

Asymmetric Dual N-Channel 30V (D-S) Power MOSFET

FEATURES

- Low $R_{DS(on)}$ to minimize conductive losses
- Low gate charge for fast power switching
- 100% UIS and R_g tested
- Compliant to RoHS directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

APPLICATIONS

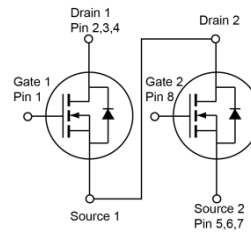
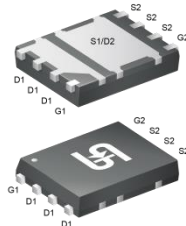
- IPC
- VGA
- NB VCORE

KEY PERFORMANCE PARAMETERS

PARAMETER	TYPE	VALUE	UNIT
V_{DS}	Q1	30	V
	Q2	30	
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	11.7	mΩ
	$V_{GS} = 4.5V$	14.9	
	$V_{GS} = 10V$	3.6	
	$V_{GS} = 4.5V$	5.5	
Q_g	Q1	4.6	nC
	Q2	25	



PDFN56 Asymmetric Dual



Note: MSL 1 (Moisture Sensitivity Level) per J-STD-020

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	SYMBOL	Q1	Q2	UNIT
Drain-Source Voltage	V_{DS}	30	30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current (Note 1)	I_D	38	107	A
		10	20	
Pulsed Drain Current	I_{DM}	152	428	A
Single Pulse Avalanche Current (Note 2)	I_{AS}	16	26	A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	38	101	mJ
Total Power Dissipation	P_D	30	69	W
		6	14	
Total Power Dissipation	P_D	2.2	2.4	W
		0.4	0.5	
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150		$^\circ\text{C}$

THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT		UNIT
		Q1	Q2	
Thermal Resistance – Junction to Case	$R_{\theta JC}$	4.2	1.8	$^\circ\text{C/W}$
Thermal Resistance – Junction to Ambient	$R_{\theta JA}$	56	52	

Thermal Performance Note: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. The case-thermal reference is defined at the solder mounting surface of the drain pins. $R_{\theta JA}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	TYPE	MIN	TYP	MAX	UNIT
Static							
Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	BV _{DSS}	Q1	30	--	--	V
	V _{GS} = 0V, I _D = 250μA		Q2	30	--	--	
Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 250μA	V _{GS(TH)}	Q1	1.2	1.9	2.5	V
	V _{GS} = V _{DS} , I _D = 250μA		Q2	1.2	1.6	2.5	
Gate-Source Leakage Current	V _{GS} = ±20V, V _{DS} = 0V	I _{GSS}	Q1	--	--	±100	nA
	V _{GS} = ±20V, V _{DS} = 0V		Q2	--	--	±100	nA
Drain-Source Leakage Current	V _{GS} = 0V, V _{DS} = 30V	I _{DSS}	Q1	--	--	1	μA
	V _{GS} = 0V, V _{DS} = 30V T _J = 125°C			--	--	100	
	V _{GS} = 0V, V _{DS} = 30V		Q2	--	--	1	
	V _{GS} = 0V, V _{DS} = 30V T _J = 125°C			--	--	100	
Drain-Source On-State Resistance ^(Note 3)	V _{GS} = 10V, I _D = 10A	R _{DS(on)}	Q1	--	8.8	11.7	mΩ
	V _{GS} = 4.5V, I _D = 9A			--	12.8	14.9	
	V _{GS} = 10V, I _D = 20A		Q2	--	2.7	3.6	
	V _{GS} = 4.5V, I _D = 16A			--	3.7	5.5	
Forward Transconductance ^(Note 3)	V _{DS} = 5V, I _D = 10A	g _{fs}	Q1	--	27	--	S
	V _{DS} = 5V, I _D = 20A		Q2	--	47	--	
Dynamic ^(Note 4)							
Total Gate Charge	Q1 V _{DS} = 15V, I _D = 10A	Q _{g(VGS=10V)}	Q1	--	9.3	--	nC
	Q2 V _{DS} = 15V, I _D = 20A		Q2	--	49	--	
Total Gate Charge	Q1 V _{DS} = 15V, I _D = 9A Q2 V _{DS} = 15V, I _D = 16A	Q _{g(VGS=4.5V)}	Q1	--	4.6	--	
			Q2	--	25	--	
Gate-Source Charge		Q _{gs}	Q1	--	2.1	--	
			Q2	--	7.3	--	
Gate-Drain Charge	Q _{gd}	Q1	--	1.8	--		
		Q2	--	12	--		
Input Capacitance	Q1 V _{GS} = 0V, V _{DS} = 15V	C _{iss}	Q1	--	555	--	pF
			Q2	--	2550	--	
Output Capacitance	f = 1.0MHz	C _{oss}	Q1	--	142	--	
	Q2		Q2	--	388	--	
Reverse Transfer Capacitance	V _{GS} = 0V, V _{DS} = 15V f = 1.0MHz	C _{rss}	Q1	--	26	--	
			Q2	--	276	--	
Gate Resistance	f = 1.0MHz	R _g	Q1	0.5	1.6	3.2	Ω
			Q2	0.5	1.5	3	

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	TYPE	MIN	TYP	MAX	UNIT
Switching ^(Note 4)							
Turn-On Delay Time	Q1 V _{GS} = 10V, V _{DS} = 15V, I _D = 10A, R _G = 2Ω Q2 V _{GS} = 10V, V _{DS} = 15V, I _D = 20A, R _G = 2Ω	t _{d(on)}	Q1	--	4.8	--	ns
			Q2	--	11	--	
Turn-On Rise Time		t _r	Q1	--	65	--	
			Q2	--	79	--	
Turn-Off Delay Time		t _{d(off)}	Q1	--	8.2	--	
			Q2	--	32	--	
Turn-Off Fall Time		t _f	Q1	--	14	--	
			Q2	--	49	--	
Source-Drain Diode							
Forward Voltage ^(Note 3)	V _{GS} = 0V, I _S = 10A	V _{SD}	Q1	--	--	1.2	V
	V _{GS} = 0V, I _S = 20A		Q2	--	--	1	
Reverse Recovery Time	Q1 I _S = 10A, dI/dt = 100A/μs	t _{rr}	Q1	--	33	--	ns
			Q2	--	14	--	
Reverse Recovery Charge	Q2 I _S = 20A, dI/dt = 100A/μs	Q _{rr}	Q1	--	19	--	nC
			Q2	--	8	--	

Notes:

- Silicon limited current only.
- Q1 : $L = 0.3\text{mH}$, $V_{GS} = 10\text{V}$, $V_{DD} = 30\text{V}$, $R_G = 25\Omega$, $I_{AS} = 16\text{A}$, Starting $T_J = 25^\circ\text{C}$
Q2 : $L = 0.3\text{mH}$, $V_{GS} = 10\text{V}$, $V_{DD} = 30\text{V}$, $R_G = 25\Omega$, $I_{AS} = 26\text{A}$, Starting $T_J = 25^\circ\text{C}$
- Pulse test: Pulse Width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
- Switching time is essentially independent of operating temperature.

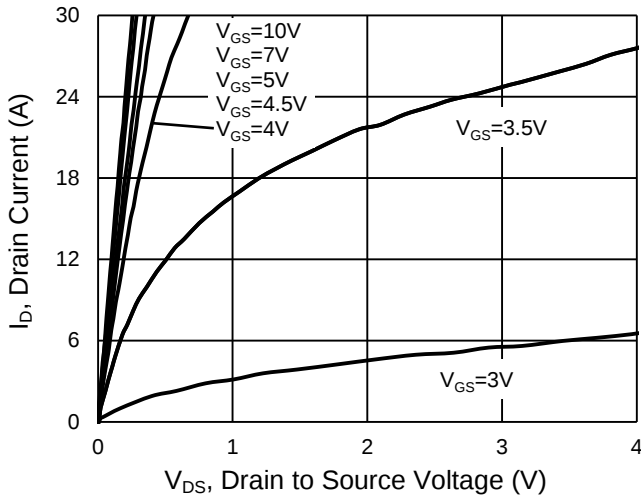
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM5055DCR RLG	PDFN56 Asymmetric Dual	2,500pcs / 13" Reel

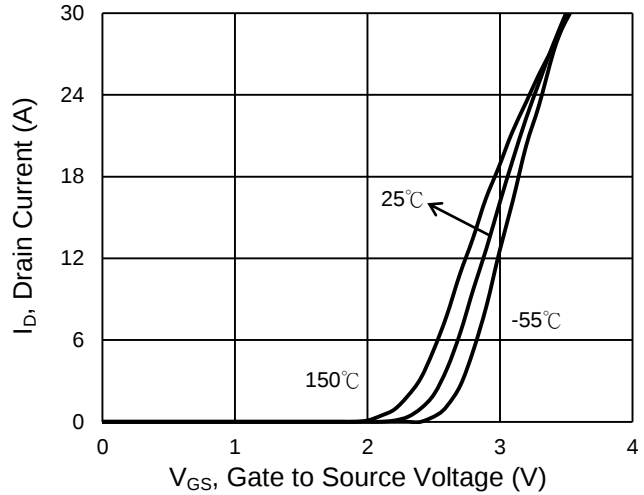
CHARACTERISTICS CURVES (Q1)

($T_A = 25^\circ\text{C}$ unless otherwise noted)

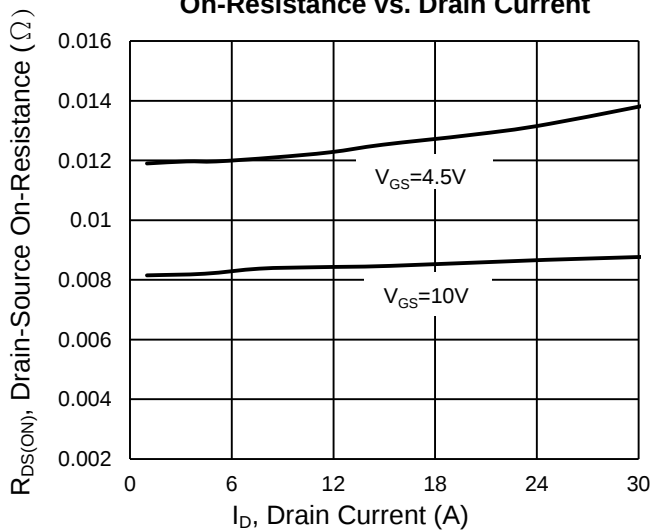
Output Characteristics



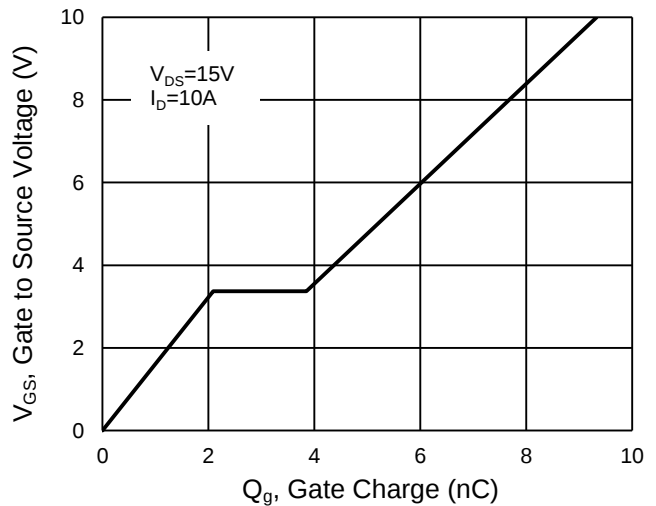
Transfer Characteristics



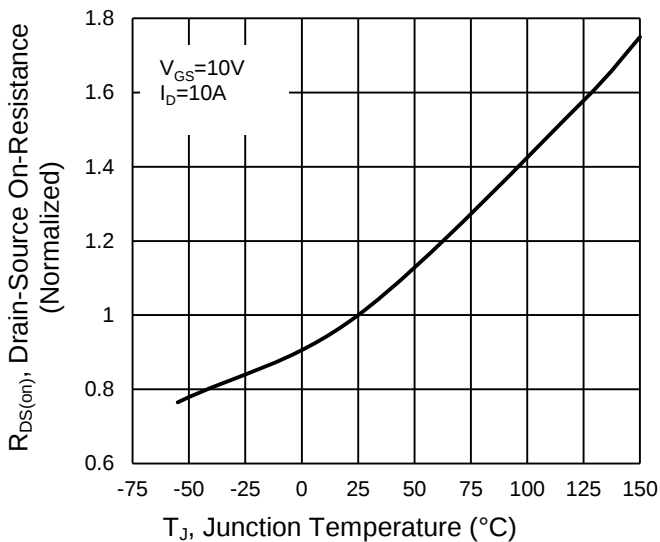
On-Resistance vs. Drain Current



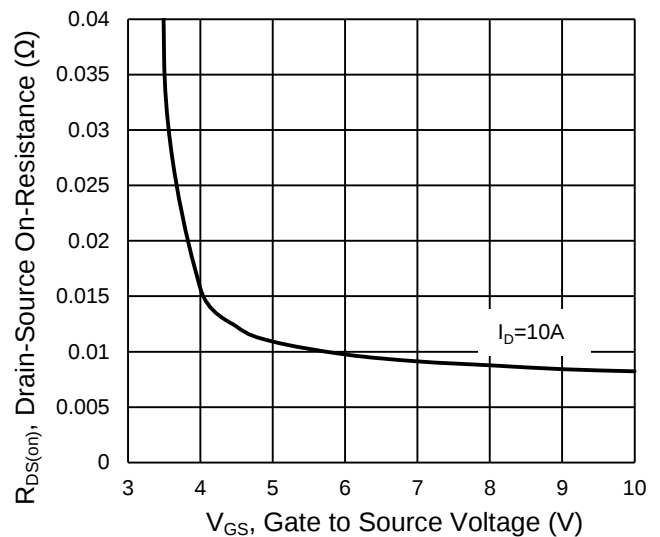
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

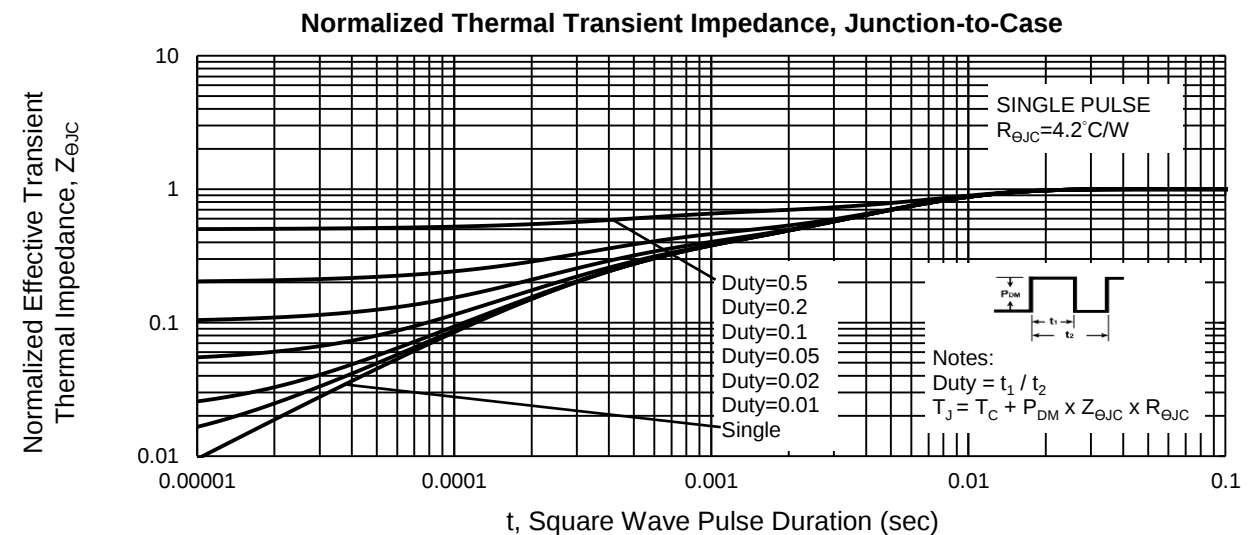
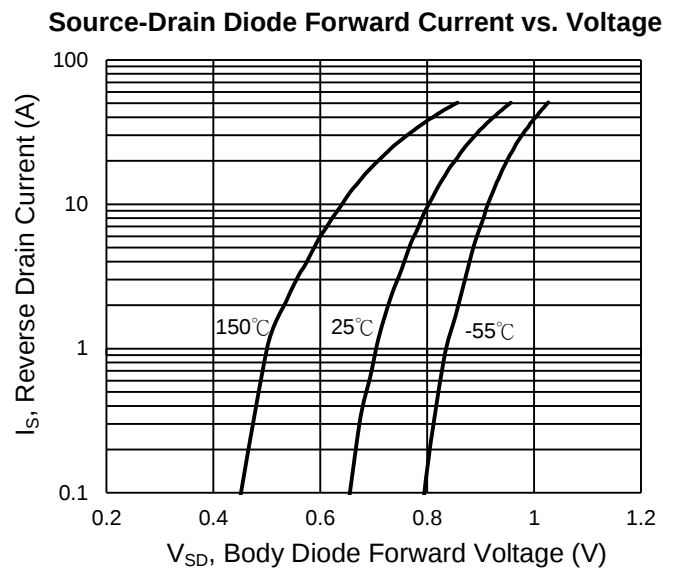
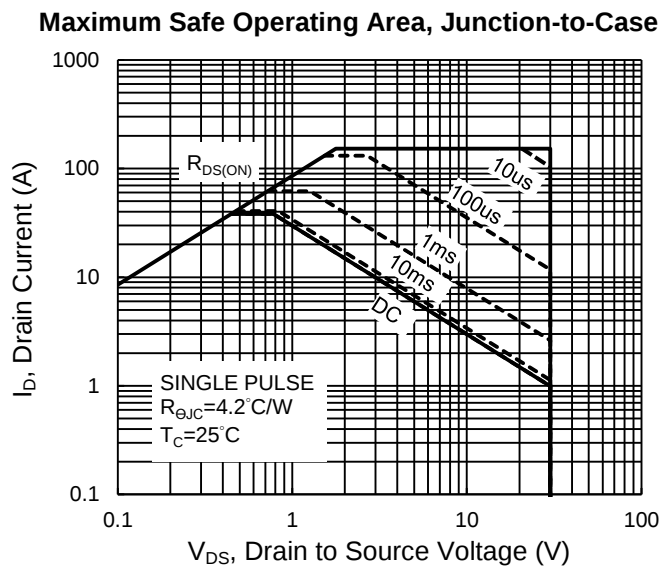
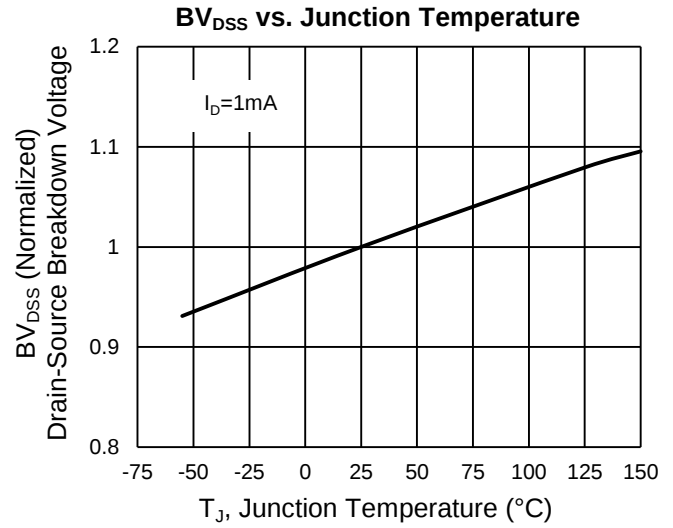
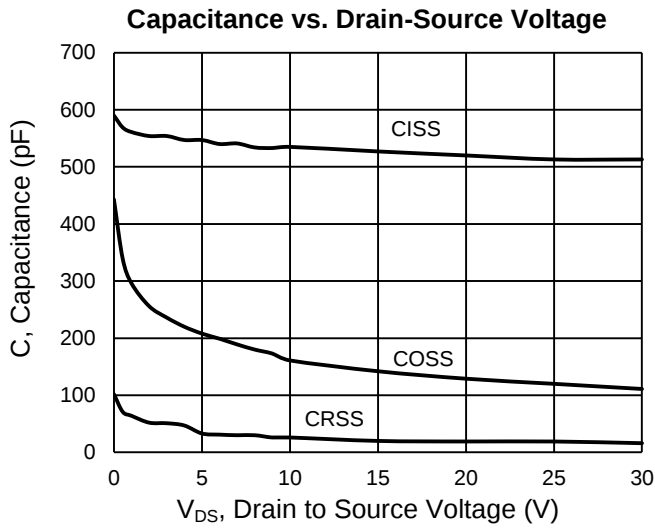


On-Resistance vs. Gate-Source Voltage



CHARACTERISTICS CURVES (Q1)

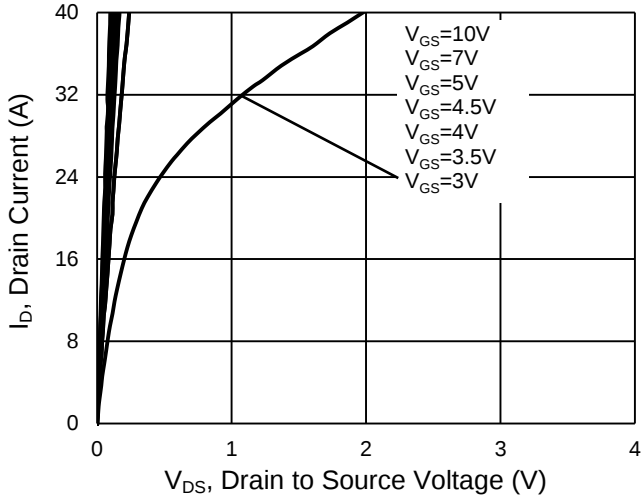
($T_A = 25^\circ\text{C}$ unless otherwise noted)



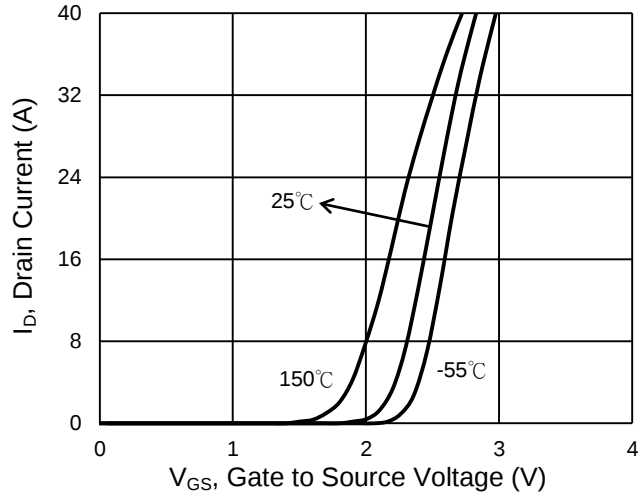
CHARACTERISTICS CURVES (Q2)

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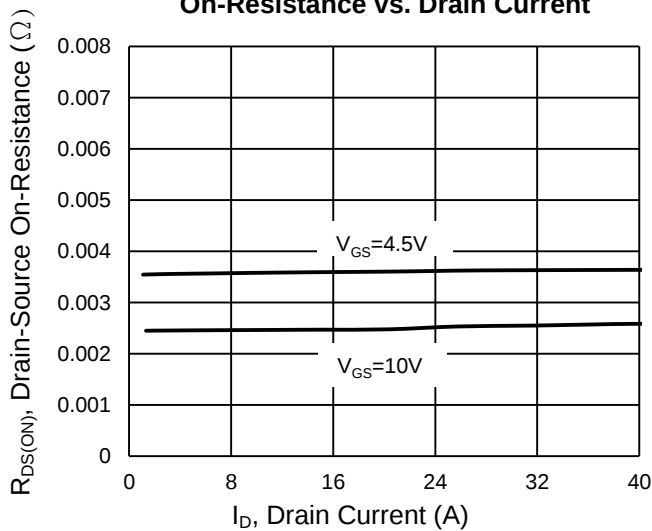
Output Characteristics



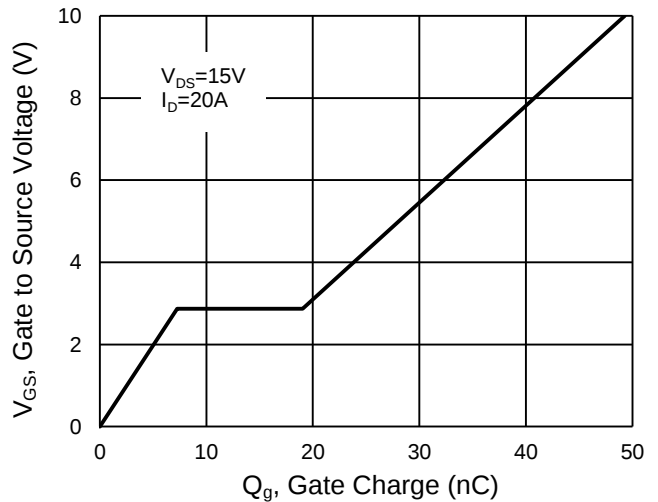
Transfer Characteristics



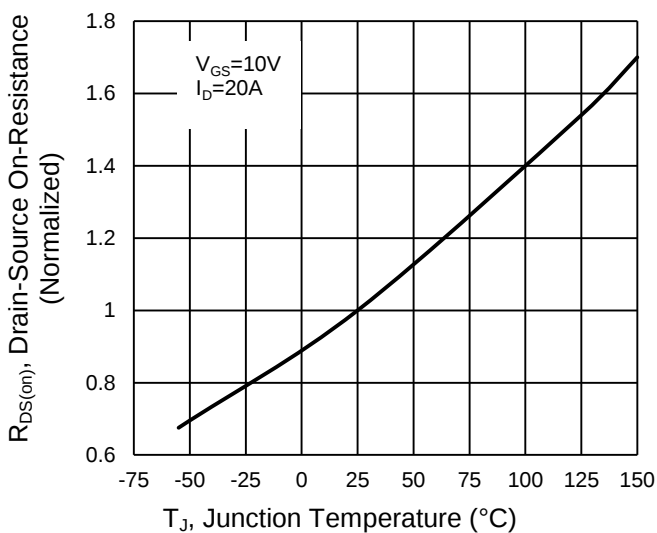
On-Resistance vs. Drain Current



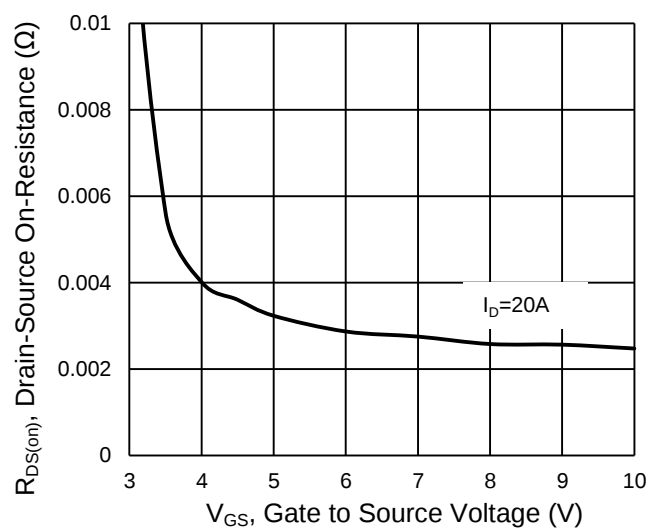
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

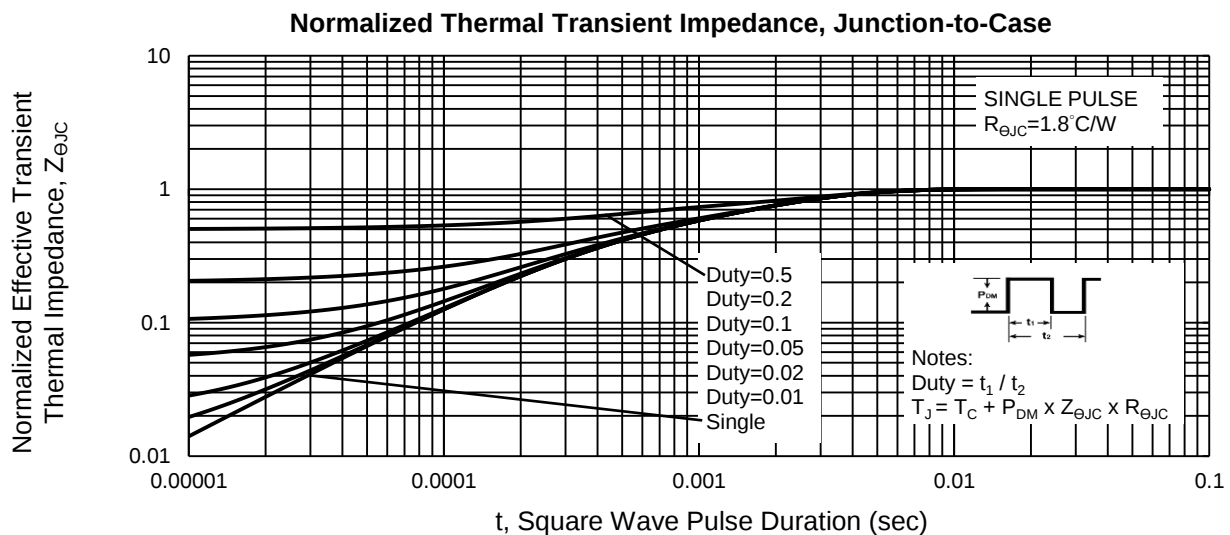
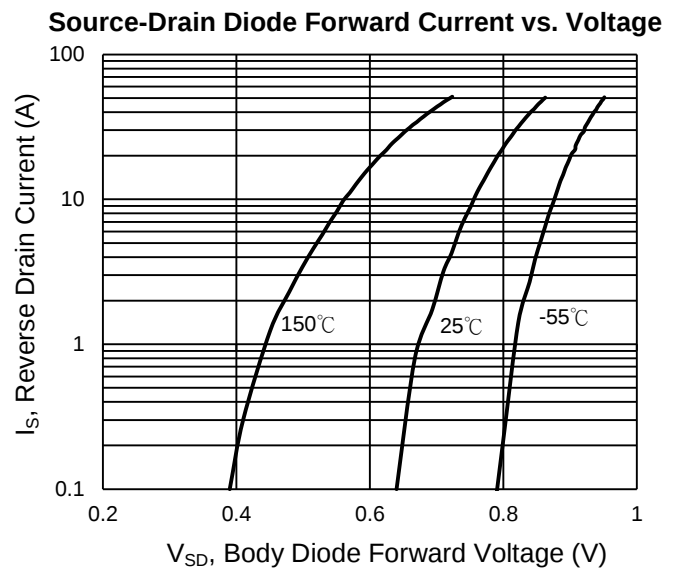
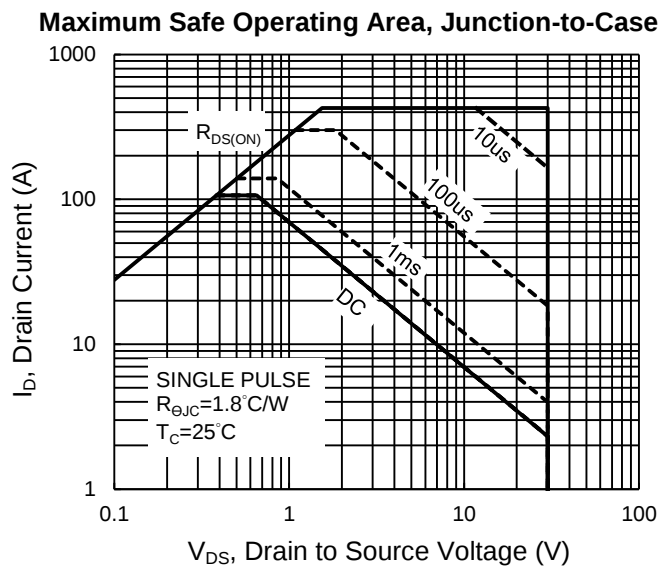
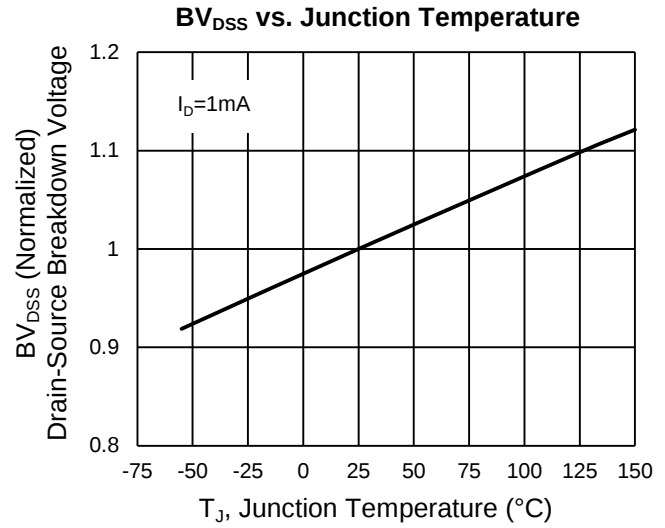
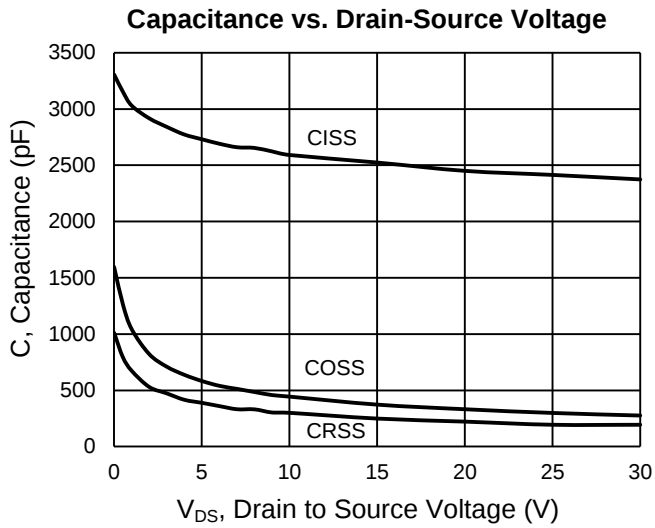


On-Resistance vs. Gate-Source Voltage



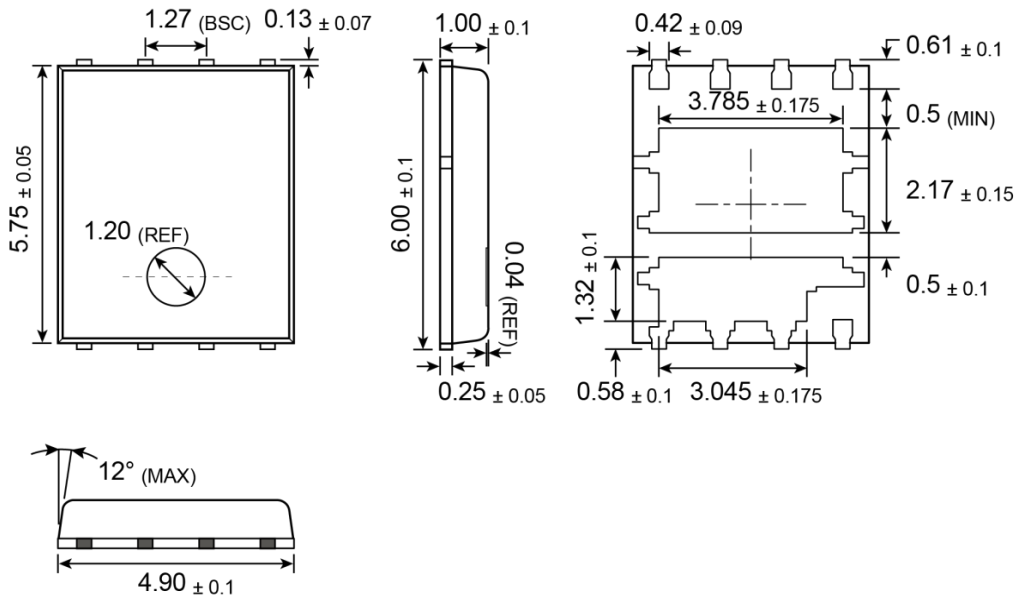
CHARACTERISTICS CURVES (Q2)

($T_A = 25^\circ\text{C}$ unless otherwise noted)

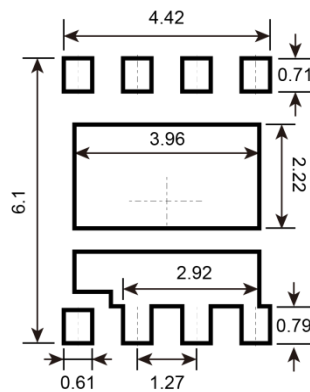


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

PDFN56 Asymmetric Dual



SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM



- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

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