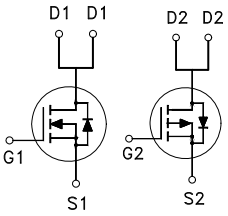
杰力科技股份有限公司
Excelliance MOS Corporation

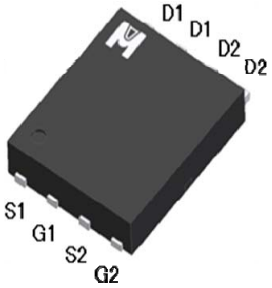
EMB20D03H

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

Product Summary:

	N-CH	P-CH
BV_{DSS}	30V	-30V
$R_{DSON\ (MAX.)}$	6.5mΩ	20mΩ
I_D	26A	-15A





UIS, Rg 100% Tested

Pb-Free Lead Plating & Halogen Free

ABSOLUTE MAXIMUM RATINGS (T_C = 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_C = 25 °C	I_D	26	-15	A
	T_C = 100 °C		15	-9	
Pulsed Drain Current[1]		I_{DM}	100	-60	
Avalanche Current		I_{AS}	25	-20	
Avalanche Energy	L = 0.1mH, ID=15A, RG=25Ω(N) L = 0.1mH, ID=-10A, RG=25Ω(P)	E_{AS}	11.25	5	mJ
Repetitive Avalanche Energy[2]	L = 0.05mH	E_{AR}	5.6	2.5	
Power Dissipation	T_C = 25 °C	P_D	25		W
	T_C = 100 °C		10		
Power Dissipation	T_A = 25 °C	P_D	2		W
	T_A = 70 °C		1.28		
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	$R_{\theta JC}$		5	°C / W
Junction-to-Ambient[3]	$R_{\theta JA}$		62.5	

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

[3]62.5°C / W when mounted on a 1 in^2 pad of 2 oz copper.

ELECTRICAL CHARACTERISTICS (T_C = 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	1.5	3	
		V_{DS} = V_{GS}, I_D = -250μA	P-CH	-1	-1.5	-3	
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} = 10V, V_{GS} = 10V	N-CH	26			A
		V_{DS} = -5V, V_{GS} = -10V	P-CH	-15			
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 20A	N-CH		5.2	6.5	mΩ
		V_{GS} = -10V, I_D = -15A	P-CH		17	20	
		V_{GS} = 4.5V, I_D = 15A	N-CH		7.0	9.5	
		V_{GS} = -4.5V, I_D = -10A	P-CH		28.5	37	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 20A	N-CH		22		S
		V_{DS} = -5V, I_D = -10A	P-CH		24		
DYNAMIC							
Input Capacitance	C_{iss}	N-CH V_{GS} = 0V, V_{DS} = 15V, f = 1MHz P=CH V_{GS} = 0V, V_{DS} = -15V, f = 1MHz	N-CH		2300		pF
			P-CH		1928		
Output Capacitance	C_{oss}		N-CH		342		
			P-CH		210		
Reverse Transfer Capacitance	C_{rss}		N-CH		218		
			P-CH		193		

Gate Resistance	R_g	V_{GS} = 15mV, V_{DS} = 0V, f = 1MHz	N-CH		3.3		Ω
			P-CH		4.5		
Total Gate Charge[1,2]	$Q_g(V_{GS}=10V)$ $Q_g(V_{GS}=-10V)$	N-CH V_{DS} = 15V, V_{GS} = 10V, I_D = 20A P-CH V_{DS} = -15V, V_{GS} = -10V, I_D = -15A	N-CH		34		nC
			P-CH		31		
	$Q_g(V_{GS}=4.5V)$ $Q_g(V_{GS}=-4.5V)$		N-CH		17		
			P-CH		15		
Gate-Source Charge[1,2]	Q_{gs}		N-CH		6.0		
			P-CH		4.4		
Gate-Drain Charge[1,2]	Q_{gd}		N-CH		7.7		
			P-CH		6.5		
Turn-On Delay Time[1,2]	$t_{d(on)}$	N-CH V_{DS} = 15V, I_D = 1A, V_{GS} = 10V, R_{GS} = 6Ω P-CH V_{DS} = -15V, I_D = -1A, V_{GS} = -10V, R_{GS} = 6Ω	N-CH		15		nS
			P-CH		10		
Rise Time[1,2]	t_r		N-CH		20		
			P-CH		15		
Turn-Off Delay Time[1,2]	$t_{d(off)}$		N-CH		25		
			P-CH		25		
Fall Time[1,2]	t_f		N-CH		25		
			P-CH		10		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25 °C)							
Continuous Current	I_S		N-CH			2.3	A
			P-CH			-2.3	
Pulsed Current[3]	I_{SM}		N-CH			9.2	
			P-CH			-9.2	
Forward Voltage[1]	V_{SD}	$I_F = I_S$, V_{GS} = 0V	N-CH			1.2	V
			P-CH			-1.2	
Reverse Recovery Time	t_{rr}	$I_F = I_S$, dI_F/dt = 100A / μS	N-CH		28		nS
			P-CH		32		
Reverse Recovery Charge	Q_{rr}		N-CH		18		nC
			P-CH		26		

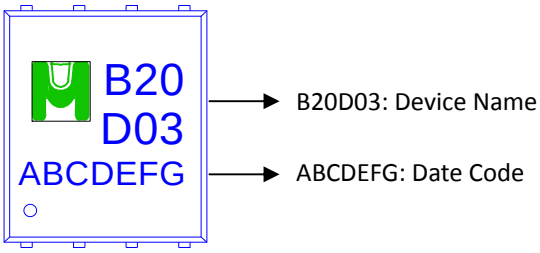
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

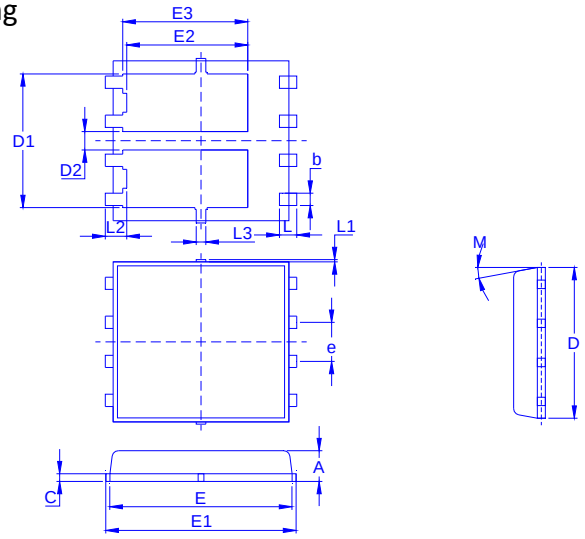
[3]Pulse width limited by maximum junction temperature.

Ordering & Marking Information:

Device Name: EMB20D03H for EDFN 5 x 6



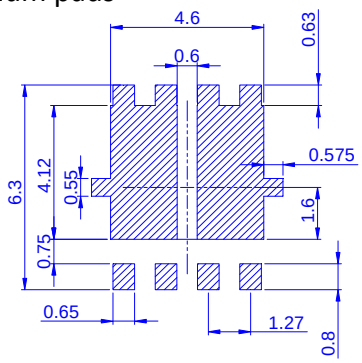
Outline Drawing



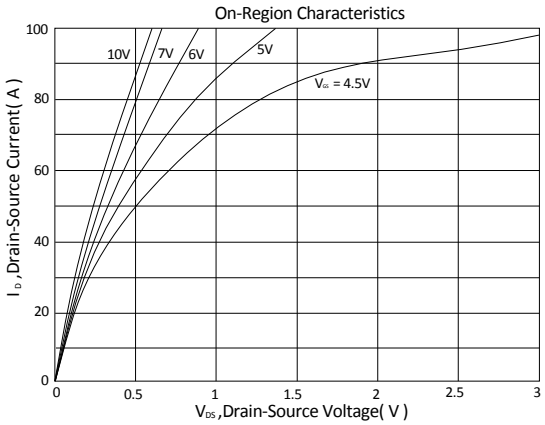
Dimension in mm

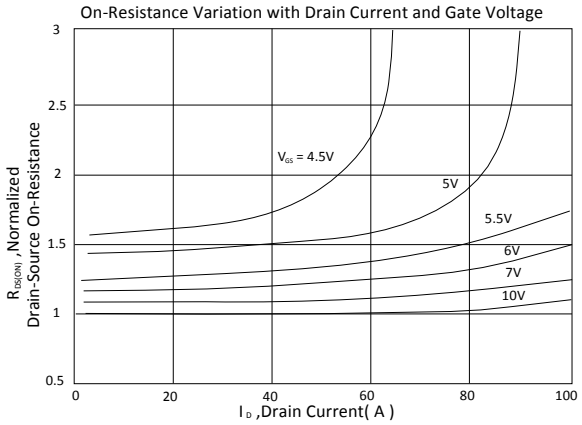
Dimension	A	A1	b	c	D	D1	D2	E	E1	E2	E3	e	L	L1	L2	L3	M
Min.	0.85	0.00	0.30	0.15			0.5						0.45	0			0°
Typ.	0.95		0.40	0.2	5.2	4.35	0.6	5.55	6.05	3.82	3.946	1.27	0.55		0.68	0.3	
Max.	1.00	0.05	0.50	0.25			0.75						0.65	0.15			10°

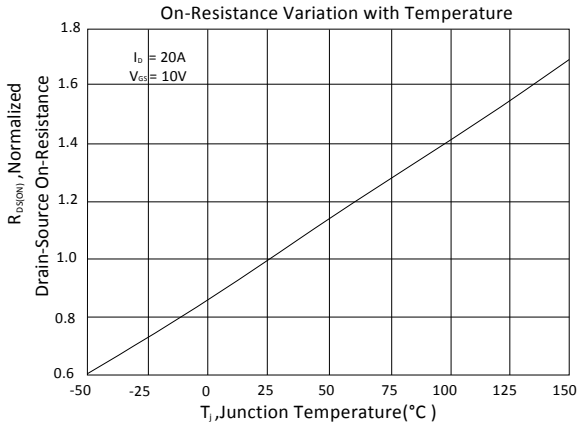
Recommended minimum pads

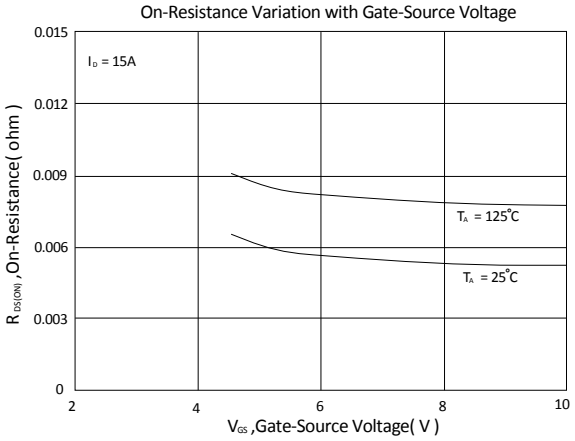


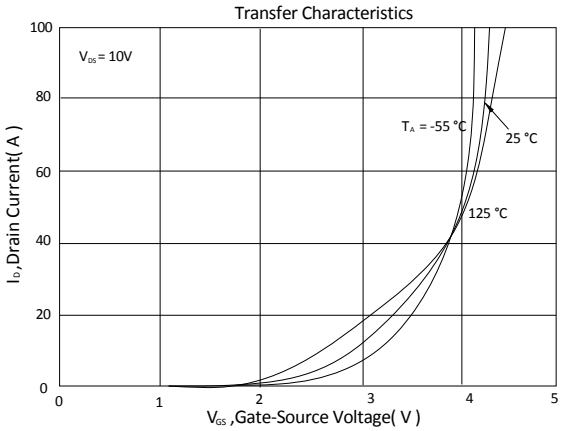
N-Channel

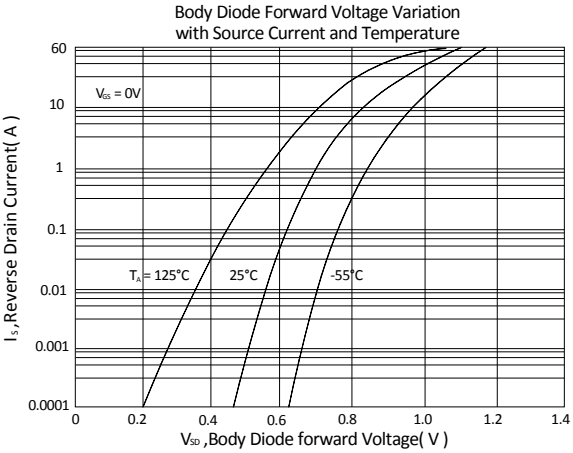

On-Region Characteristics
10V
7V
6V
5V
VGS = 4.5V
ID ,Drain-Source Current(A)
VDS ,Drain-Source Voltage(V)

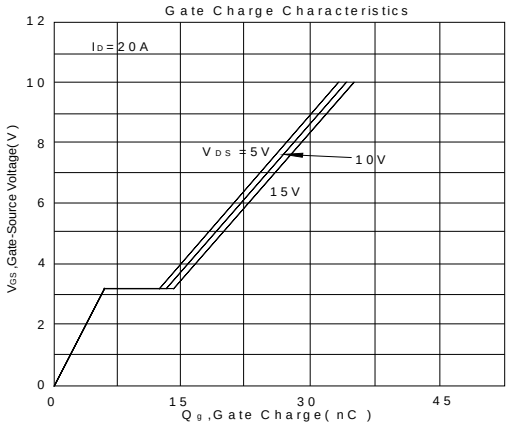

On-Resistance Variation with Drain Current and Gate Voltage
VGS = 4.5V
5V
5.5V
6V
7V
10V
RDS(ON) ,Normalized
Drain-Source On-Resistance
ID ,Drain Current(A)

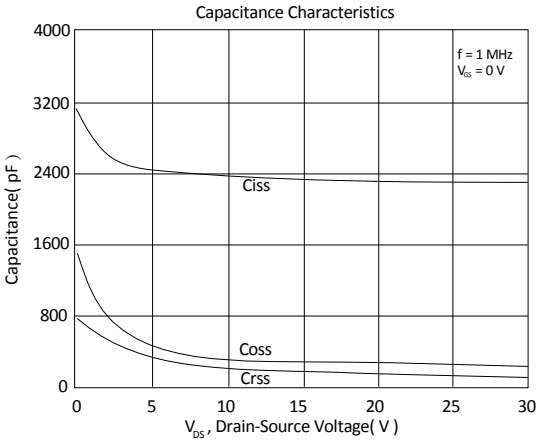

On-Resistance Variation with Temperature
ID = 20A
VGS = 10V
RDS(ON) ,Normalized
Drain-Source On-Resistance
TJ ,Junction Temperature(°C)

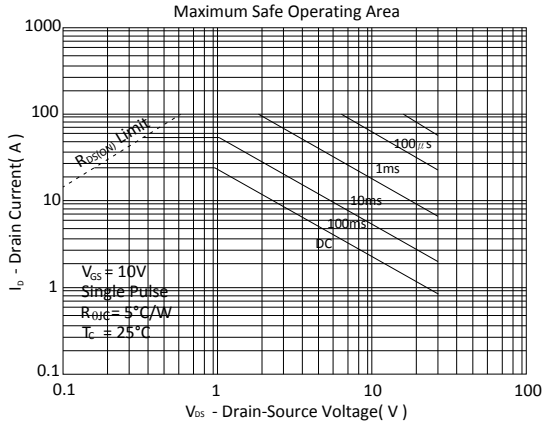

On-Resistance Variation with Gate-Source Voltage
ID = 15A
TA = 125°C
TA = 25°C
RDS(ON) ,On-Resistance(ohm)
VGS ,Gate-Source Voltage(V)

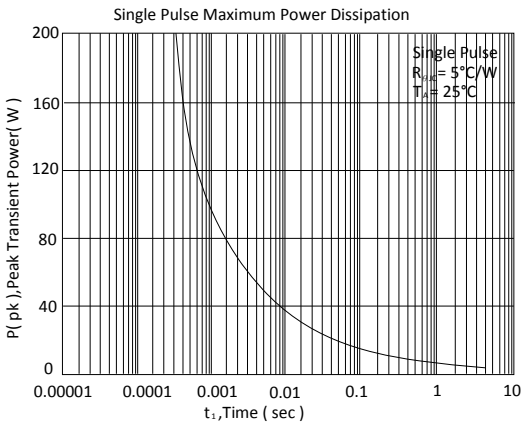

Transfer Characteristics
VDS = 10V
TA = -55 °C
25 °C
125 °C
ID ,Drain Current(A)
VGS ,Gate-Source Voltage(V)

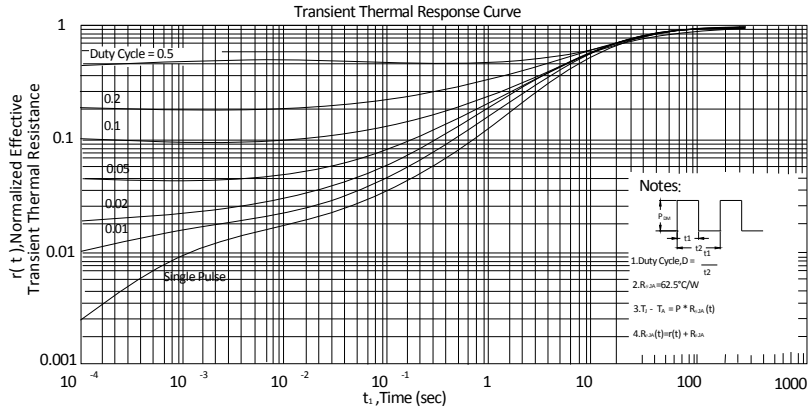

Body Diode Forward Voltage Variation
with Source Current and Temperature
VGS = 0V
TA = 125°C
25°C
-55°C
IS ,Reverse Drain Current(A)
VSD ,Body Diode forward Voltage(V)


Gate Charge Characteristics
I D = 2 0 A
V D S = 5 V
1 0 V
1 5 V
V GS ,Gate-Source Voltage(V)
Q g ,G a t e C h a r g e (n C)

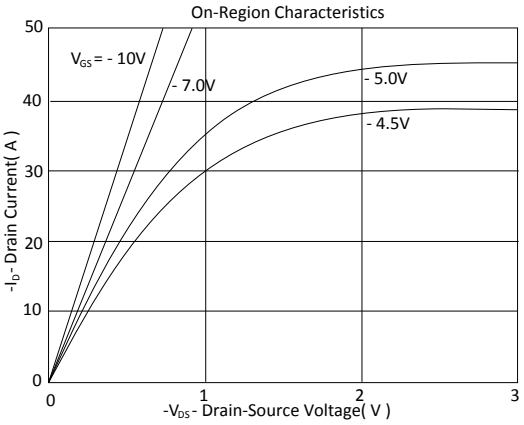

Capacitance Characteristics
f = 1 MHz
V GS = 0 V
Ciss
Coss
Crss
Capacitance(pF)
V DS , Drain-Source Voltage(V)

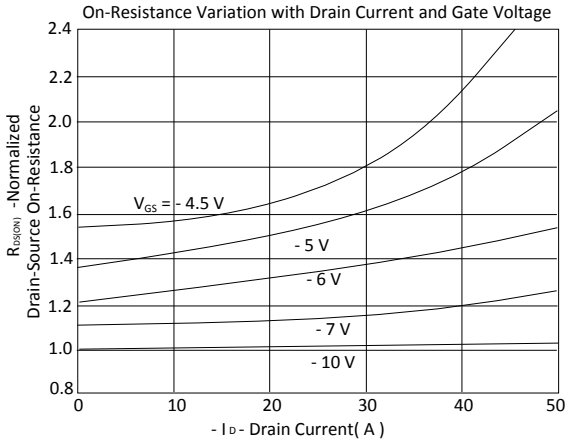

Maximum Safe Operating Area
R DS(ON) Limit
100 μ s
1ms
10ms
100ms
DC
V GS = 10V
Single Pulse
R θJC = 5°C/W
T C = 25°C
I D - Drain Current(A)
V DS - Drain-Source Voltage(V)

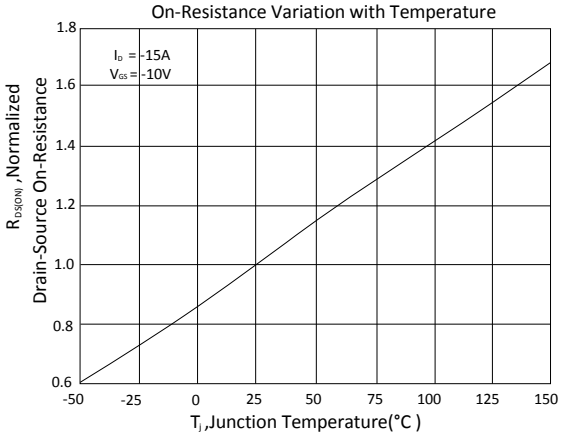

Single Pulse Maximum Power Dissipation
Single Pulse
R θJA = 5°C/W
T A = 25°C
P(pk),Peak Transient Power(W)
t 1 ,Time (sec)

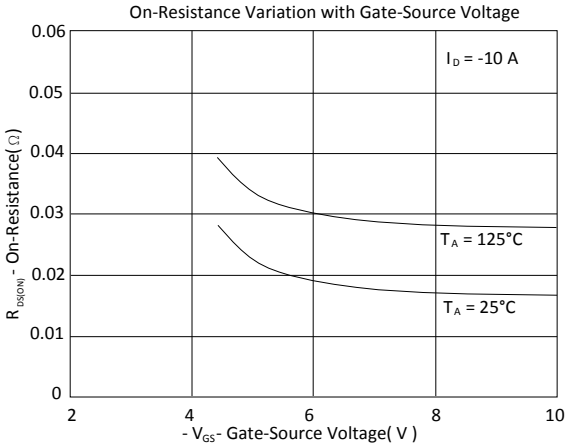

Transient Thermal Response Curve
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Notes:
1.Duty Cycle,D =
2.R θJA =62.5°C/W
3.T J - T A = P * R θJA (t)
4.R θJA (t)=r(t) + R θJA
r(t),Normalized Effective Transient Thermal Resistance
t 1 ,Time (sec)

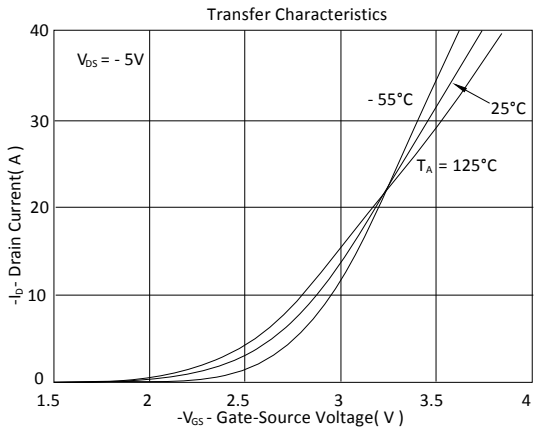
P-Channel

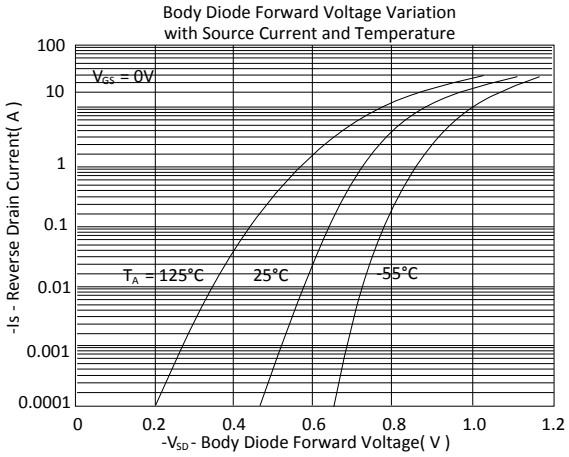

On-Region Characteristics
V_{GS} = - 10V
- 7.0V
- 5.0V
- 4.5V
$-I_D$ - Drain Current(A)
$-V_{DS}$ - Drain-Source Voltage(V)

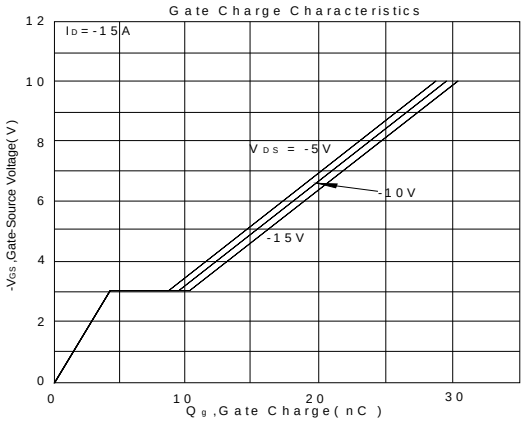

On-Resistance Variation with Drain Current and Gate Voltage
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
V_{GS} = - 4.5 V
- 5 V
- 6 V
- 7 V
- 10 V
- I_D - Drain Current(A)

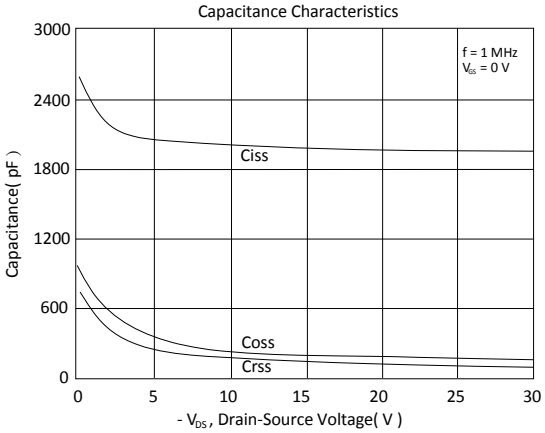

On-Resistance Variation with Temperature
I_D = -15A
V_{GS} = -10V
$R_{DS(ON)}$,Normalized
Drain-Source On-Resistance
T_j ,Junction Temperature(°C)

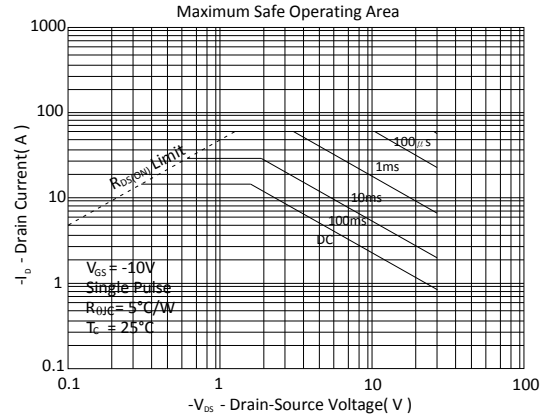

On-Resistance Variation with Gate-Source Voltage
I_D = -10 A
T_A = 125°C
T_A = 25°C
$R_{DS(ON)}$ - On-Resistance(Ω)
- V_{GS} - Gate-Source Voltage(V)

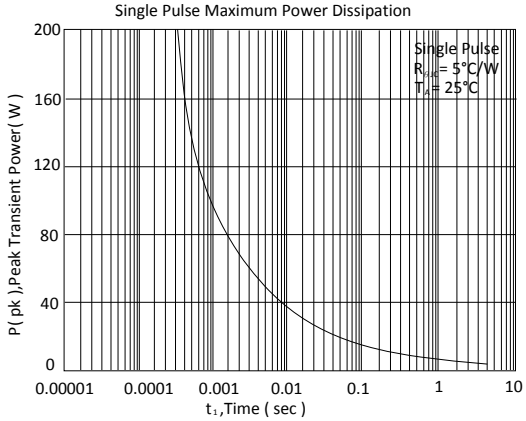

Transfer Characteristics
V_{DS} = - 5V
- 55°C
25°C
T_A = 125°C
$-I_D$ - Drain Current(A)
$-V_{GS}$ - Gate-Source Voltage(V)

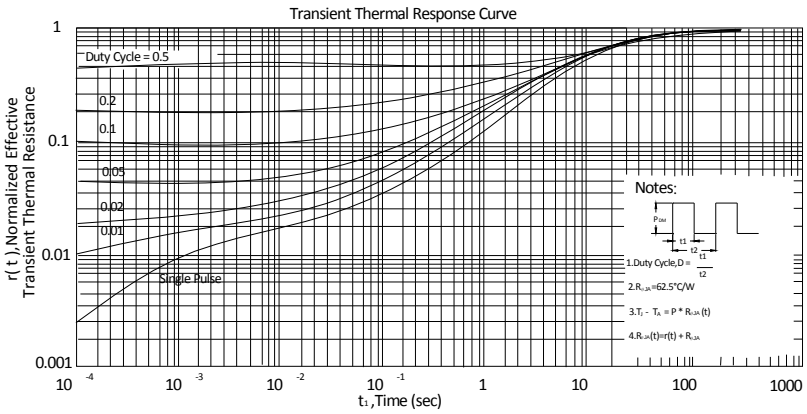

Body Diode Forward Voltage Variation
with Source Current and Temperature
V_{GS} = 0V
T_A = 125°C
25°C
-55°C
-Is - Reverse Drain Current(A)
$-V_{SD}$ - Body Diode Forward Voltage(V)


Gate Charge Characteristics
I D = -15 A
V DS = -5 V
-10 V
-15 V
-VGS ,Gate-Source Voltage(V)
Q g ,Gate Charge(nC)


Capacitance Characteristics
f = 1 MHz
VGS = 0 V
Ciss
Coss
Crss
Capacitance(pF)
- VDS , Drain-Source Voltage(V)


Maximum Safe Operating Area
RDS(ON) Limit
100μs
1ms
10ms
100ms
DC
VGS = -10V
Single Pulse
RθJC = 5°C/W
TC = 25°C
-ID - Drain Current(A)
-VDS - Drain-Source Voltage(V)


Single Pulse Maximum Power Dissipation
Single Pulse
RθJA = 5°C/W
TA = 25°C
P(pk),Peak Transient Power(W)
t1 ,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 =
2.RθJA=62.5°C/W
3.TJ - TA = P * RθJA (t)
4.RθJA(t)=r(t) + RθJA
r(t),Normalized Effective Transient Thermal Resistance
t1 ,Time (sec)