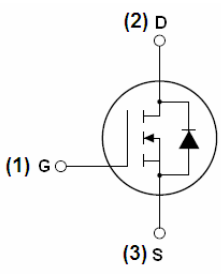
EFM160N02D

N-Channel Advanced MOSFET

• Product Summary

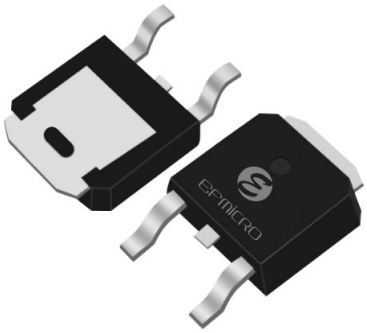
Part #	V_{DS}	$R_{DS(on).typ}$ ($@V_{GS}$=4.5V)	$R_{DS(on).typ}$ ($@V_{GS}$=2.5V)	I_D
EFM160N02D	20V	16mΩ	22mΩ	20A



N-Channel MOSFET

• Description

- The EFM160N02D is the high cell density trenched
- N-ch MOSFETs which provide excellent
- RDSON and gate cherge for most of the
- synchronous buck converter applications.
- The EFM160N02D meet the RoHS and Green
- Prod uct requirement, 100 % EAS guaranteed
- with full function reliability approved.



TO-252-2L

•Application

- Super Low Gate Charge 100% EAS Guaranteed
- Green Device Available Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

•Ordering Information:

Part NO.	EFM160N02D
Marking	160N02D ******
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	±12	V
Drain Current-Continuous	I_D	20	A
Drain Current-Pulsed (Note 1)	I_{DM}	40	A
Maximum Power Dissipation	P_D	5	W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

•Thermal Characteristic

Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{\theta JA}$	62	℃/W

● Static Electrical Characteristics @ T_J = 25°C (unless otherwise stated)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250uA	20	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=20V V_{GS}=0V	--	--	1	nA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±12V V_{DS}=0V	--	--	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS} I_D=250uA	0.4	0.8	1.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=4.5V I_D=10A	--	16	24	mΩ
		V_{GS}=2.5V I_D=6A	--	22	30	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V I_D=15A	--	22	--	S
Gate Resistance	Rg	F=1.0MHz	--	2.5	--	Ω
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=15V V_{GS}=0V F=1.0MHz	--	472	--	PF
Output Capacitance	C_{oss}		--	71	--	PF
Reverse Transfer Capacitance	C_{rss}		--	55	--	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V I_D=15A V_{GS}=4.5V R_G=3.3Ω,	--	4	--	nS
Turn-on Rise Time	t_r		--	7.6	--	nS
Turn-Off Delay Time	$t_{d(off)}$		--	21	--	nS
Turn-Off Fall Time	t_f		--	4	--	nS
Total Gate Charge	Q_g	V_{DS}=15V I_D=15A V_{GS}=4.5V	--	6.2	--	nC
Gate-Source Charge	Q_{gs}		--	2.4	--	nC
Gate-Drain Charge	Q_{gd}		--	2.5	--	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V I_S=1A	--	--	1.2	V
Diode Forward Current (Note 2)	I_S		--	--	20	A

Note :
1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.The EAS data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=21A
4.The power dissipation is limited by 150℃ junction temperature
5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

• Typical Characteristics

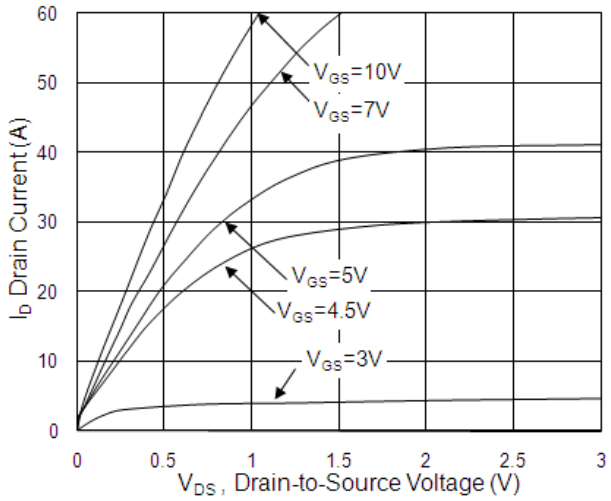


Fig.1 Typical Output Characteristics

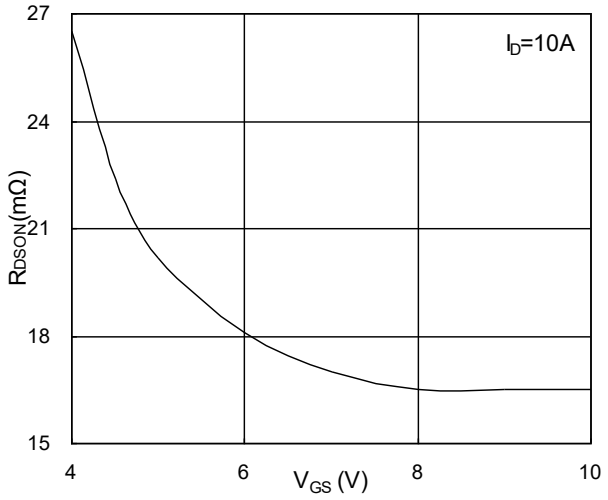


Fig.2 On-Resistance v.s Gate-Source

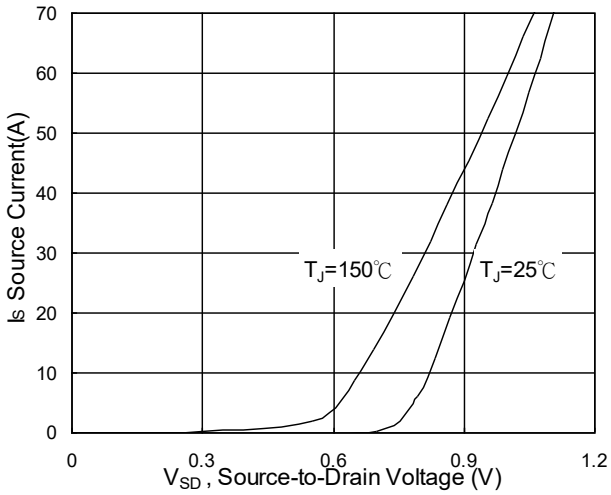


Fig.3 Forward Characteristics Of Reverse

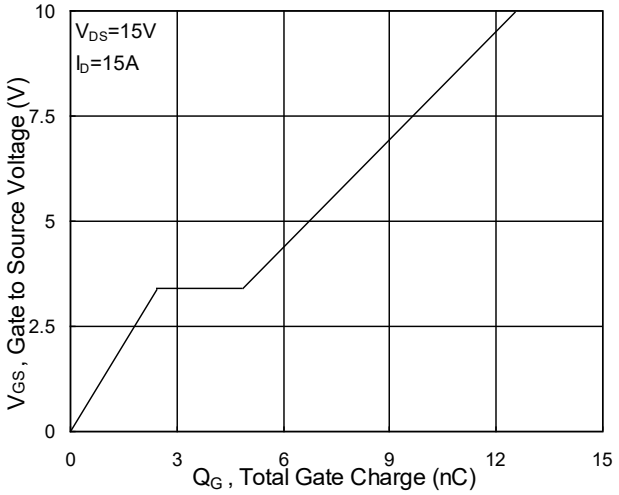


Fig.4 Gate-Charge Characteristics

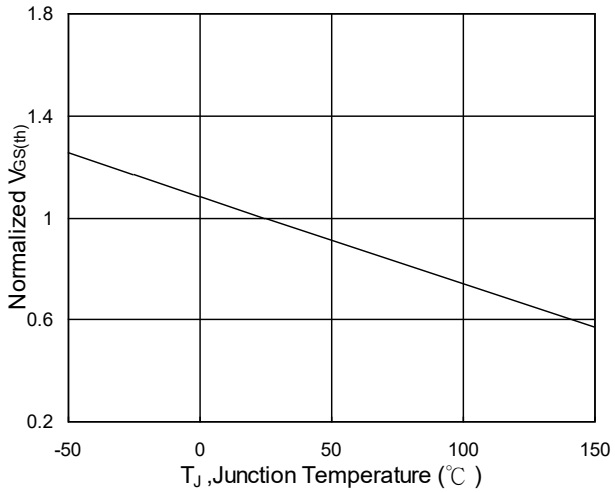


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

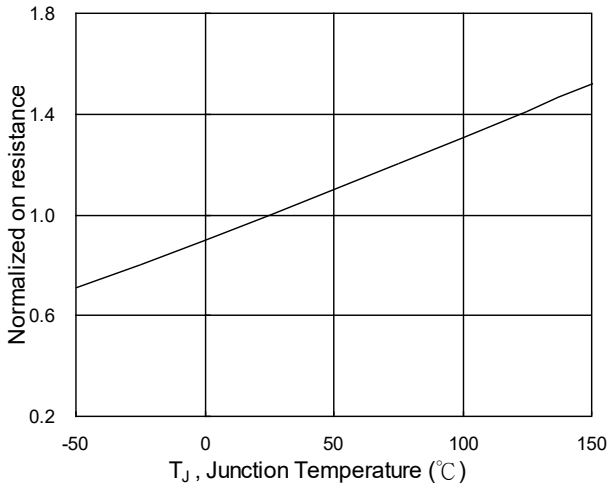


Fig.6 Normalized R_{DSON} v.s T_J

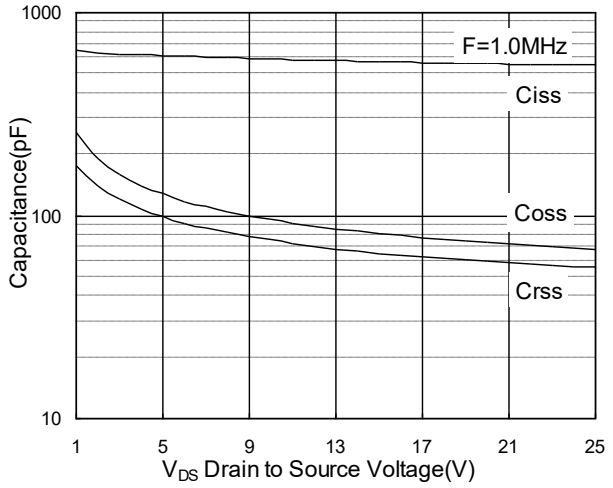


Fig.7 Capacitance

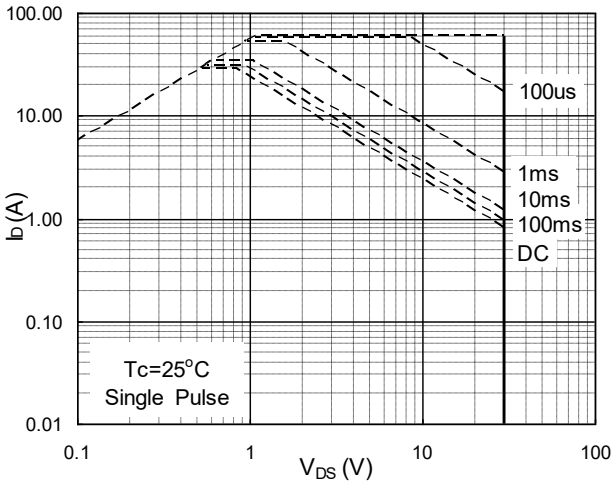


Fig.8 Safe Operating Area

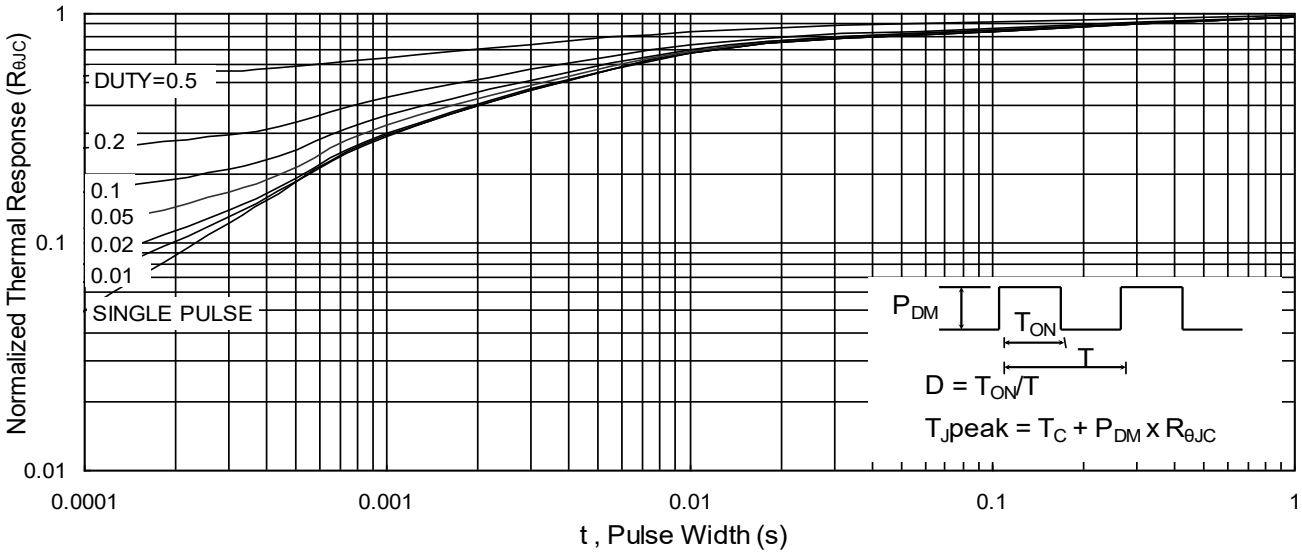


Fig.9 Normalized Maximum Transient Thermal Impedance

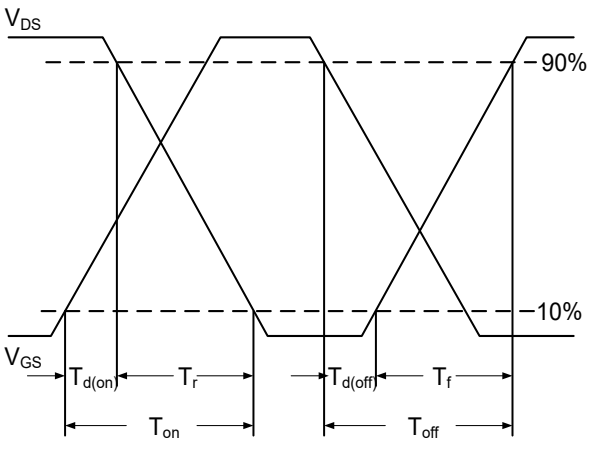


Fig.10 Switching Time Waveform

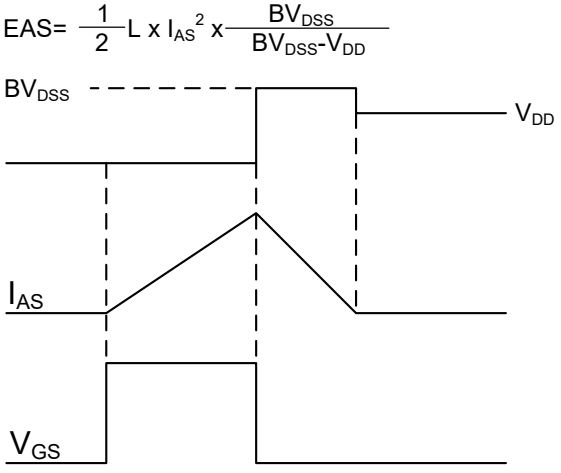
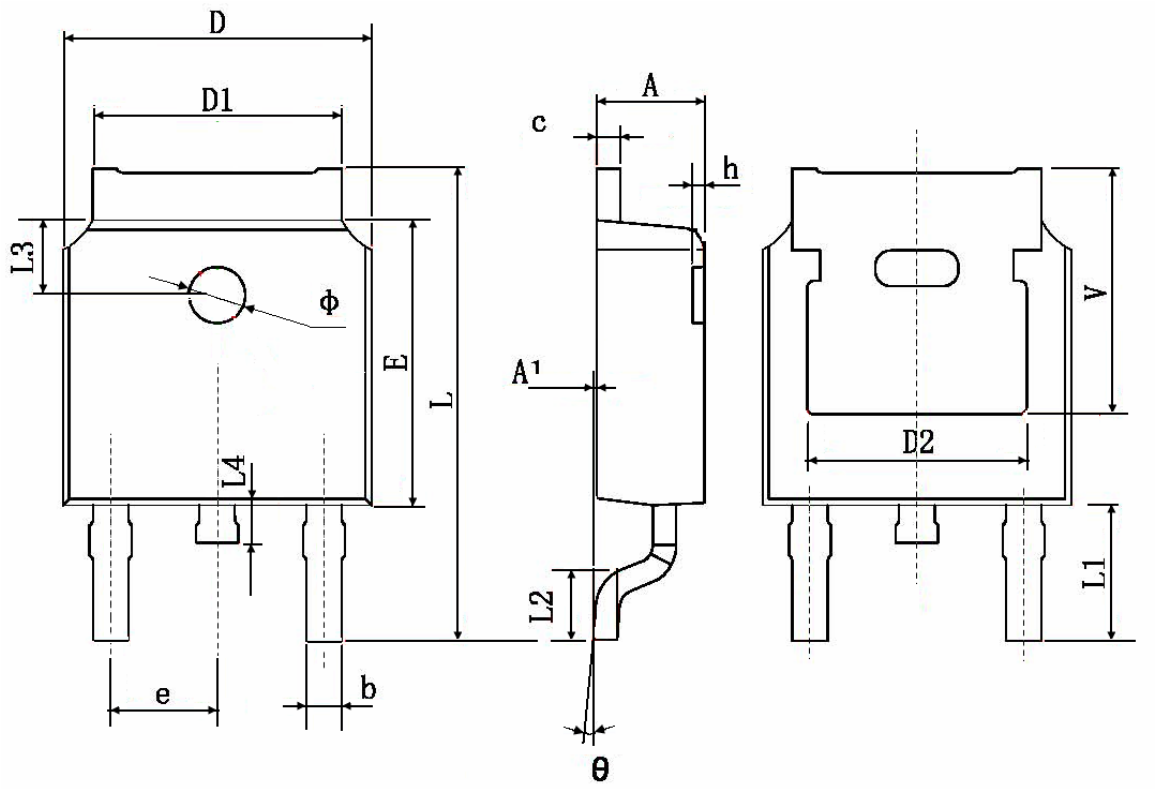


Fig.11 Unclamped Inductive Switching Waveform

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.83 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	