

Description

The VSM255N03 uses **Super Trench III** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . It includes two specialized MOSFETs in a dual Power DFN5x6 package.

General Features

Q1 "High Side" MOSFET

- $V_{DS} = 30V, I_D = 83A$
 $R_{DS(ON)} < 3.6m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 5.3m\Omega @ V_{GS} = 4.5V$

Q2 "Low Side" MOSFET

- $V_{DS} = 30V, I_D = 255A$
 $R_{DS(ON)} < 1.25m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 1.75m\Omega @ V_{GS} = 4.5V$

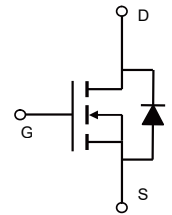
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb free terminal plating
- RoHS compliant
- Halogen free

Application

- Compact DC/DC converter applications



DFN5x6



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM255N03	VSM255N03-D56	DFN5x6	330mm	12mm	5000 units

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

Parameter	Symbol	Q1	Q2	Unit
Drain-Source Voltage	V_{DS}	30	30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Drain Current-Continuous	I_D	83	255	A
		52	161	A
Drain Current -Pulsed	I_{DM}	332	1020	A
Power Dissipation	P_D	40	130	W
Single pulse avalanche energy ^(Note1)	E_{AS}	68	332	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Q1)	$R_{\theta JC}$	3.13	$^\circ C/W$
Thermal Resistance, Junction-to-Case (Q2)	$R_{\theta JC}$	0.96	$^\circ C/W$

Q1 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	30	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =30V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.2	1.7	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	2.8	3.6	mΩ
		V _{GS} =4.5V, I _D =20A	-	3.9	5.3	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =20A	-	30	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, F=1.0MHz	-	1400	-	pF
Output Capacitance	C _{oss}		-	350	-	pF
Reverse Transfer Capacitance	C _{rss}		-	20	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =15V, I _D =20A V _{GS} =10V, R _G =1.6Ω	-	9	-	nS
Turn-on Rise Time	t _r		-	24	-	nS
Turn-Off Delay Time	t _{d(off)}		-	38	-	nS
Turn-Off Fall Time	t _f		-	11	-	nS
Total Gate Charge	Q _g	V _{DS} =15V, I _D =20A, V _{GS} =10V	-	23	-	nC
Gate-Source Charge	Q _{gs}		-	4.5	-	nC
Gate-Drain Charge	Q _{gd}		-	4	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current	I _S		-	-	83	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =40A	-	13	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	15	-	nC

Notes:

1. EAS condition : T_J=25°C, V_{DD}=15V, V_G=10V, L=0.1mH, R_G=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.

Q1 Typical Electrical and Thermal Characteristics

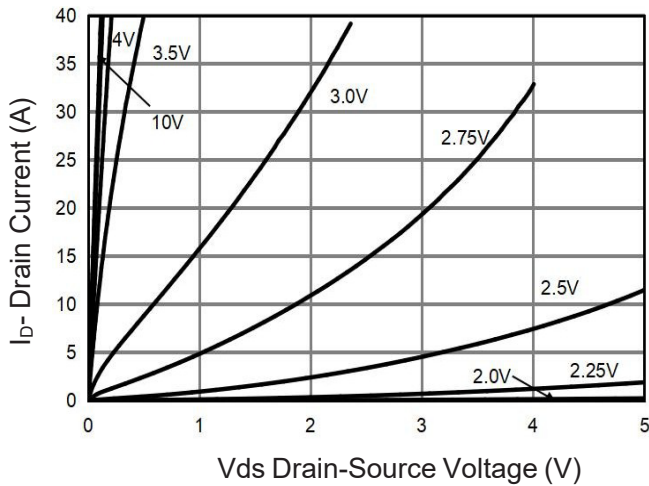


Figure 1 Output Characteristics

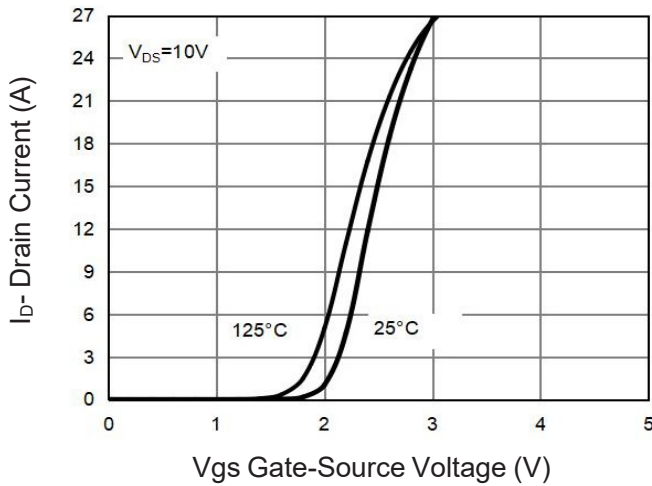


Figure 2 Transfer Characteristics

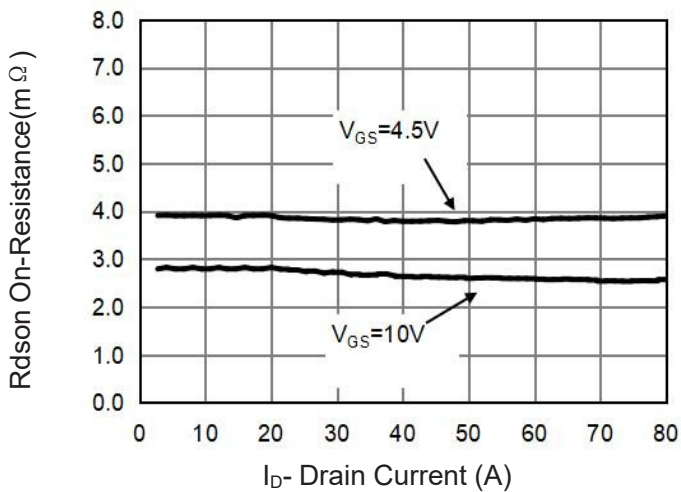


Figure 3 Rdson- Drain Current

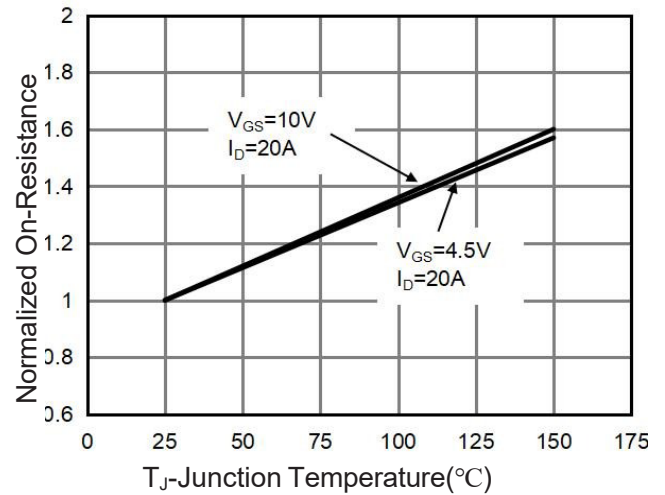


Figure 4 Rdson-Junction Temperature

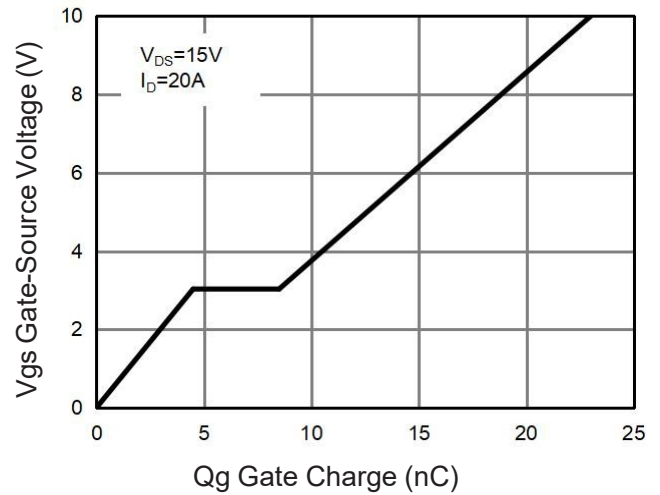


Figure 5 Gate Charge

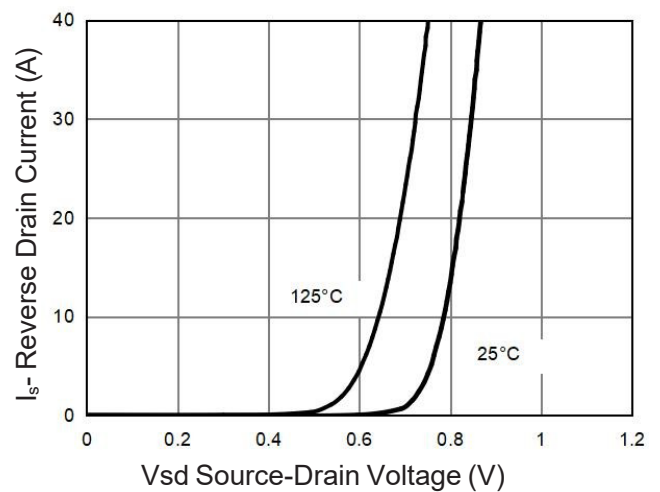
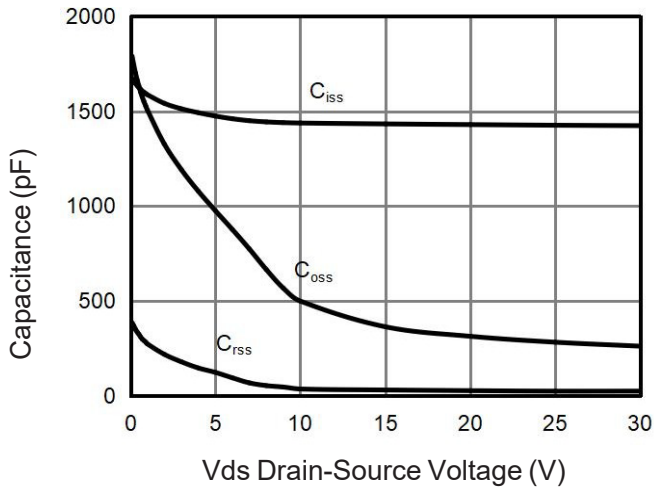
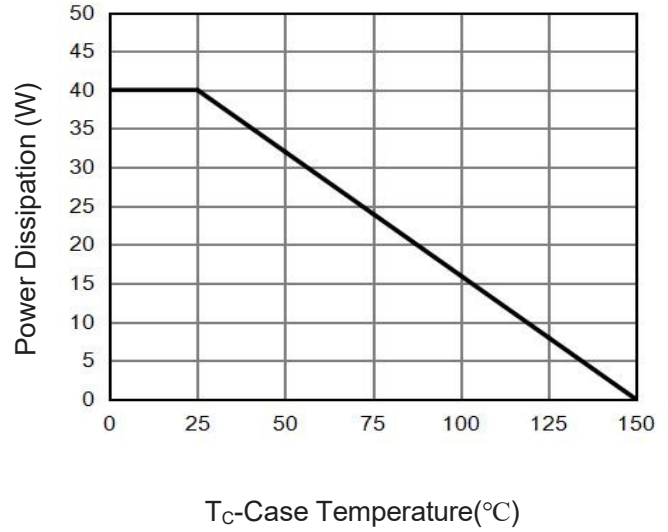
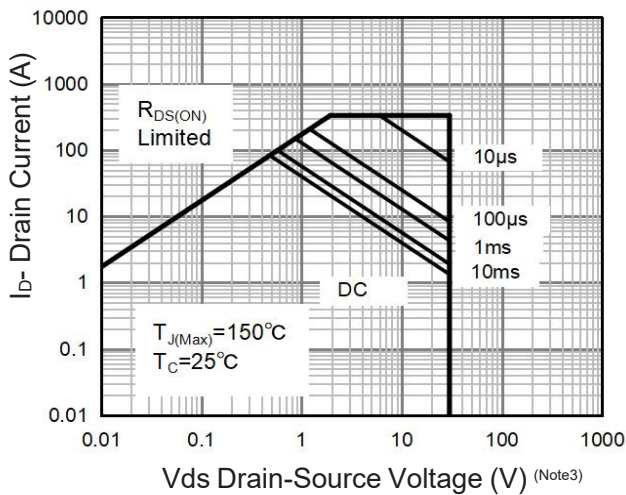
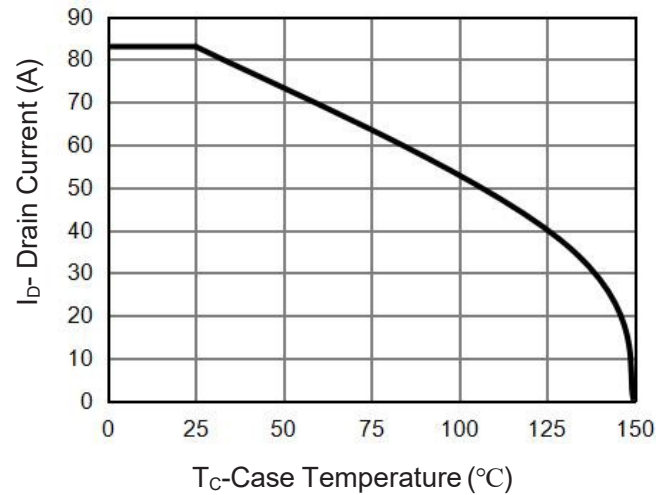
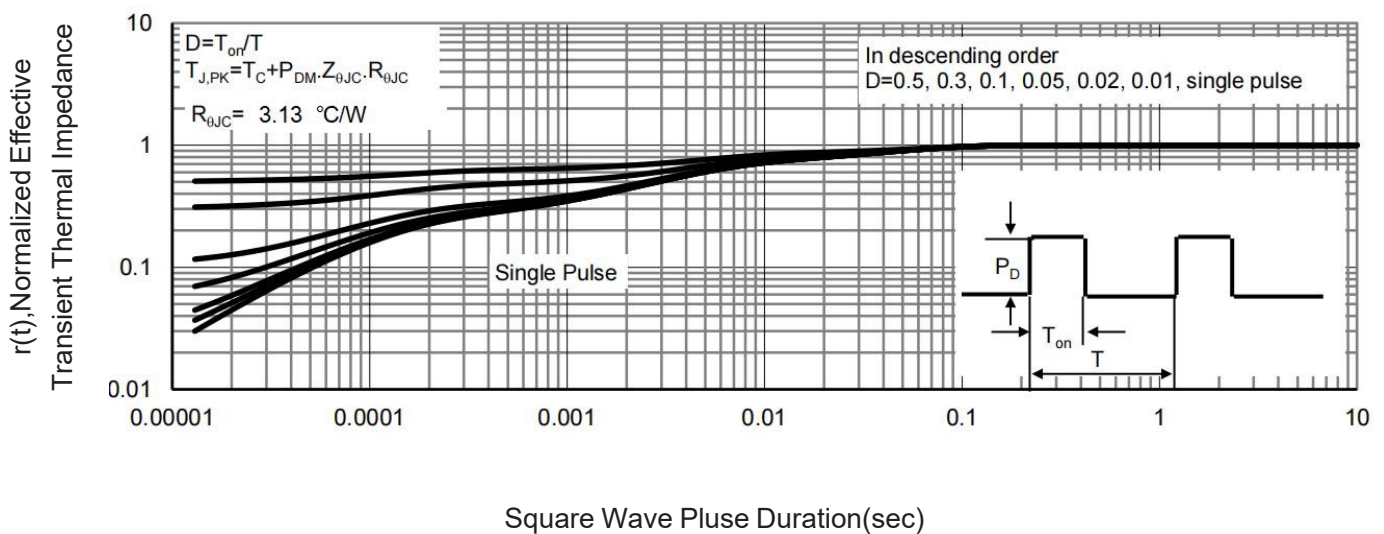


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance

Q2 Electrical Characteristics (TC=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	-	0.9	1.25	m Ω
		$V_{GS}=4.5V, I_D=20A$	-	1.2	1.75	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=20A$	-	35	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	4100	-	PF
Output Capacitance	C_{oss}		-	1100	-	PF
Reverse Transfer Capacitance	C_{rss}		-	45	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=20A$ $V_{GS}=10V, R_G=1.6\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	45	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	52	-	nS
Turn-Off Fall Time	t_f		-	20	-	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=20A,$ $V_{GS}=10V$	-	55	-	nC
Gate-Source Charge	Q_{gs}		-	11		nC
Gate-Drain Charge	Q_{gd}		-	8		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-		1.2	V
Diode Forward Current	I_S		-	-	255	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = 40A$ $di/dt = 100A/\mu s$	-	60	-	nS
Reverse Recovery Charge	Q_{rr}		-	80	-	nC

Notes:

1. Surface Mounted on FR4 Board, $t \leq 10$ sec.
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=150^\circ C$. The SOA curve provides a single pulse rating.

Q2 Typical Electrical and Thermal Characteristics

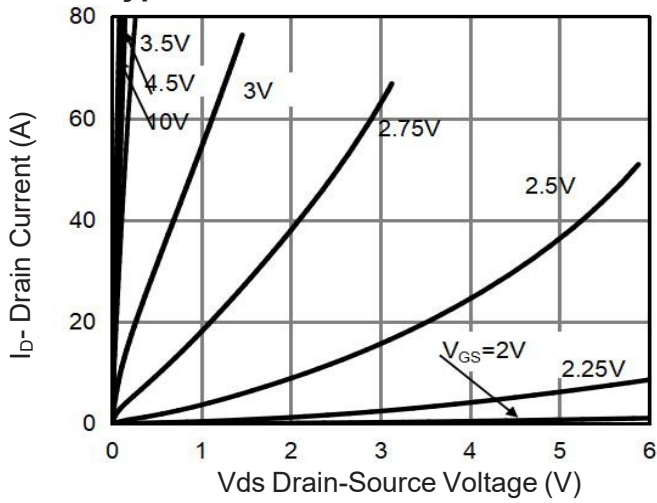


Figure 1 Output Characteristics

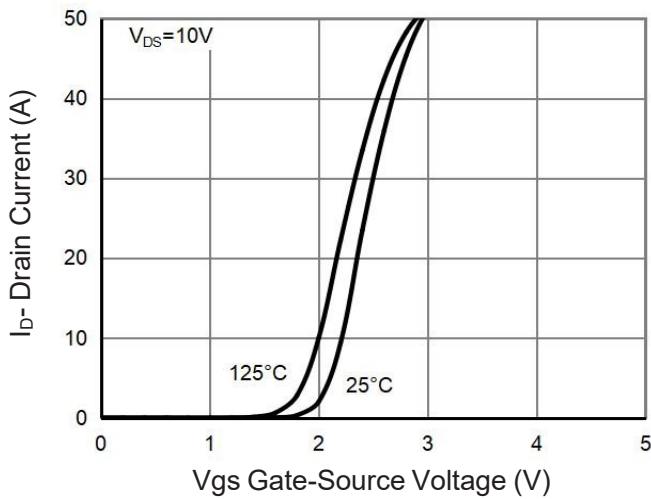


Figure 2 Transfer Characteristics

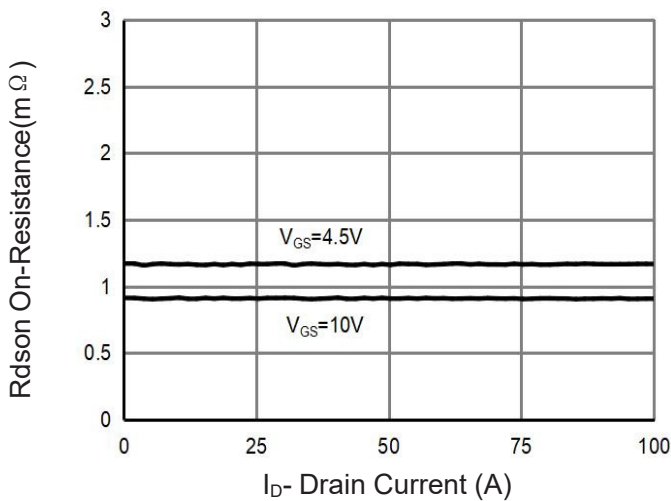


Figure 3 Rdson- Drain Current

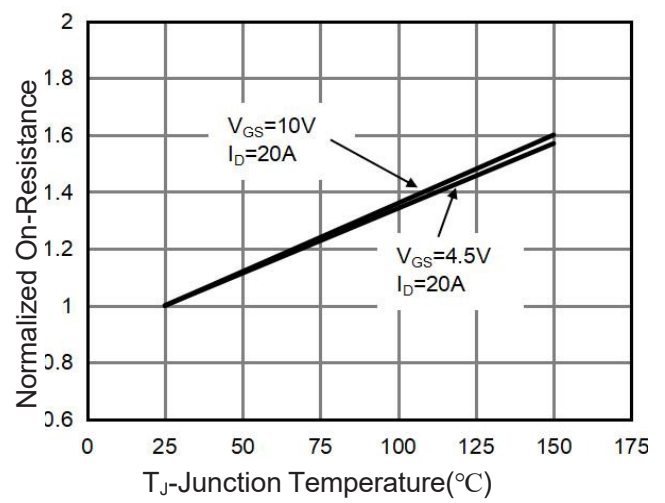


Figure 4 Rdson-Junction Temperature

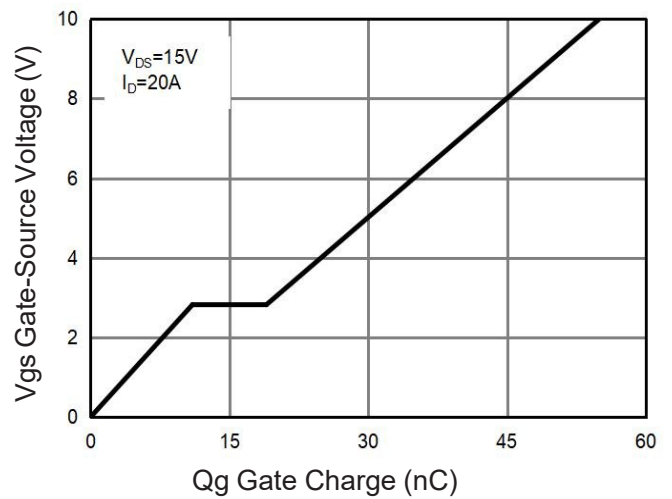


Figure 5 Gate Charge

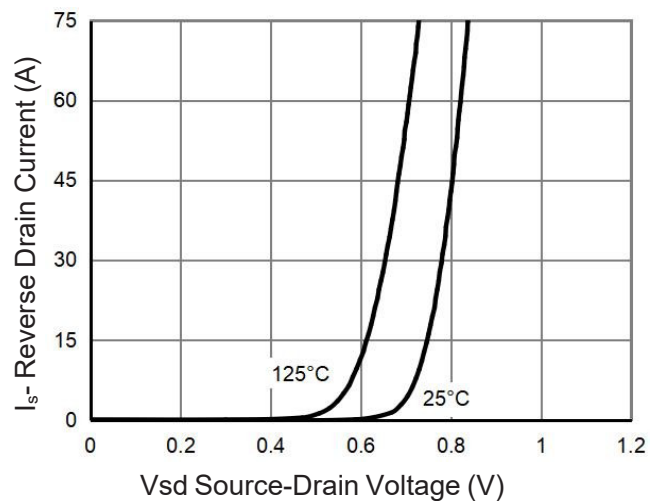
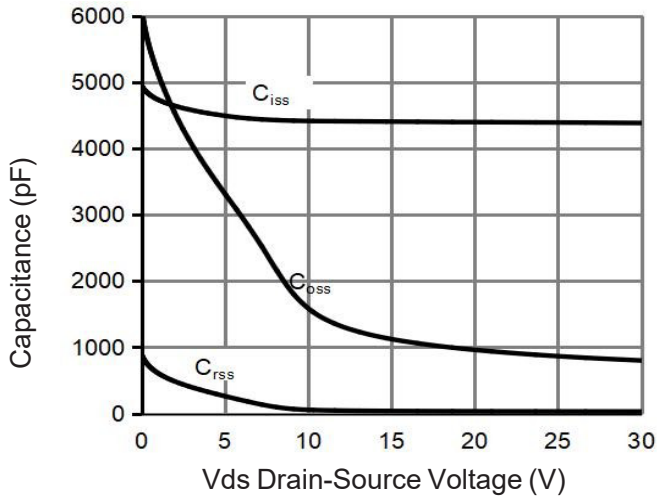
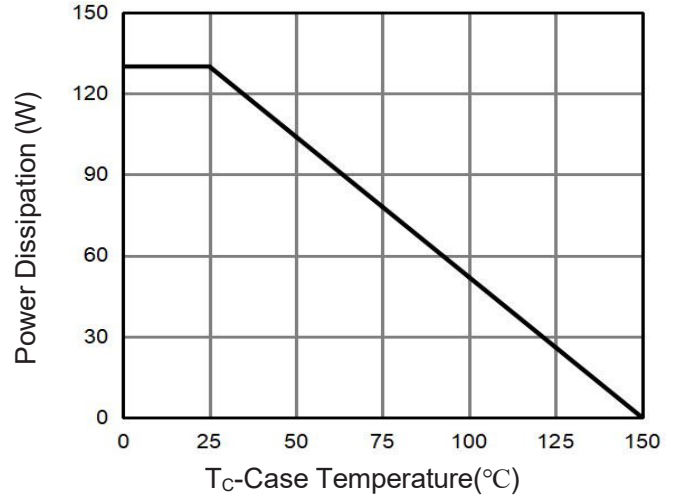
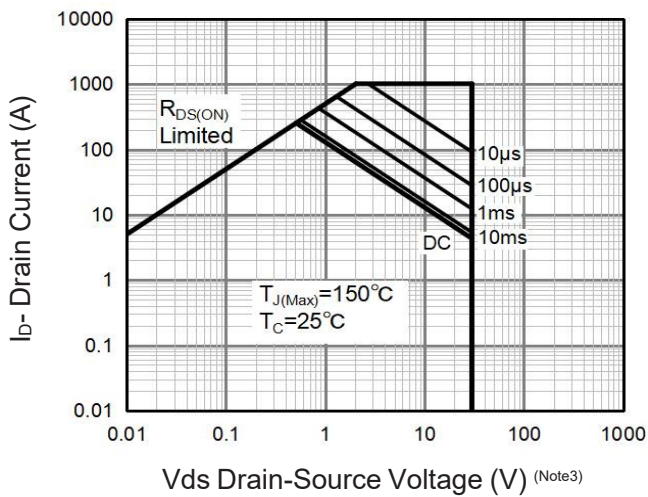
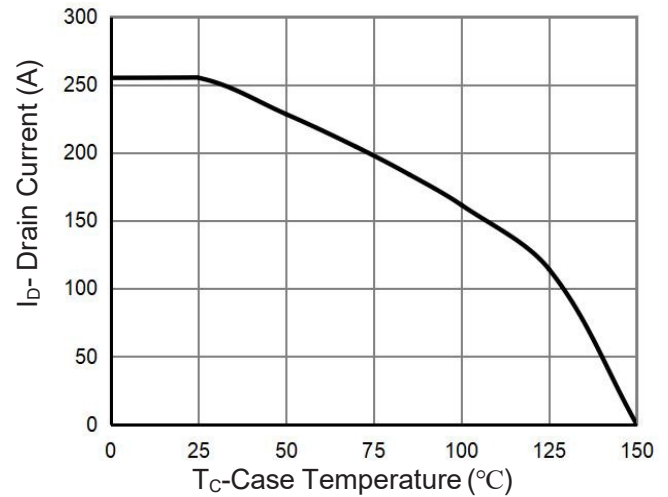
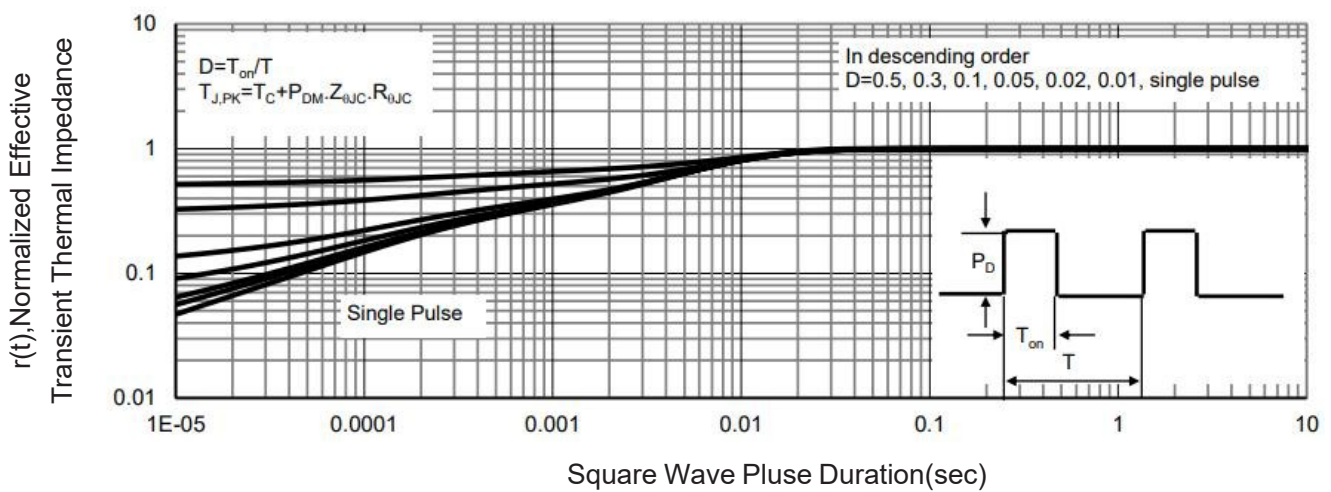


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