

1200V, 93A, N-channel SiC power MOSFET

General Description:

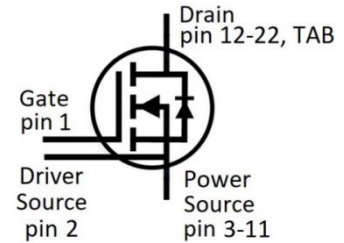
NCES120P030QD is a SiC MOSFET that contributes to miniaturization and low power consumption of applications. This product achieves industry-leading low on-resistance without sacrificing short-circuit withstand time. This is a QDPAK-22L package type with a driver source terminal that can maximize the high-speed switching performance that is a feature of SiC MOSFETs.

Features

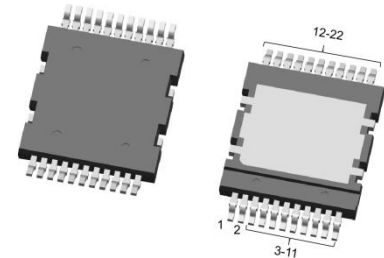
- Low on-resistance
- Fast switching speed
- Fast reverse recovery
- Easy to parallel
- Simple to drive
- Pb-free lead plating ; RoHS compliant

Application

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating
- Motor drives



Schematic diagram



QDPAK 22L

Package Marking and Ordering Information

Device	Device Package	Device Marking
NCES120P030QD	QDPAK 22L	NCES120P030QD

Absolute Maximum Ratings (T_c=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	1200	V
Gate-Source Voltage,max static voltage	V _{GS}	-10 to +24	V
Gate-Source Voltage,max transient voltage (Note 1)	V _{GS}	-11 to +26	V
Drain Current-Continuous (Note 2)	I _D	93	A
Drain Current-Continuous(T _c =100°C)	I _D (100°C)	66	A
Pulsed Drain Current (Note 3)	I _{DM}	233	A
Maximum Power Dissipation	P _D	517	W
Recommended turn-on gate - source drive voltage	V _{GS_on}	+15 to +18	V
Recommended turn-off gate - source drive voltage	V _{GS_off}	-4 to 0	V
Virtual junction temperature	T _{vj}	175	°C
Operating Junction and Storage Temperature Range	T _J ,T _{STG}	-55 To 175	°C

Thermal Characteristic

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case	0.29	$^{\circ}\text{C}/\text{W}$

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}	$V_{GS}=0V, I_D=100\mu A$	1200			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=1200V, V_{GS}=0V$		1	80	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=-10V / +22V, V_{DS}=0V$			± 100	nA
On Characteristics (Note 4)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=8mA$	1.9	3.0	4.8	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=18V, I_D=30A$		30	39	m Ω
Gate input resistance	R_G	f=1MHZ, open drain		1.5		Ω
Forward Transconductance	g_{FS}	$V_{DS}=20V, I_D=30A$		14		S
Dynamic Characteristics (Note 5)						
Input Capacitance	C_{iss}	$V_{DS}=800V, V_{GS}=0V,$ f=1MHz		2270		pF
Output Capacitance	C_{oss}			84		pF
Reverse Transfer Capacitance	C_{rss}			10.2		pF
Switching Characteristics (Note 5)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=800V, I_D=30A, V_{GS}=+18V /$ $-3V, R_G=2.7\Omega, L=200\mu H$		16.8		ns
Turn-on Rise Time	t_r			21		ns
Turn-Off Delay Time	$t_{d(off)}$			20.9		ns
Turn-Off Fall Time	t_f			10.8		ns
Total Gate Charge	Q_g	$V_{DS}=800V, I_D=30A, V_{GS}=-3/18V$		120		nC
Gate-Source Charge	Q_{gs}			22		nC
Gate-Drain Charge	Q_{gd}			39		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 4)	V_{SD}	$V_{GS}=0V, I_D=30A$		3.4		V
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}, I_F = 30A, V_R=800V,$ $di/dt = 3500A/\mu S^{(Note3)}$		14		ns
Reverse Recovery Charge	Q_{rr}			267		nC
Peak reverse recovery current	I_{rrm}			33.8		A

Notes:

- $t_p < 500ns, D < 0.01$
- Repetitive Rating: Pulse width limited by maximum junction temperature.
- $PW \leq 10\mu s$, Duty cycle $\leq 1\%$
- Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- Guaranteed by design, not subject to production

Test Circuit

Fig.1-1 Gate Charge Measurement Circuit

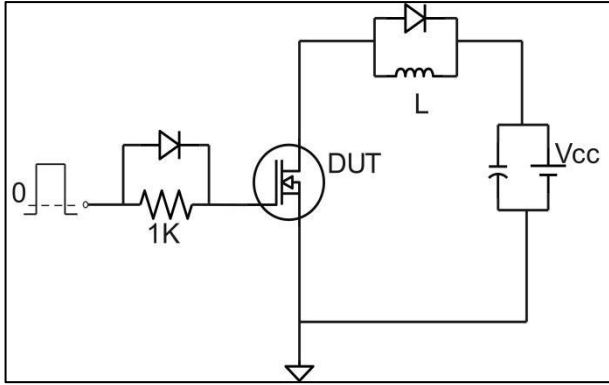


Fig.1-2 Gate Charge Waveform

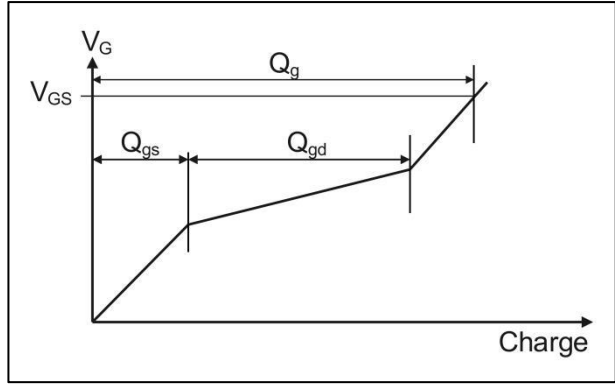


Fig.2-1 Switching Characteristics Measurement Circuit

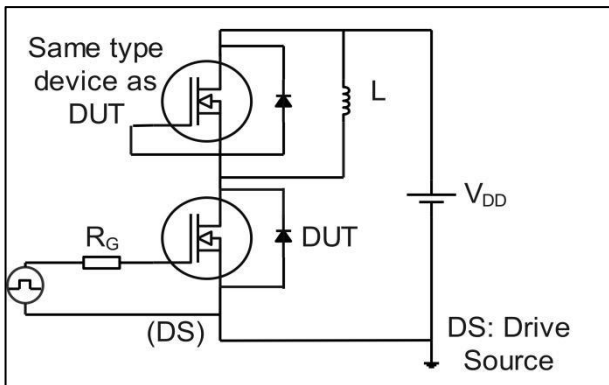
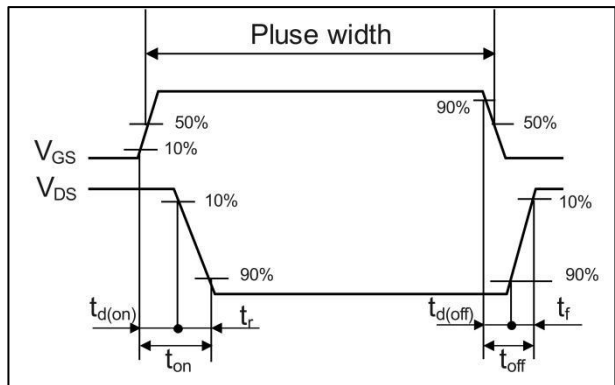


Fig.2-2 Waveforms for Switching Time



Typical Electrical and Thermal Characteristics

Fig.1 Power Dissipation Derating Curve

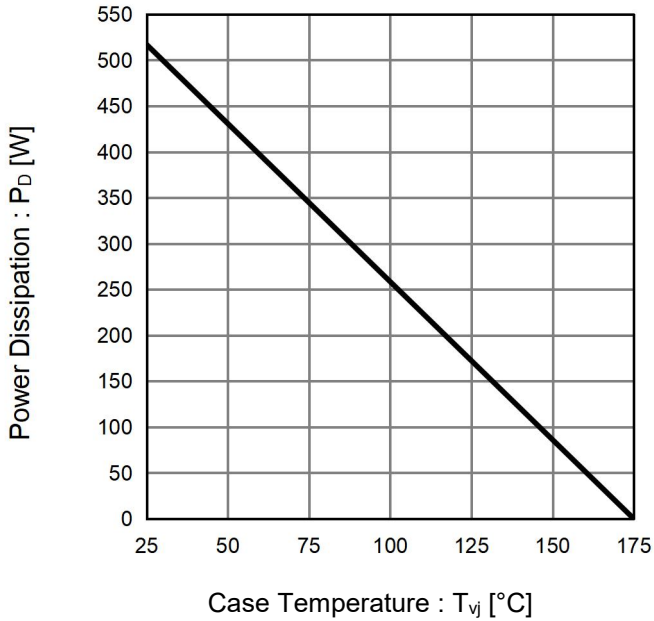


Fig.2 Maximum Safe Operating Area

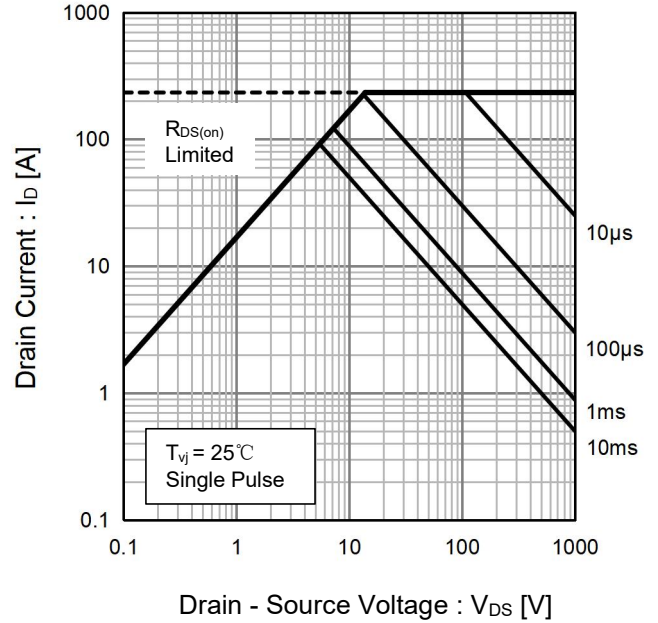


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width

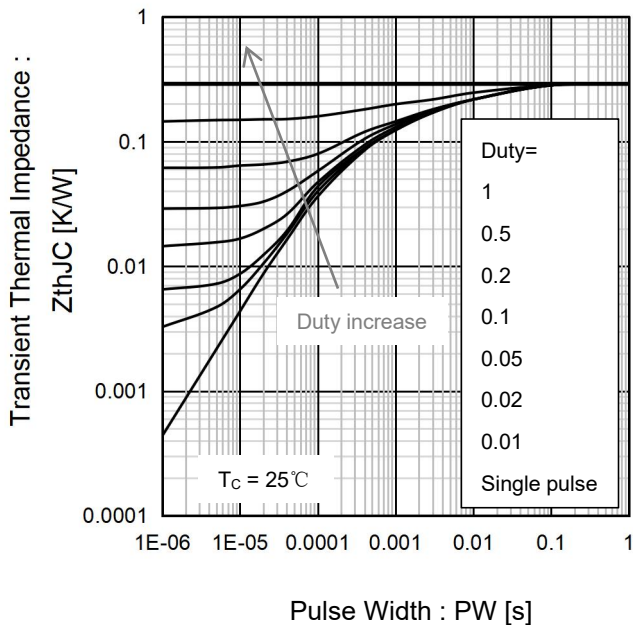


Fig.4 $T_{vj} = 25^{\circ}\text{C}$ Typical Output Characteristics

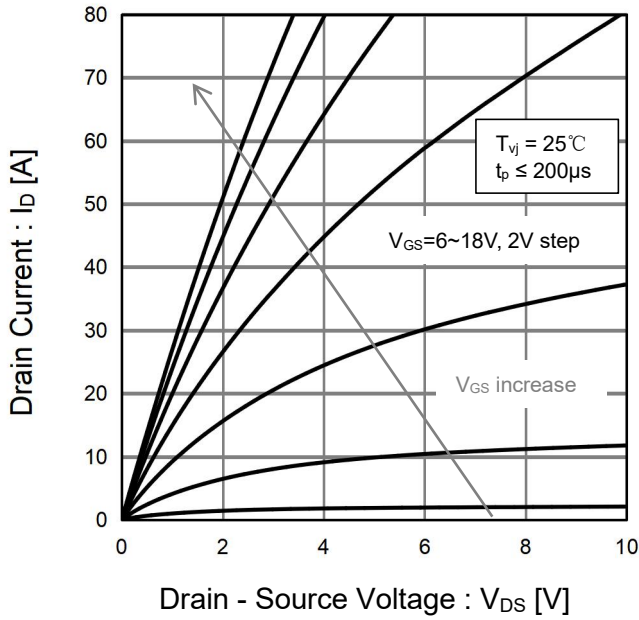


Fig.5 $T_{vj} = 25^{\circ}\text{C}$ 3rd Quadrant Characteristics

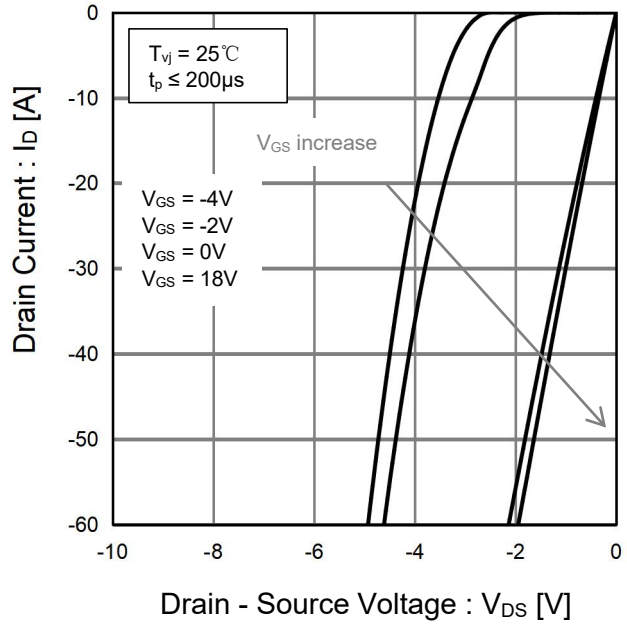


Fig.6 $T_{vj} = 175^{\circ}\text{C}$ Typical Output Characteristics

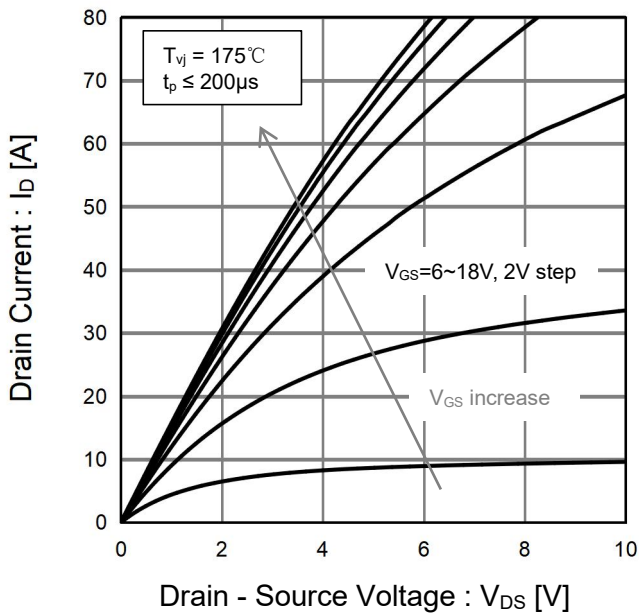


Fig.7 $T_{vj} = 175^{\circ}\text{C}$ 3rd Quadrant Characteristics

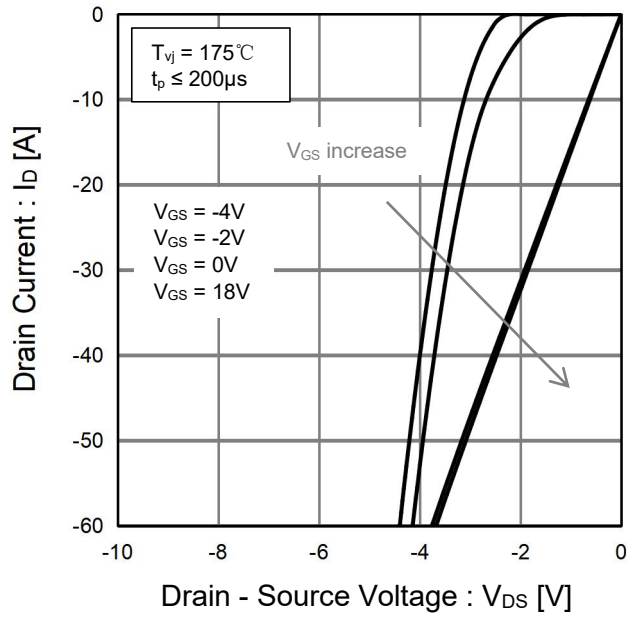


Fig.8 Typical Transfer Characteristics

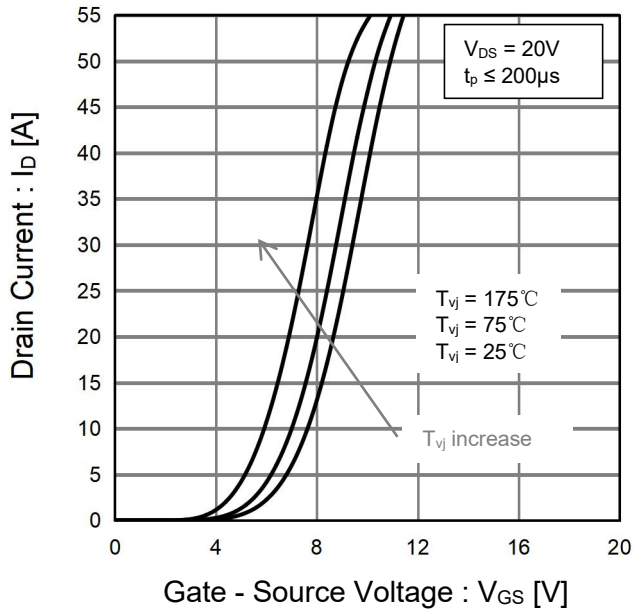


Fig.9 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

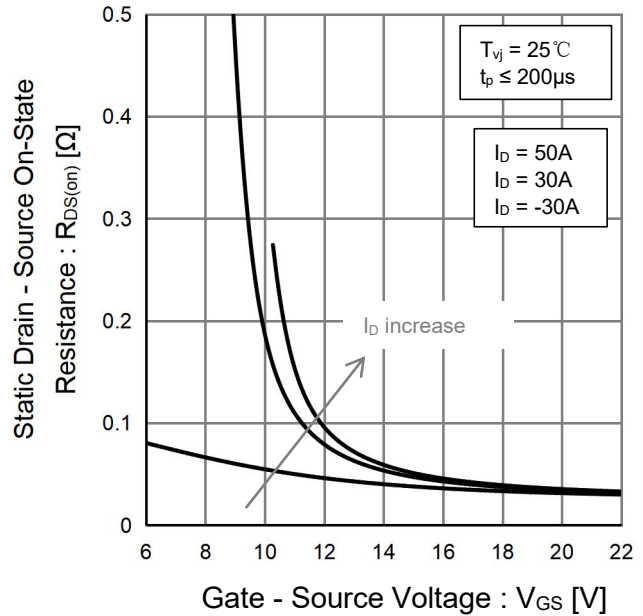


Fig.10 Static Drain - Source On - State Resistance vs. Drain Current

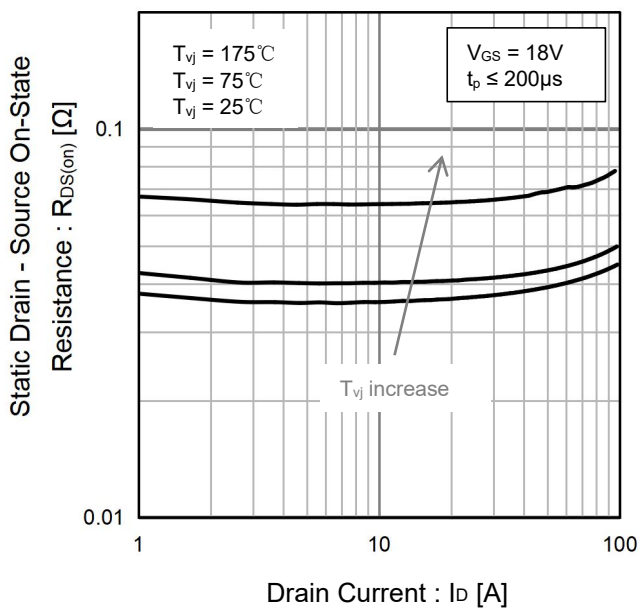


Fig.11 Static Drain - Source On - State Resistance vs. Virtual Junction Temperature

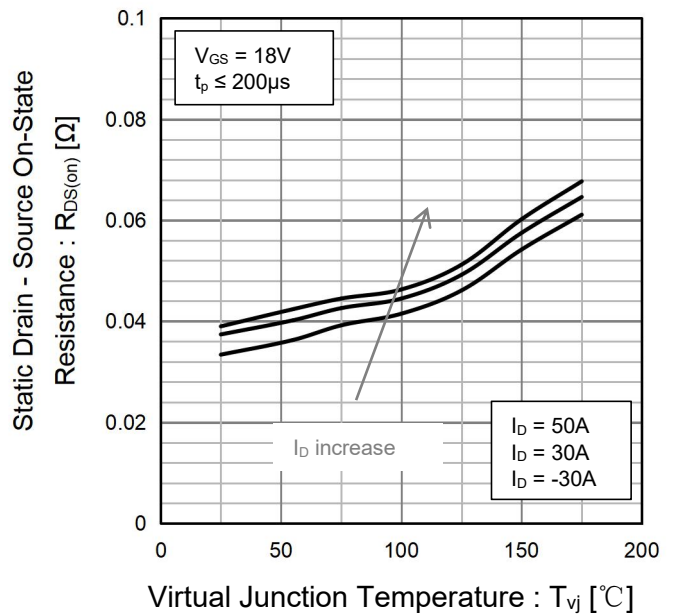


Fig.12 Typical Capacitance vs. Drain - Source Voltage

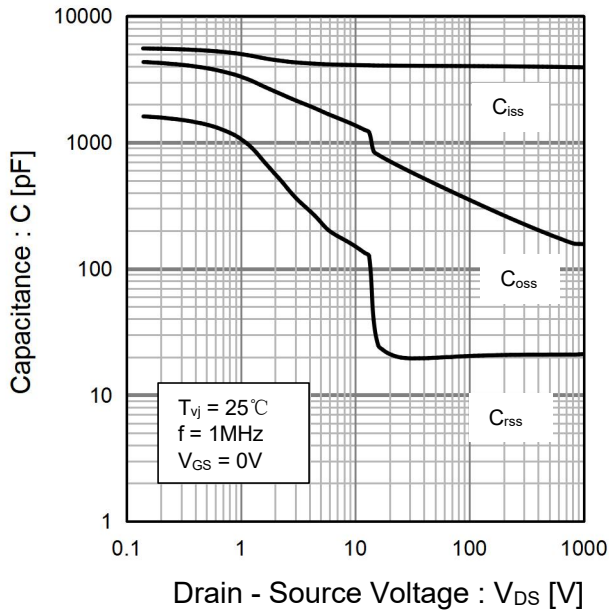
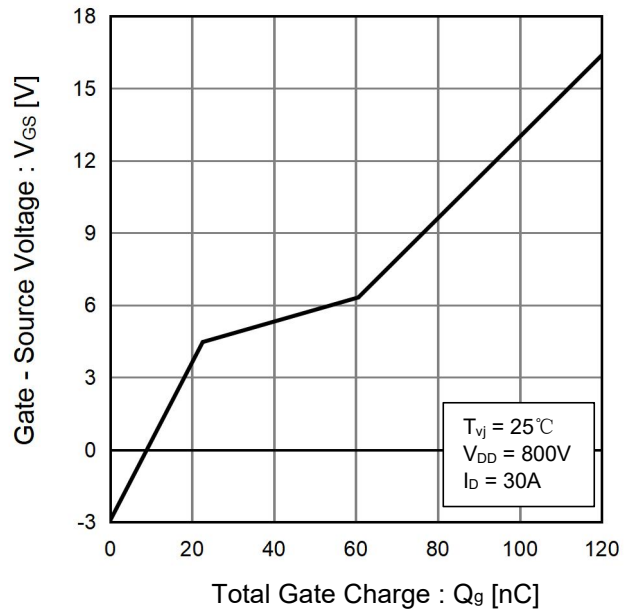
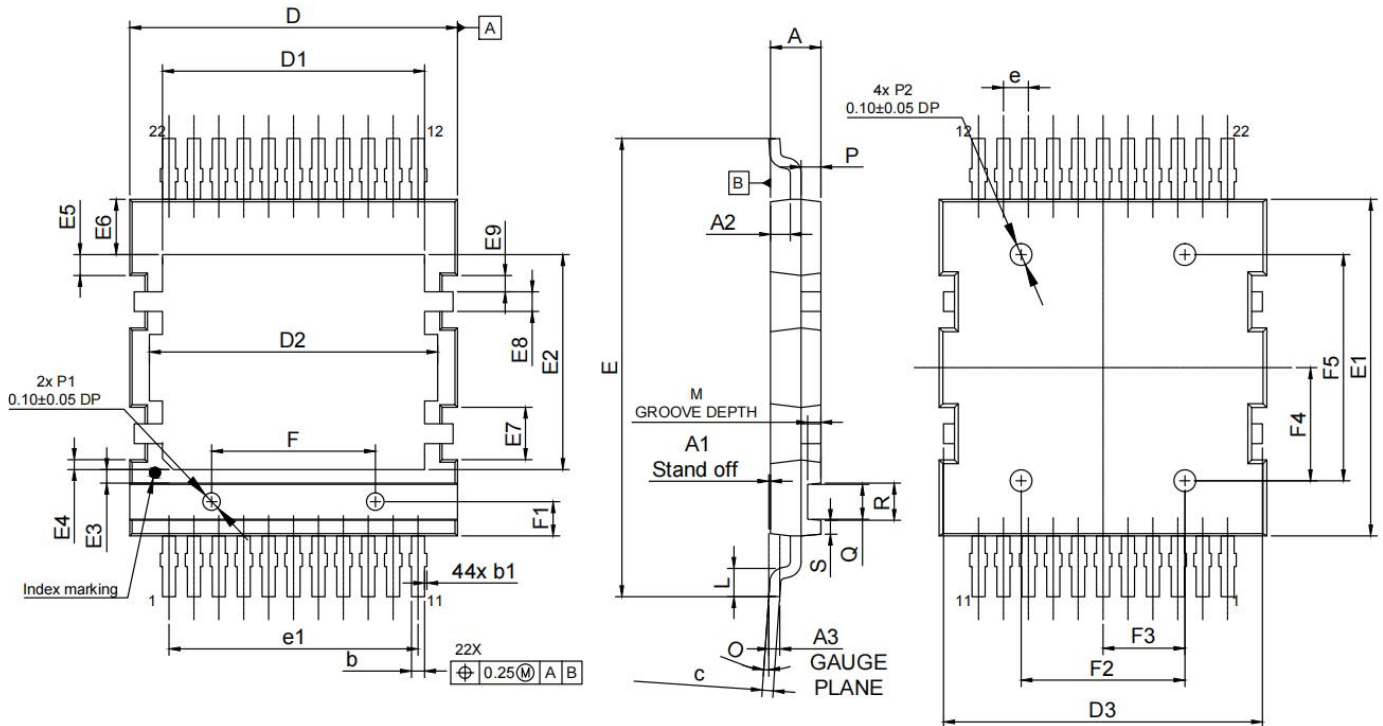


Fig.13 Dynamic Input Characteristics



QDPAK 22L Package Information



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.25	2.35	E9		0.75
A1	0.00	0.15	e		1.14
A2		0.90	e1		11.4
A3		0.50	F	7.40	7.60
b	0.50	0.70	F1	1.47	1.67
b1	-	0.15	F2	7.40	7.60
c	0.46	0.58	F3	3.65	3.85
D	14.90	15.10	F4	5.07	5.27
D1		12.00	F5	10.24	10.44
D2		13.20	L		1.30
D3	14.50	14.70	M		0.60
E	20.81	21.11	N		22
E1	15.30	15.50	O	0°	8°
E2		9.83	P		0.90
E3		0.625	P1	0.70	0.90
E4		0.45	P2	0.90	1.10
E5		0.95	Q		1.60
E6		2.53	R		1.70
E7		2.40	S		0.631
E8		0.90			

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