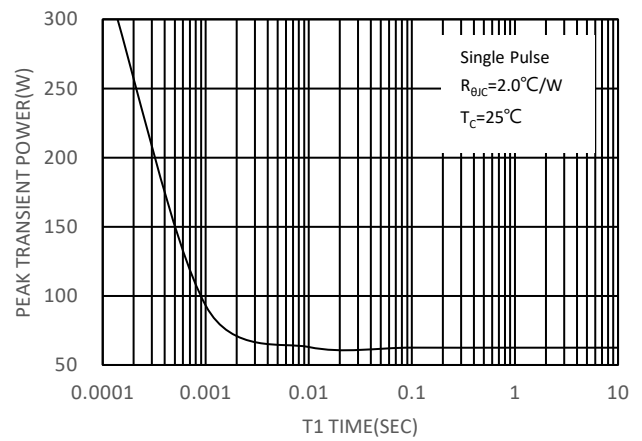


Fig.10. Single Pulse Maximum Power Dissipation

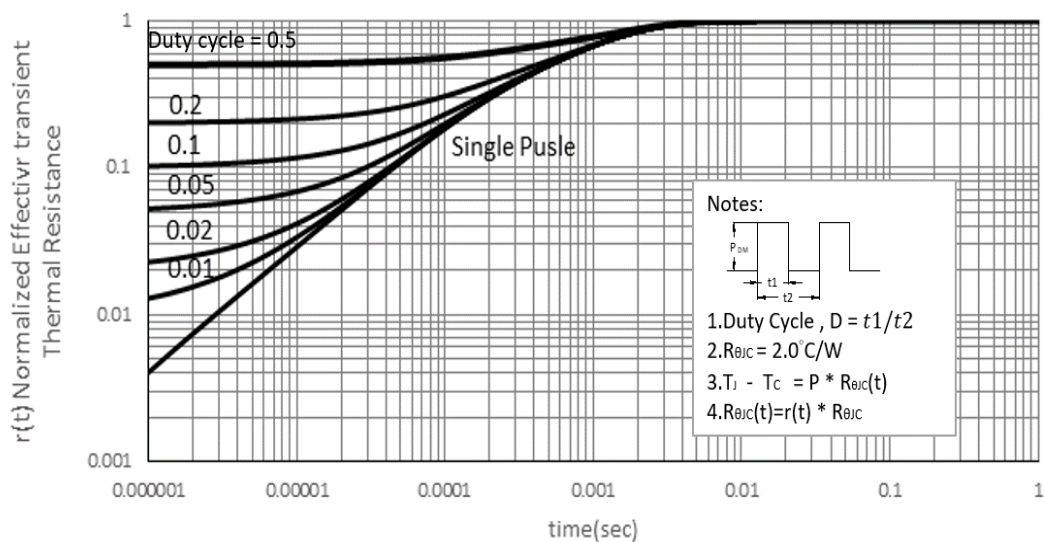


Fig.11. Effective Transient Thermal Impedance

Ordering & Marking Information:

Device Name: EMB12N04V for EDFN 3x3



B12N04: Device Name

ABCDEFGH: Date Code

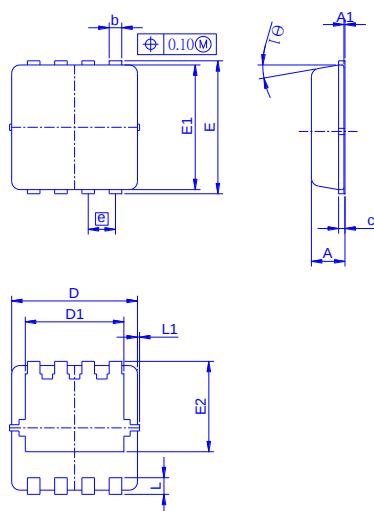
A: Assembly House

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)

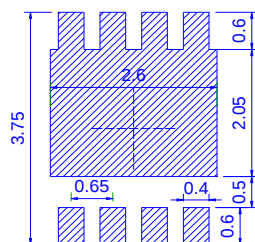
DEFG: Serial No.

Outline Drawing

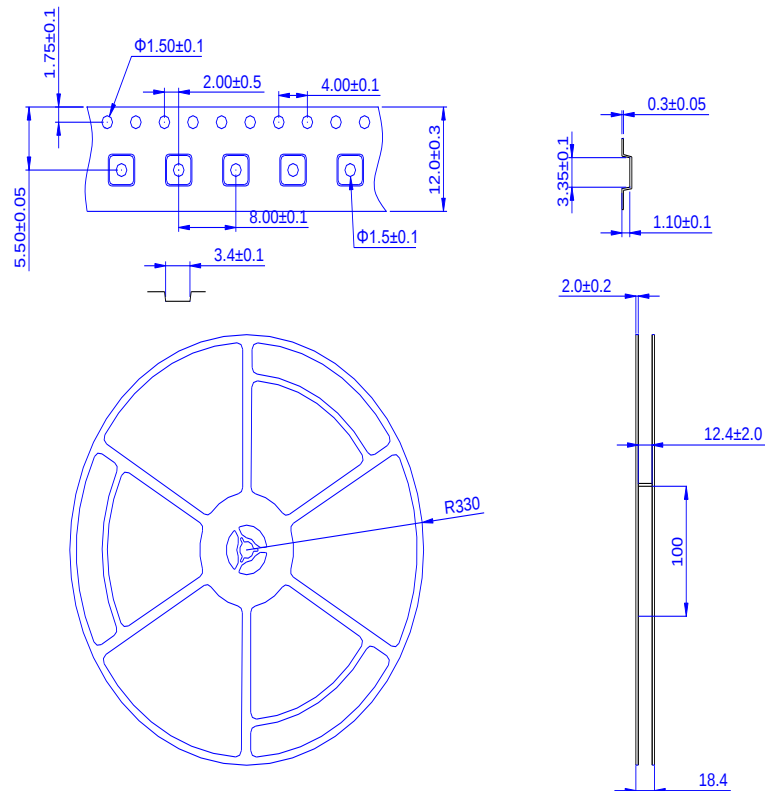


Dimension	A	A1	b	c	D	D1	E	E1	E2	e	L	L1	θ1
Min.	0.65	0	0.2	0.1	2.9	2.15	3.1	2.9	1.53	0.55	0.25	-	0°
Typ.	0.75	-	0.3	0.15	3	2.45	3.2	3	1.97	0.65	0.4	0.075	10°
Max.	0.9	0.05	0.4	0.25	3.3	2.74	3.5	3.3	2.59	0.75	0.6	0.15	14°

Footprint



◆ **Tape&Reel Information:5000pcs/Reel**
(Dimension in millimeter)



產品別	EDFN 3x3
Reel尺寸	13"
編帶方式	FEED DIRECTION
前空格	50
後空格	50
裝箱數	
滿捲數量	5K
捲/內盒比	01:01
內盒滿箱數	5K
內/外箱比	10:01
外箱滿箱數	50K



★Datasheet Latest version specification :

	Revision History	Prepared	Approved	Date
A.0	Initial Datasheet	Jannie	Andy	2017/8/28
A.1	Adjust electrical data	Johnson	Sam	2020/8/12