Description

The VSM42NP04 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge . The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

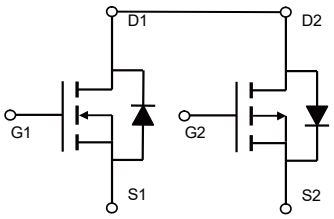
General Features

- **N-Channel**
  V_{DS} =40V,I_D =42A
  $R_{DS(ON)}$ < 12mΩ @ V_{GS}=10V
  $R_{DS(ON)}$ < 18mΩ @ V_{GS}=4.5V

- **P-Channel**
  V_{DS} =-40V,I_D = -42A
  $R_{DS(ON)}$ < 13mΩ @ V_{GS}=-10V
  $R_{DS(ON)}$ < 19mΩ @ V_{GS}=-4.5V

- High power and current handing capability
- Lead free product is acquired
- Surface mount package

TO-252-4L



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM42NP04	VSM42NP04-T2-4	TO-252-4L	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	40	-40	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current	T_C=25℃	I_D	42	-42	A
	T_C=70℃		38	-38	
Pulsed Drain Current (Note 1)		I_{DM}	168	-168	A
Maximum Power Dissipation	T_C=25℃	P_D	50	50	W
Single pulse avalanche energy (Note 5)		E_{AS}	116	144	mJ
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note2)	$R_{\theta JC}$	N-Ch	2.5	℃/W
Thermal Resistance,Junction-to-Case(Note2)	$R_{\theta JC}$	P-Ch	2.5	℃/W

N-CH Electrical Characteristics (T_C=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.0	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	9.8	12	mΩ
		V_{GS}=4.5V, I_D=15A	-	13.5	18	mΩ
Forward Transconductance	g_{FS}	V_{DS}=15V,I_D=20A	-	42	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	1150	-	pF
Output Capacitance	C_{oss}		-	135	-	pF
Reverse Transfer Capacitance	C_{rss}		-	125	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V,R_L=1Ω V_{GS}=10V,R_G=3Ω	-	6	-	nS
Turn-on Rise Time	t_r		-	17	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	17	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A, V_{GS}=10V	-	32.5	-	nC
Gate-Source Charge	Q_{gs}		-	3.6	-	nC
Gate-Drain Charge	Q_{gd}		-	9.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=20A	-	-	1.2	V

P-CH Electrical Characteristics (T_C=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250μA	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-40V,V_{GS}=0V	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1.2	-1.9	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}= -10V, I_D=-20A	-	10.2	13	mΩ
		V_{GS}= -4.5V, I_D=-10A	-	14.3	19	mΩ
Forward Transconductance	g_{FS}	V_{DS}= -5V,I_D=-20A	-	20	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=-20V,V_{GS}=0V, F=1.0MHz	-	2214	-	pF
Output Capacitance	C_{oss}		-	242	-	pF
Reverse Transfer Capacitance	C_{rss}		-	235	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-20V,I_D=-20A V_{GS}=-10V,R_G=3Ω	-	10	-	nS
Turn-on Rise Time	t_r		-	18	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	45	-	nS
Turn-Off Fall Time	t_f		-	26	-	nS
Total Gate Charge	Q_g	V_{DS}=-20V,I_D=-20A, V_{GS}=-10V	-	52.4	-	nC
Gate-Source Charge	Q_{gs}		-	6.0	-	nC
Gate-Drain Charge	Q_{gd}		-	14.7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-20A	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : Tj=25℃,N: V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω. P: V_{DD}=-30V,V_G=-10V,L=0.5mH,Rg=25Ω.

N- Channel Typical Electrical and Thermal Characteristics (Curves)

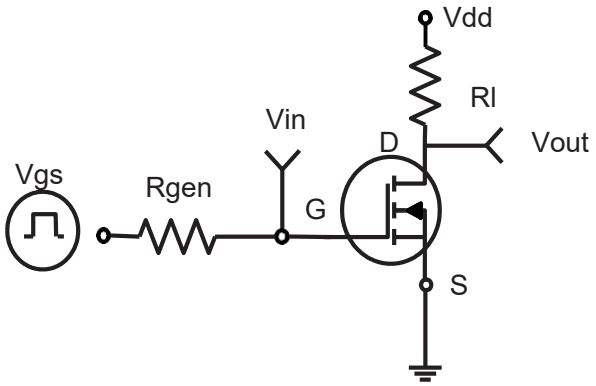


Figure 1:Switching Test Circuit

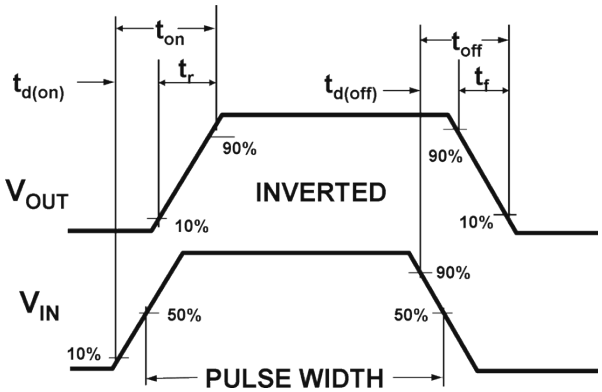


Figure 2:Switching Waveforms

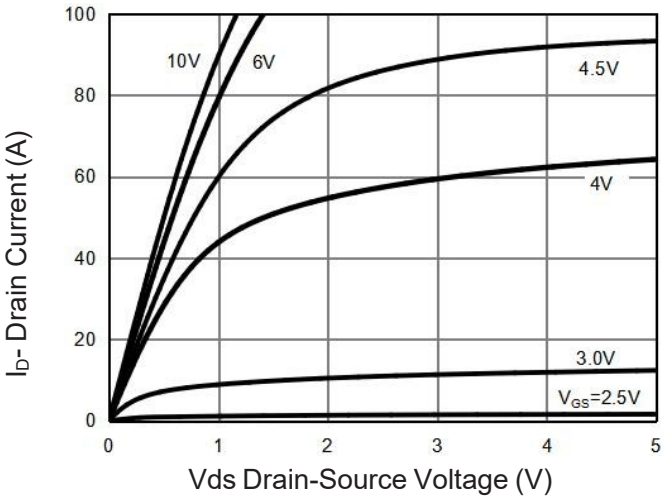


Figure 3 Output Characteristics

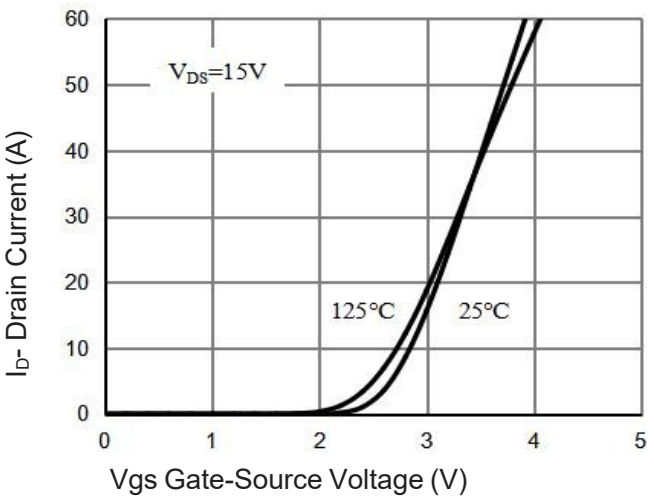


Figure 4 Transfer Characteristics

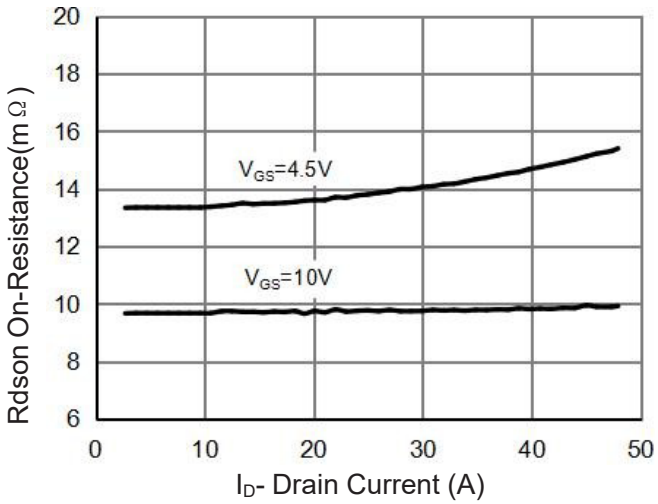


Figure 5 Drain-Source On-Resistance

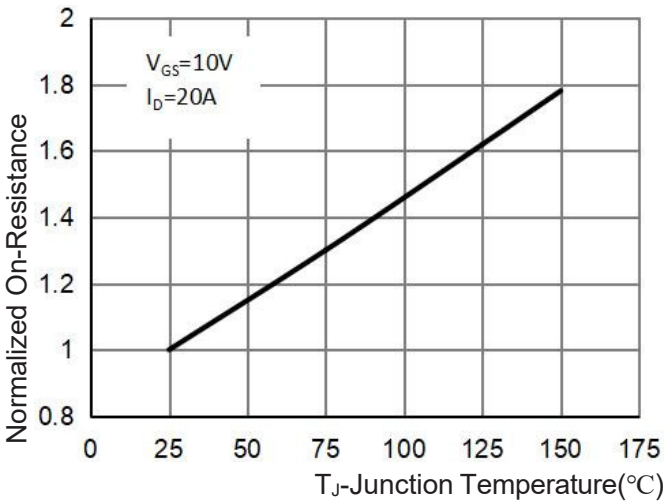


Figure 6 Drain-Source On-Resistance

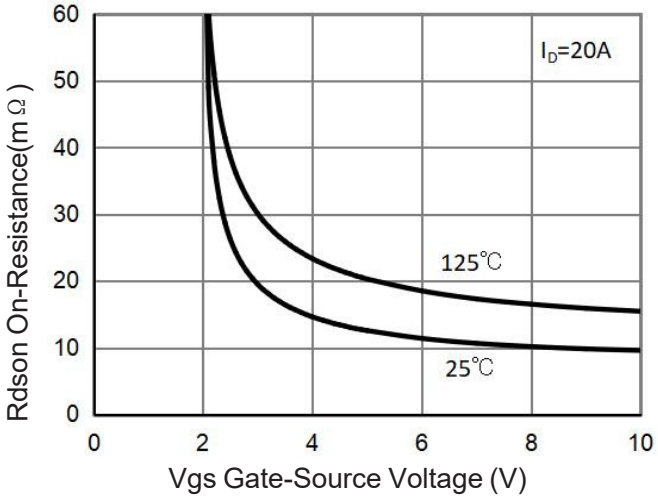


Figure7 Rdson vs Vgs

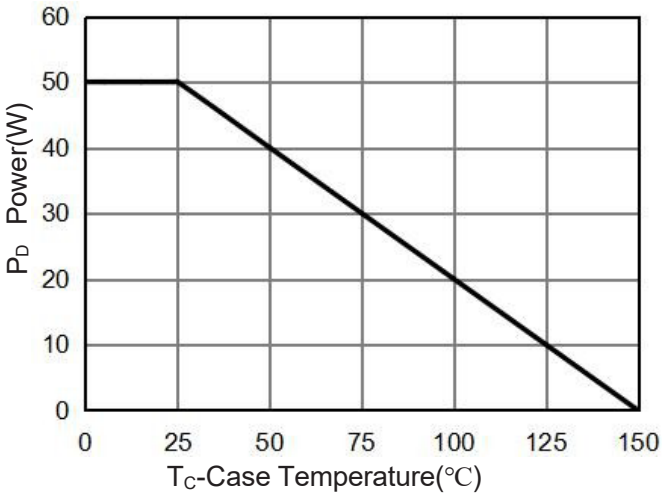


Figure 8 Power Dissipation

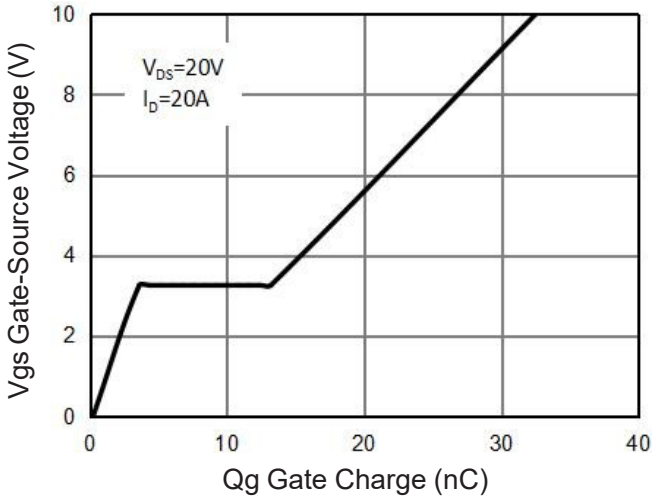


Figure 9 Gate Charge

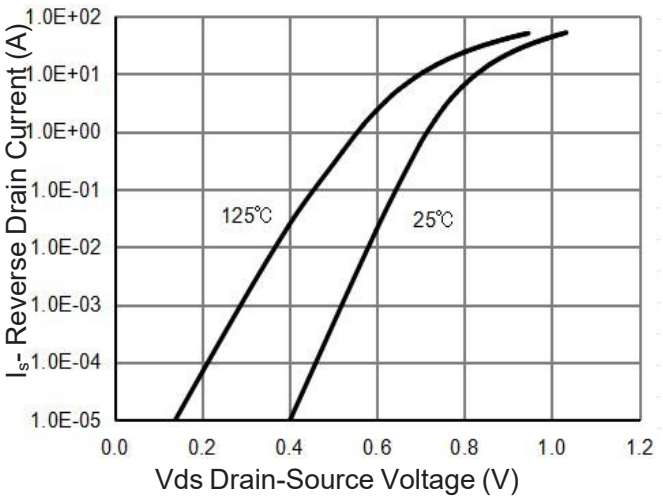


Figure 10 Source- Drain Diode Forward

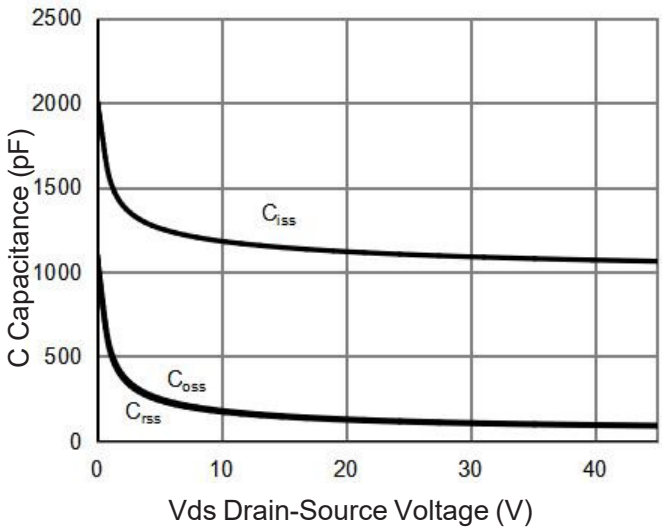


Figure 11 Capacitance vs Vds

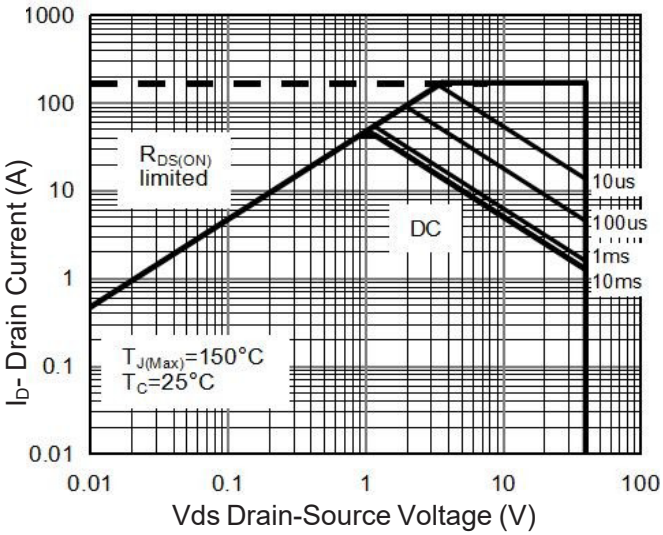


Figure 12 Safe Operation Area

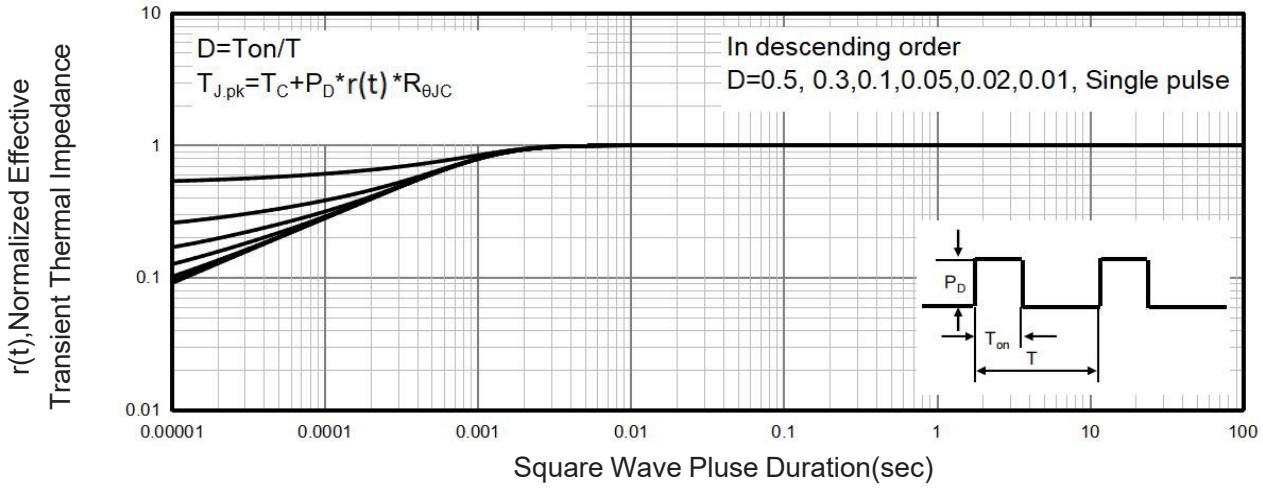


Figure 13 Normalized Maximum Transient Thermal Impedance

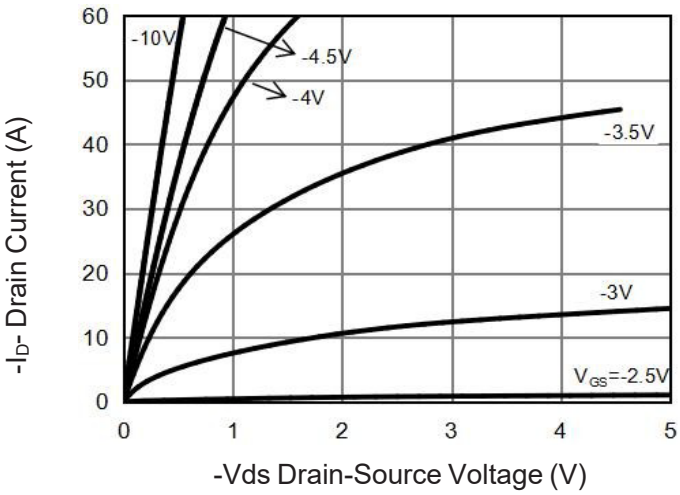


Figure 1 Output Characteristics

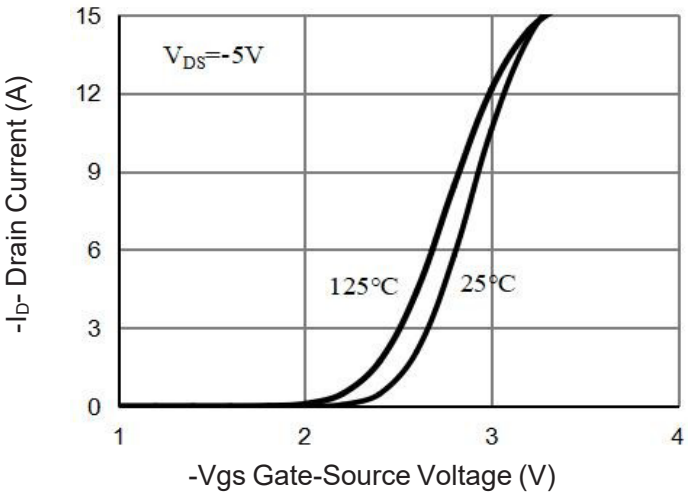


Figure 2 Transfer Characteristics

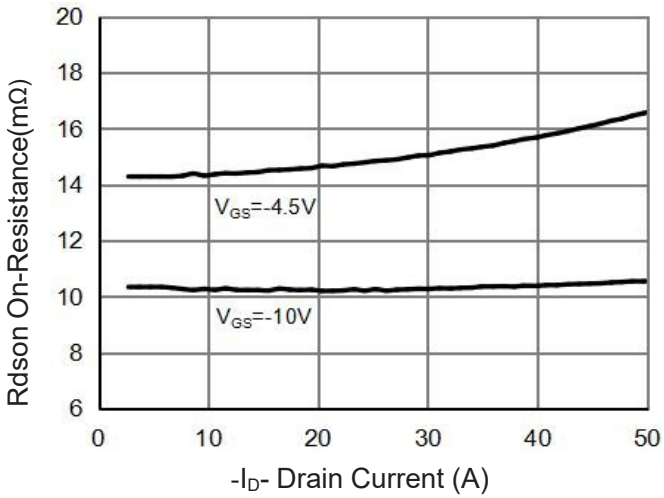


Figure 3 Rdson- Drain Current

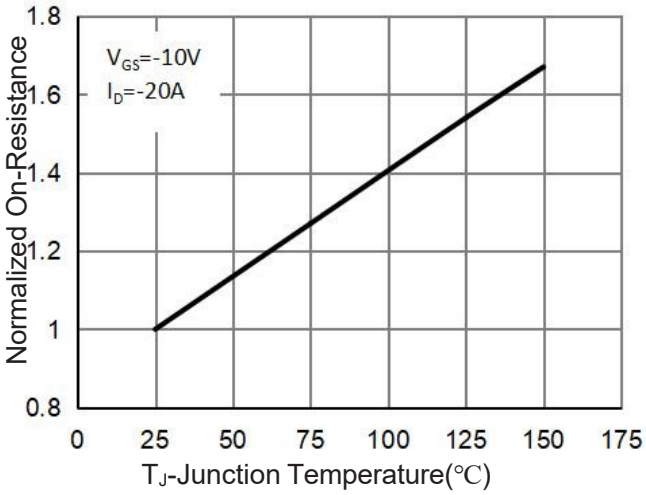


Figure 4 Rdson-Junction Temperature

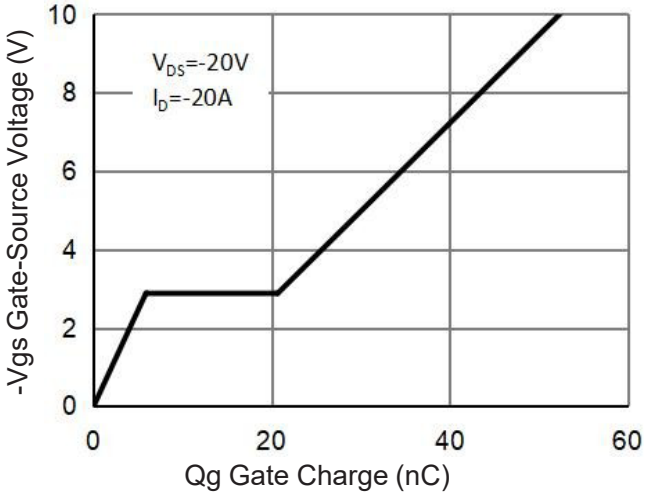


Figure 5 Gate Charge

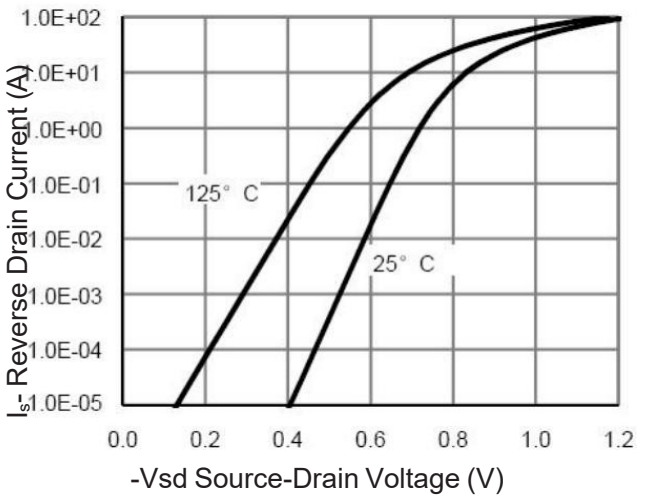


Figure 6 Source- Drain Diode Forward

-Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds

T_C-Case Temperature(℃)

Figure 9 Power Dissipation

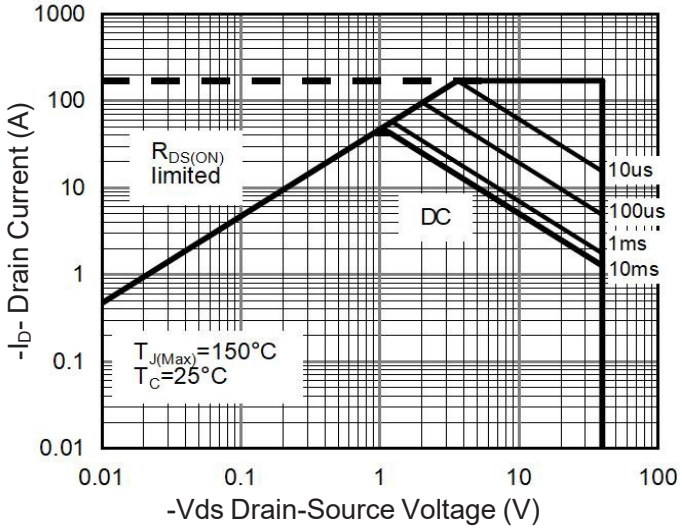


Figure 8 Safe Operation Area

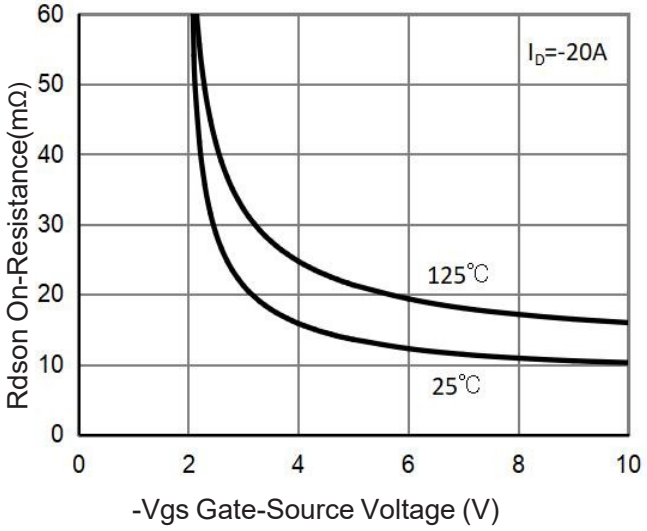


Figure10 Rdson vs Vgs

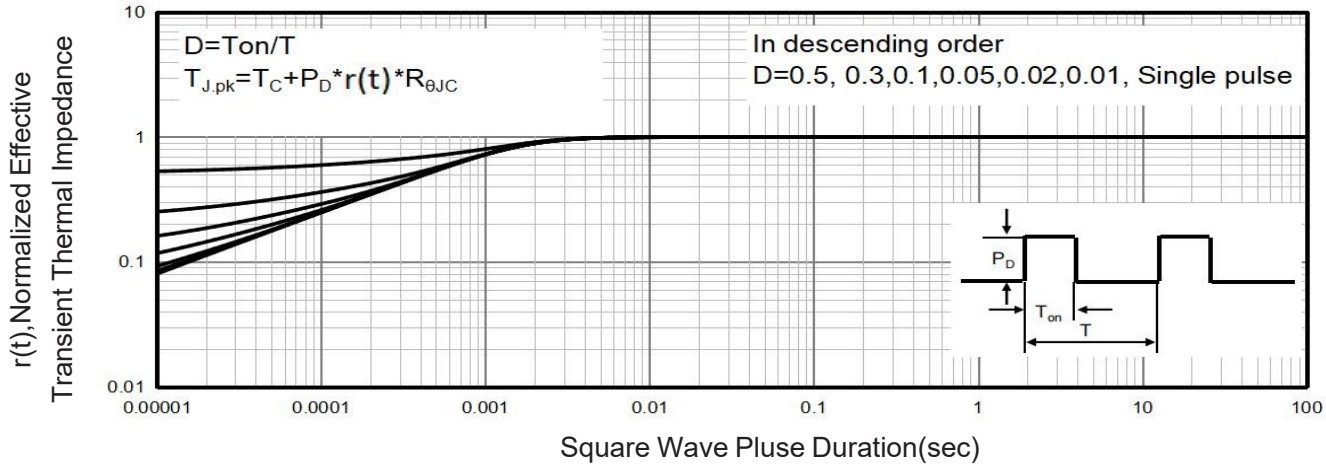
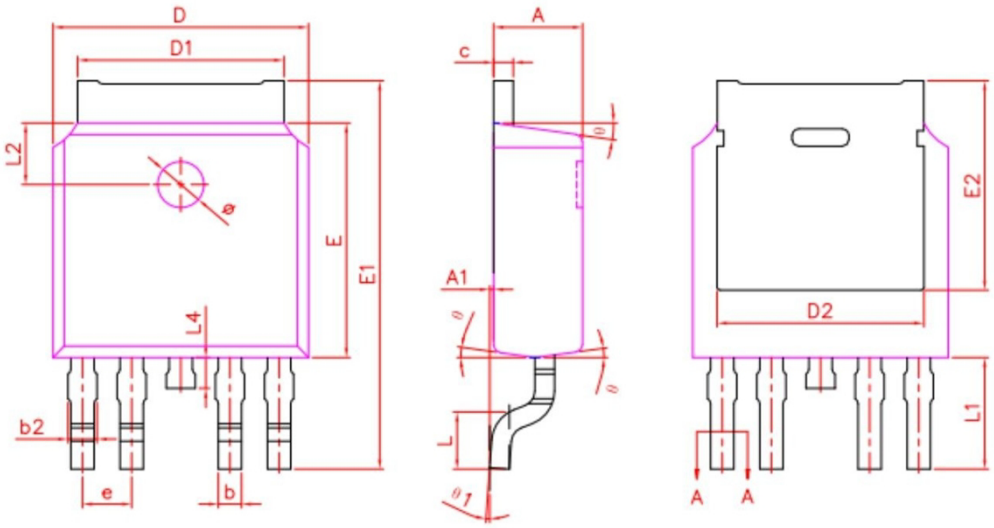
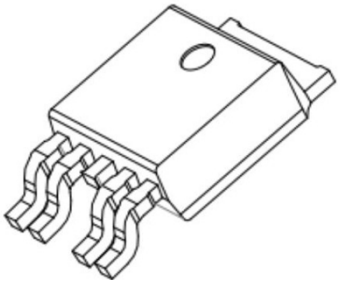
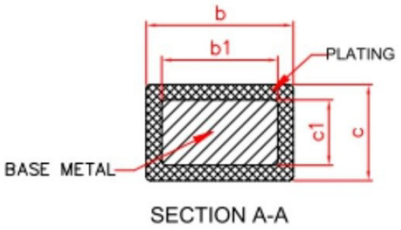


Figure 11 Normalized Maximum Transient Thermal Impedance







TO252-4L			
DIM.	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
A1	0.00	0.08	0.13
b	0.50	0.60	0.70
b1	0.57	0.60	0.63
b2		0.75REF	
c	0.46	0.508	0.58
c1	0.50	0.508	0.52
D	6.50	6.60	6.70
D1	5.10	5.334	5.46
D2		5.346REF	
E	6.00	6.10	6.20
E1	9.80	10.10	10.40
E2		5.446REF	
e	1.17	1.27	1.37
L	1.40	1.50	1.70
L1		2.90REF	
L2		1.60REF	
L4	0.60	0.80	1.00
ø	ø1.10	ø1.20	ø1.30
Θ	5°	8°	10°
Θ1	0°	–	8°
All dimensions in millimeters			