

Description

The VSM15NP06 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

N channel

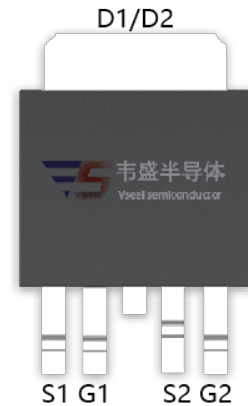
- $V_{DS}=60V, I_D=15A$
 $R_{DS(ON)} < 70m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 80m\Omega @ V_{GS}=4.5V$

p channel

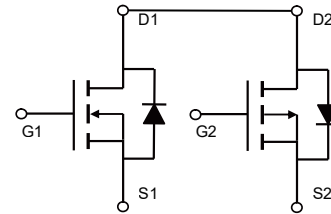
- $V_{DS}=-60V, I_D=-15A$
 $R_{DS(ON)} < 65m\Omega @ V_{GS}=-10V$
 $R_{DS(ON)} < 85m\Omega @ V_{GS}=-4.5V$
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

- H-bridge
- Inverters



TO-252-4L



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM15NP06	VSM15NP06-T2-4	TO-252-4L	-	-	-

Absolute Maximum Ratings ($T_C=25^\circ C$ unless otherwise noted)

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	60	-60	V
Gate-Source Voltage		V_{GS}	± 20	± 20	V
Continuous Drain Current	$T_C=25^\circ C$	I_D	15	-15	A
	$T_C=100^\circ C$		10.6	-10.6	
Pulsed Drain Current (Note 1)		I_{DM}	60	-60	A
Maximum Power Dissipation	$T_C=25^\circ C$	P_D	35		W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 175		$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	4.3	$^\circ C/W$
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N-Channel Electrical Characteristics (T_C=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, 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 =10A	-	54.5	70	mΩ
		V _{GS} =4.5V, I _D =10A		66	80	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =10A	8	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	844	-	PF
Output Capacitance	C _{Oss}		-	45	-	PF
Reverse Transfer Capacitance	C _{rss}		-	35	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, R _L =3Ω V _{GS} =10V, R _G =3Ω	-	5	-	nS
Turn-on Rise Time	t _r		-	2.6	-	nS
Turn-Off Delay Time	t _{d(off)}		-	16.1	-	nS
Turn-Off Fall Time	t _f		-	2.3	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =10A, V _{GS} =10V	-	20.8	-	nC
Gate-Source Charge	Q _{gs}		-	4.2	-	nC
Gate-Drain Charge	Q _{gd}		-	4.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =10A	-		1.2	V
Diode Forward Current (Note 2)	I _S		-	-	15	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =10A di/dt = 100A/μs(Note3)	-	29	-	nS
Reverse Recovery Charge	Q _{rr}		-	49	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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: T_J=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25Ω

N-Channel Typical Electrical and Thermal Characteristics (Curves)

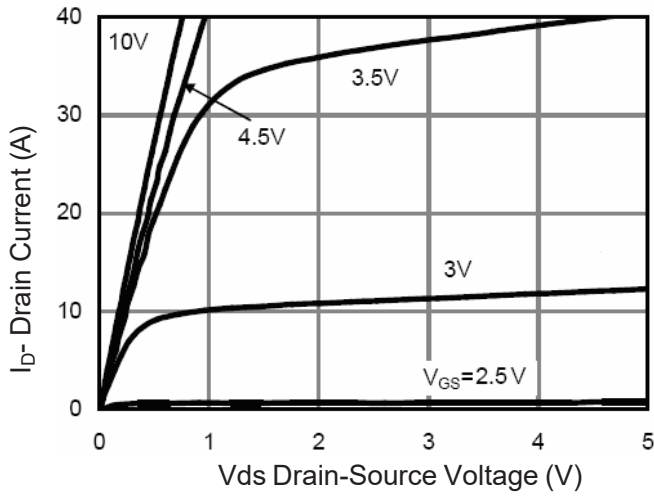


Figure 1 Output Characteristics

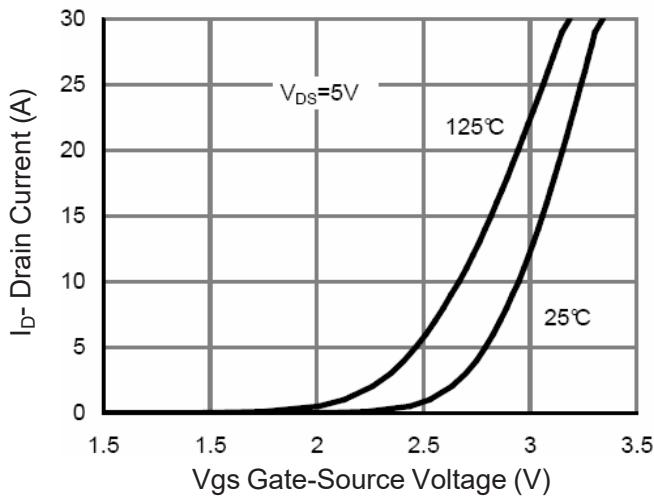


Figure 2 Transfer Characteristics

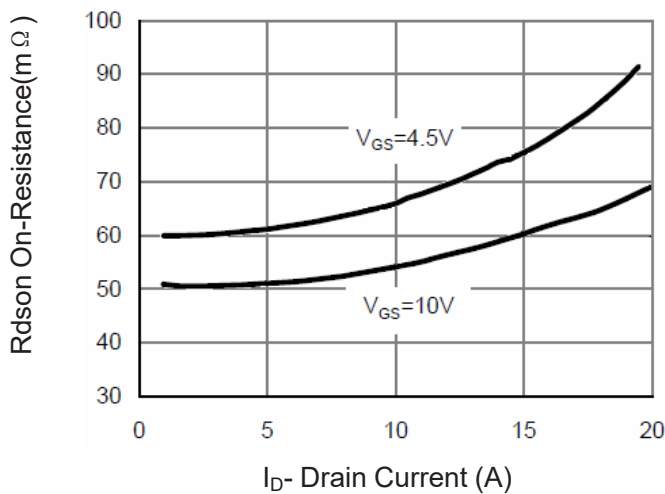


Figure 3 Rdson- Drain Current

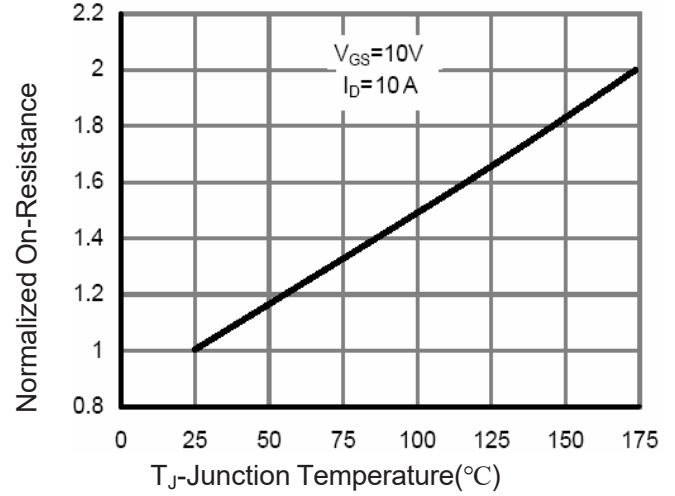


Figure 4 Rdson-Junction Temperature

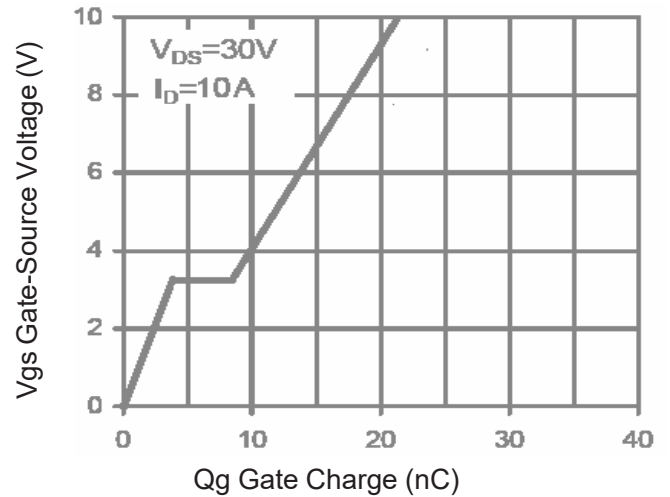


Figure 5 Gate Charge

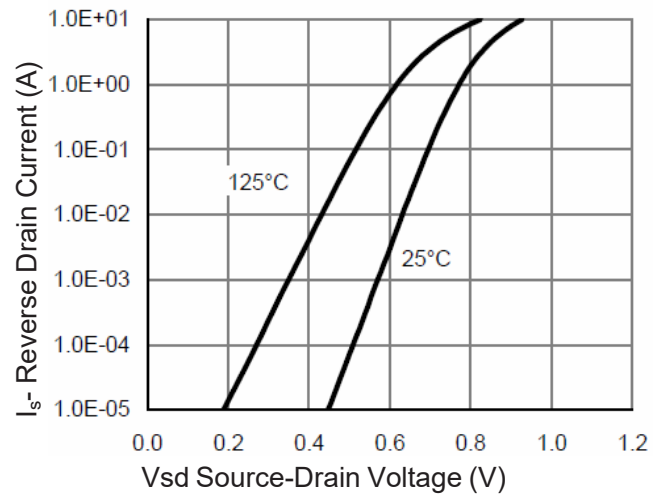
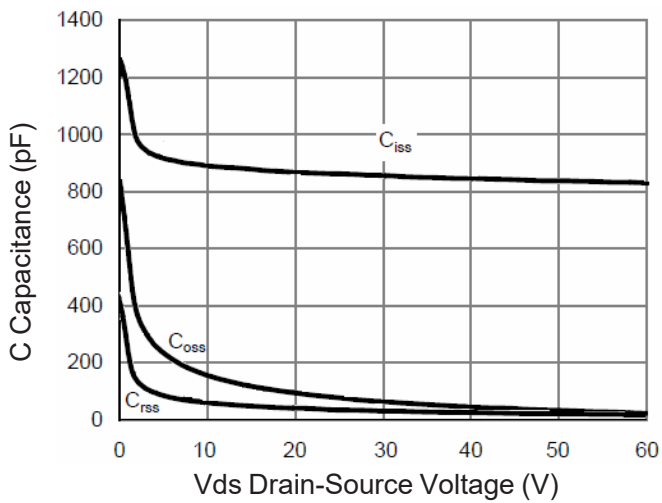
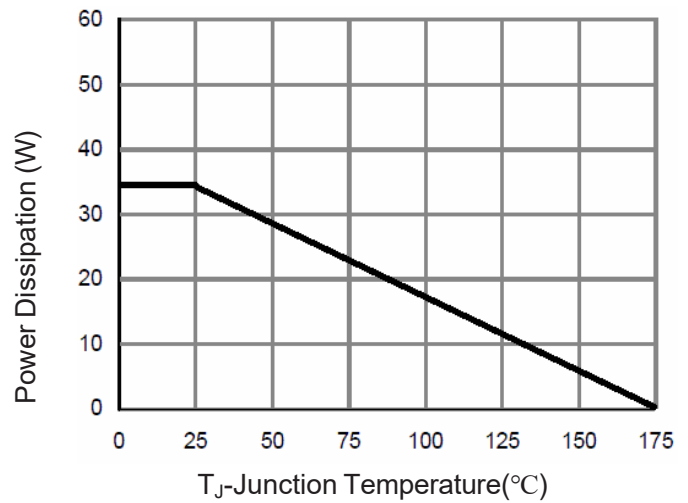
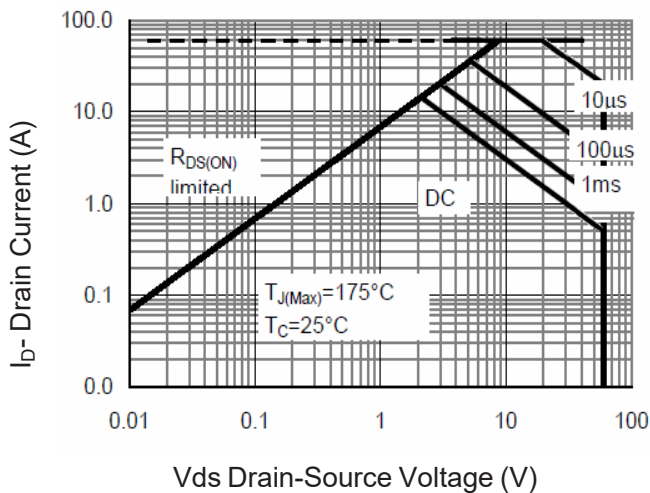
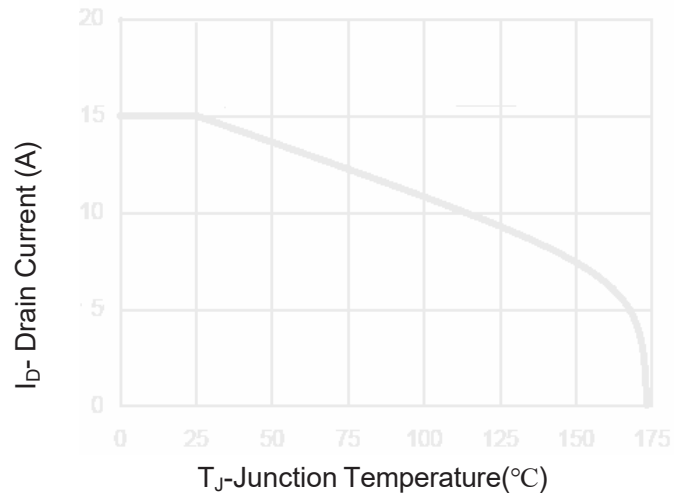
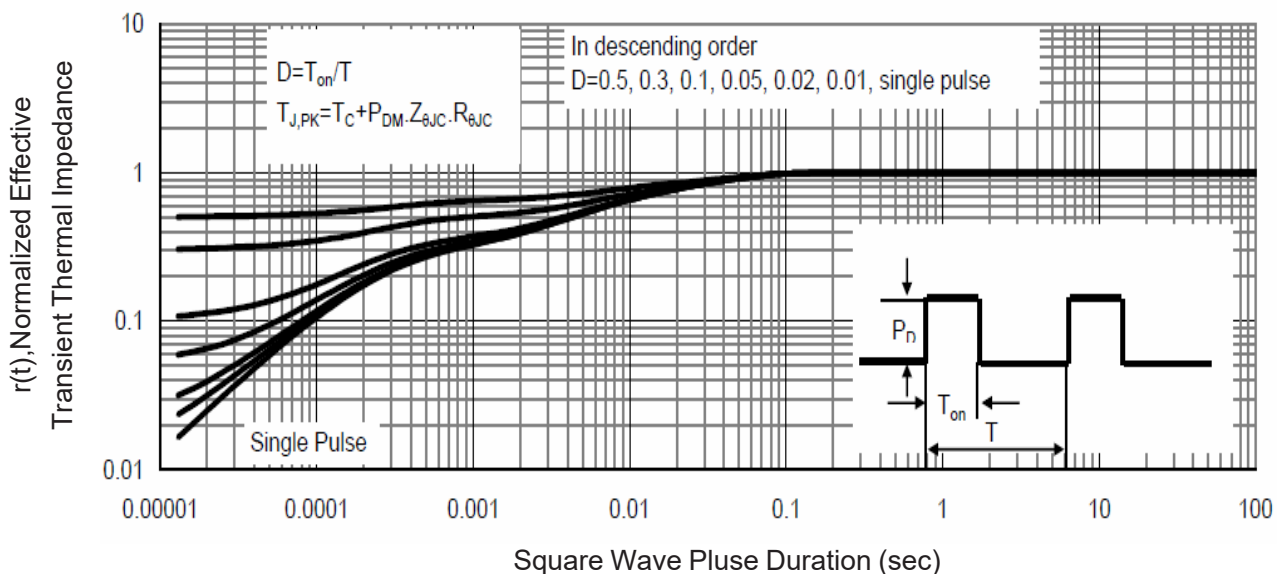


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 I_D Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance

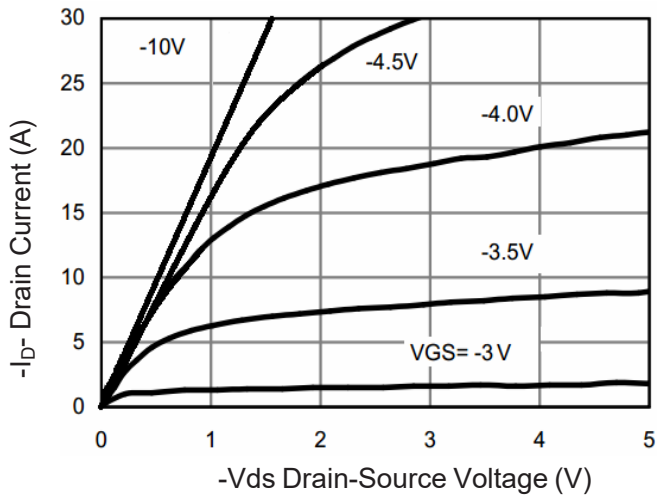
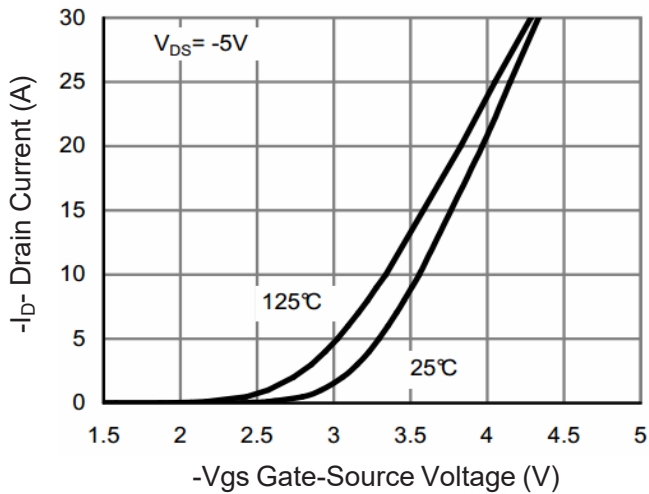
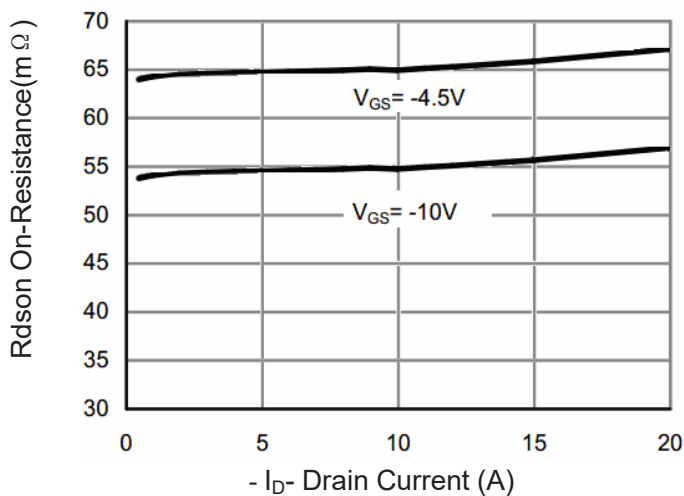
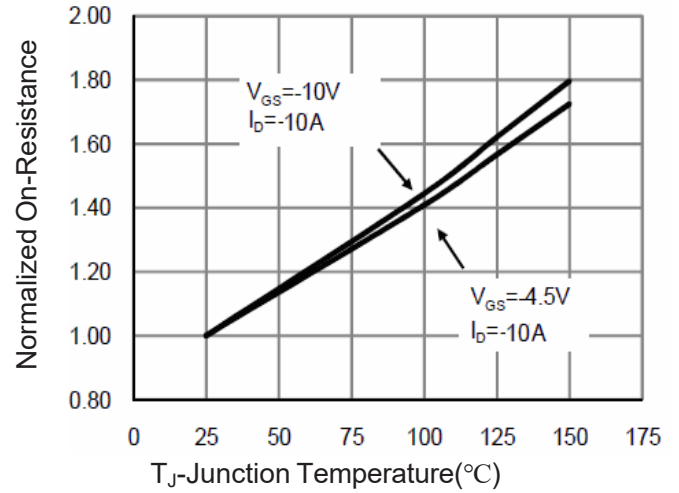
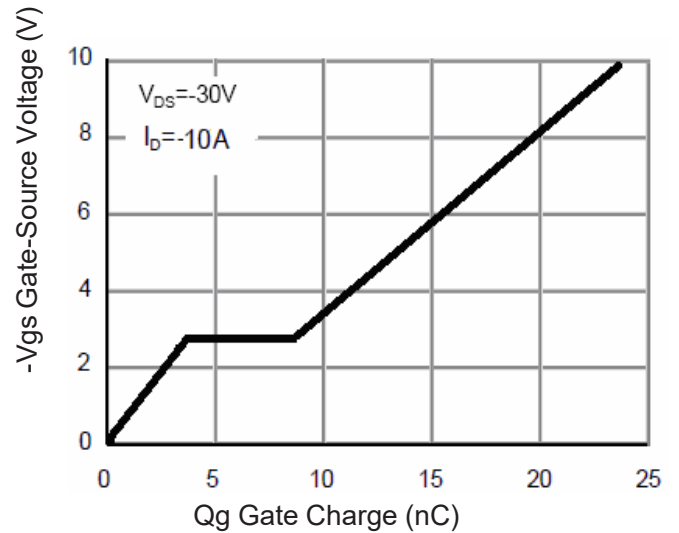
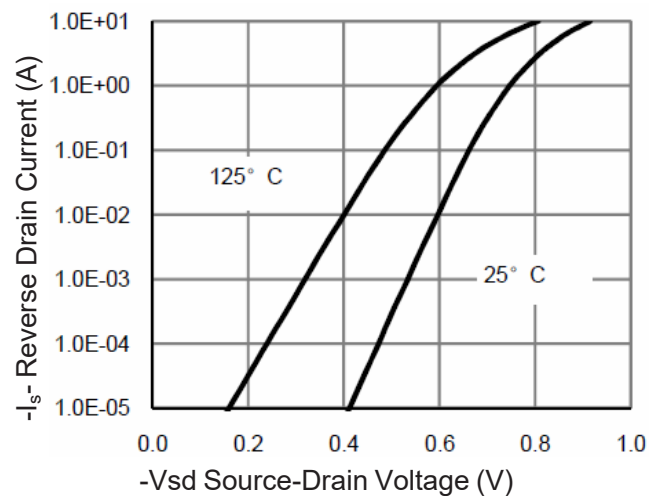
P-Channel Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

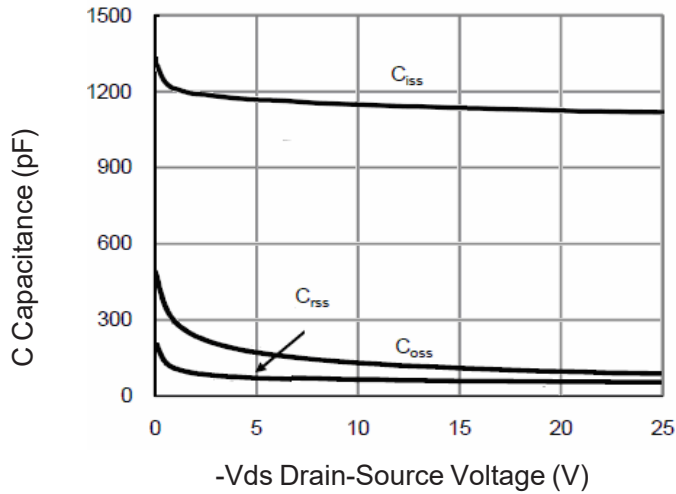
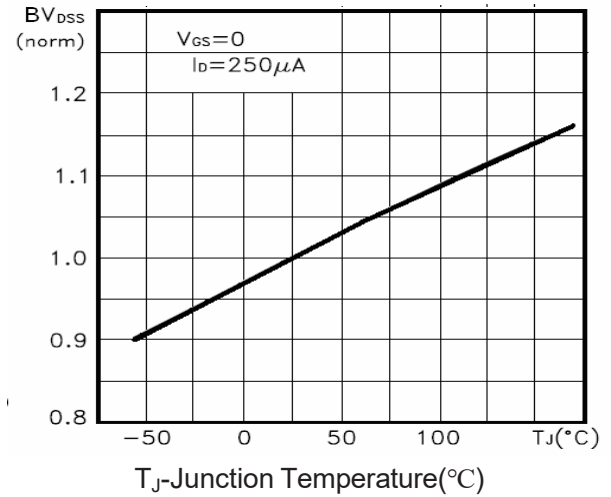
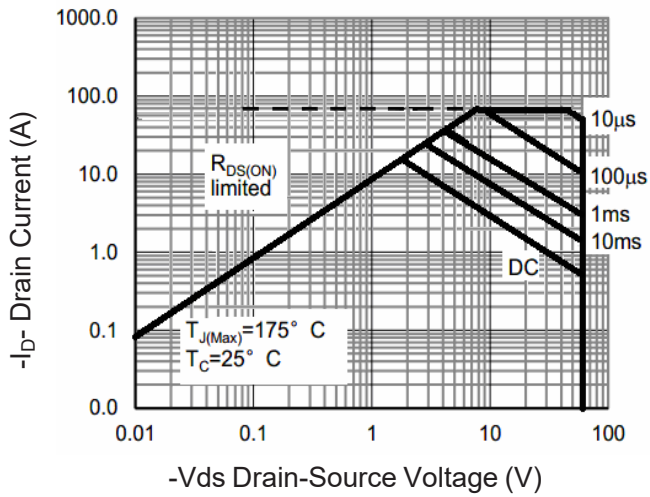
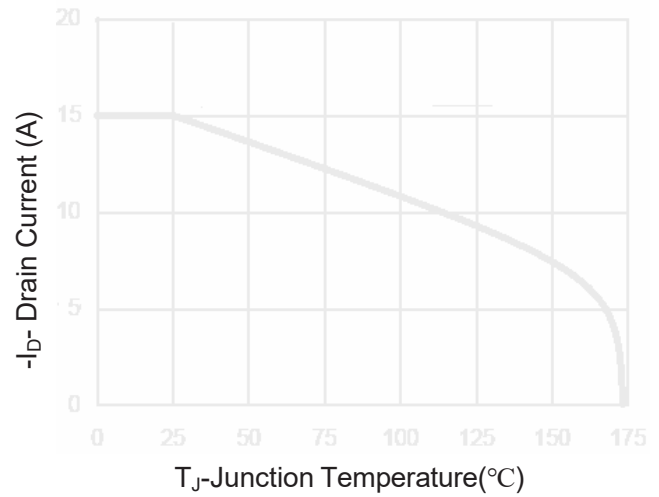
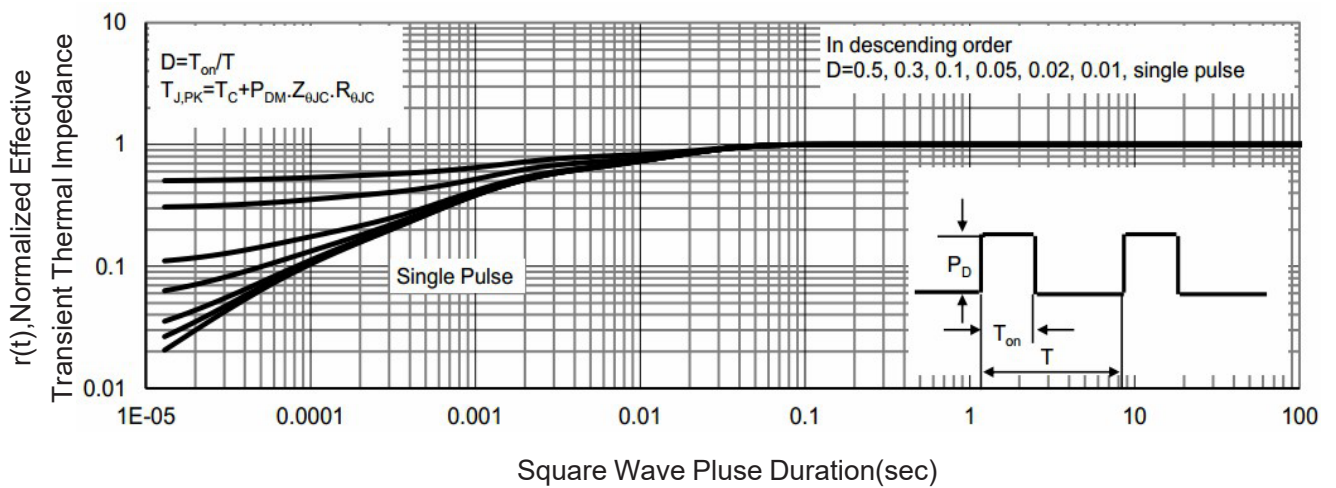
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	1.5	-2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-10A	-	55	65	mΩ
		V _{GS} =-4.5V, I _D =-10A	-	65	85	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-10A	-	15	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-30V, V _{GS} =0V, F=1.0MHz	-	1108	-	PF
Output Capacitance	C _{oss}		-	73.7	-	PF
Reverse Transfer Capacitance	C _{rss}		-	58.2	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V, R _L =3Ω, V _{GS} =-10V, R _G =3Ω	-	8	-	nS
Turn-on Rise Time	t _r		-	4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	32	-	nS
Turn-Off Fall Time	t _f		-	7	-	nS
Total Gate Charge	Q _g	V _{DS} =-30, I _D =-10A, V _{GS} =-10V	-	23.4	-	nC
Gate-Source Charge	Q _{gs}		-	4.1	-	nC
Gate-Drain Charge	Q _{gd}		-	4.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-10A	-		-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-15	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =- 10A	-	25		nS
Reverse Recovery Charge	Q _{rr}	di/dt = -100A/μs ^(Note3)	-	31		nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

P-Channel Typical Electrical and Thermal Characteristics (Curves)


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


Figure 7 Capacitance vs Vds

Figure 9 BV_{DSS} vs Junction Temperature

Figure 8 Safe Operation Area

Figure 10 I_D Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance