

P-channel Enhancement Mode Power MOSFET

Features

- Uses CRM advanced Trench technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_{gx}R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

Applications

- Portable Electronics
- Electrical tools
- Lithium Battery Protection

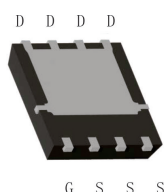
Product Summary

Parameters	Value	Unit
V_{DSS}	-20	V
$V_{GS(th)_{Typ}}$	-0.7	V
$I_D(@V_{GS}=-4.5V)$	-50	A
$R_{DS(ON)_{Typ}} @V_{GS}=-4.5V$	6.9	$m\Omega$
$R_{DS(ON)_{Typ}} @V_{GS}=-2.5V$	10	$m\Omega$

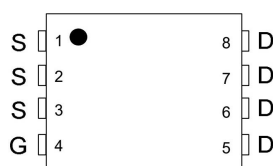
Top View



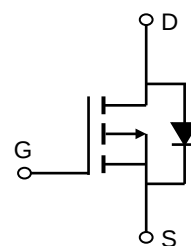
Bottom View



PDFN3x3-8L



Marking



Schematic Diagram

Device	Marking	Package	Packing	Reel Size	Tape Width	Reel (pcs)
ZK20P50Q	20P50	DFN3x3	Reel	N/A	N/A	5000

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	± 10	V
Continuous Drain Current	$T_C = 25^{\circ}C$	I_D	-50	A
	$T_C = 100^{\circ}C$		-46	
Pulsed Drain Current		I_{DM}	-200	A
Single Pulsed Avalanche Energy		E_{AS}	66	mJ
Power Dissipation		P_D	59.5	W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	2.1	$^{\circ}C/W$
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150	$^{\circ}C$

MOSFET ELECTRICAL CHARACTERISTICS

$T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	V _{(BR) DSS}	V _{GS} = 0V, I _D = -250uA	-20			V
Zero gate voltage drain current	I _{DSS}	V _{DS} = -16V, V _{GS} =0V			-1	μA
Gate-body leakage current	I _{GSS}	V _{DS} = 0V, V _{GS} =±12V			±100	nA
On characteristics ④						
Gate-threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250uA	-0.3	-0.7	-1.5	V
Static drain-source on-sate resistance	R _{DS(on)}	V _{GS} =-4.5V, I _D =-10A		4.4	8	mΩ
		V _{GS} =-2.5V, I _D =-5A		6.1	11	mΩ
Dynamic characteristics ④ ⑤						
Input capacitance	C _{iss}	V _{DS} =-10V,V _{GS} =0V f =1MHz		3499		pF
Output capacitance	C _{oss}			524		
Reverse transfer capacitance	C _{rss}			496		
Switching characteristics ④ ⑤						
Total gate charge	Q _g	V _{GS} =0 to -4.5V V _{DS} =-10V, I _D =-19A		35		nC
Gate-source charge	Q _{gs}			5.5		
Gate-drain charge	Q _{gd}			11.5		
Turn-on delay time	t _{d(on)}	V _{DS} =-10V,I _D =-19A V _{GS} =-4.5V,R _{GEN} =3Ω		14.94		ns
Turn-on rise time	t _r			105.9		
Turn-off delay time	t _{d(off)}			101.9		
Turn-off fall time	t _f			98.5		
Drain-Source Diode Characteristics						
Drain-source diode forward voltage	V _{SD} ④	V _{GS} =0V, I _S =-19A			-1.2	V
Continuous drain-source diode forward current	I _S ①				-50	A
Pulsed drain-source diode forward current	I _{SM} ②				-48	A
Reverse recovery time	trr	di/dt = 100A/μs, I _F = -19A		48.28		ns
Reverse recovery charge	Qrr			27.42		nC

Typical Performance Characteristics

Fig 1: Output Characteristics

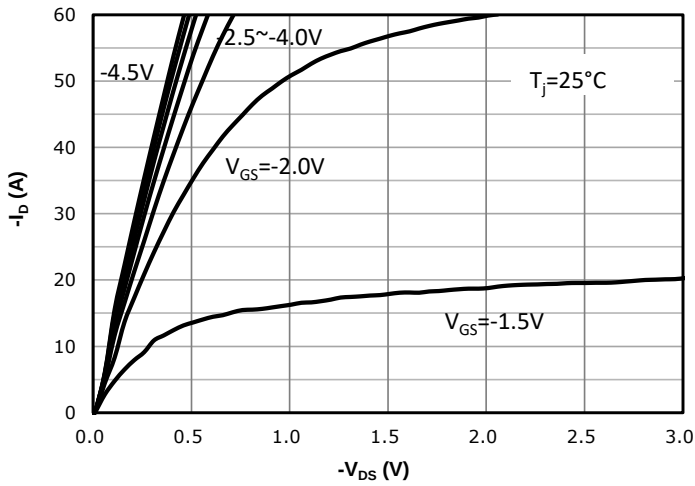


Fig 2: Transfer Characteristics

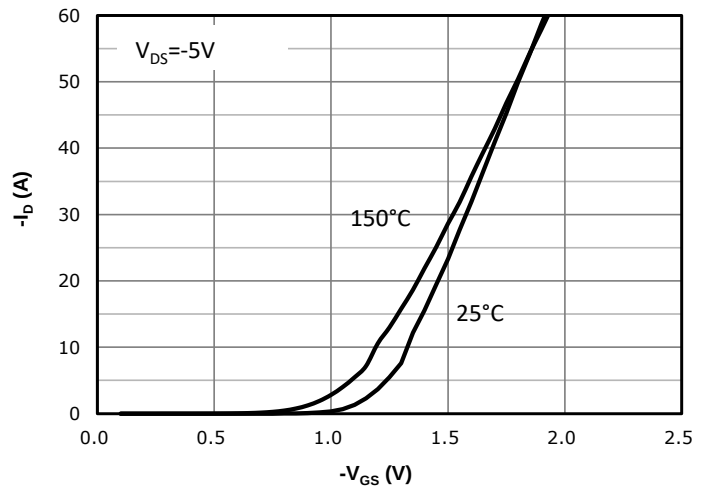


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

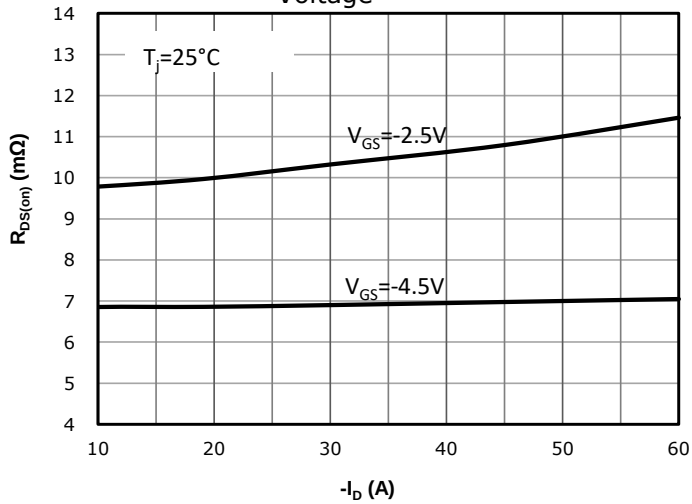


Fig 4: $R_{DS(on)}$ vs Gate Voltage

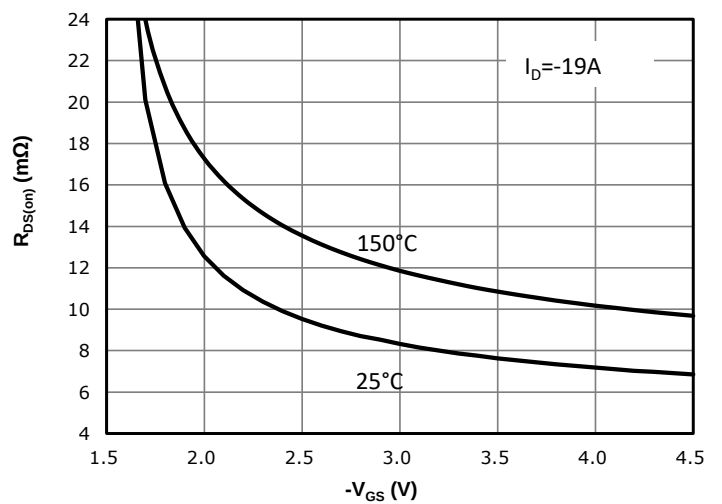


Fig 5: $R_{DS(on)}$ vs. Temperature

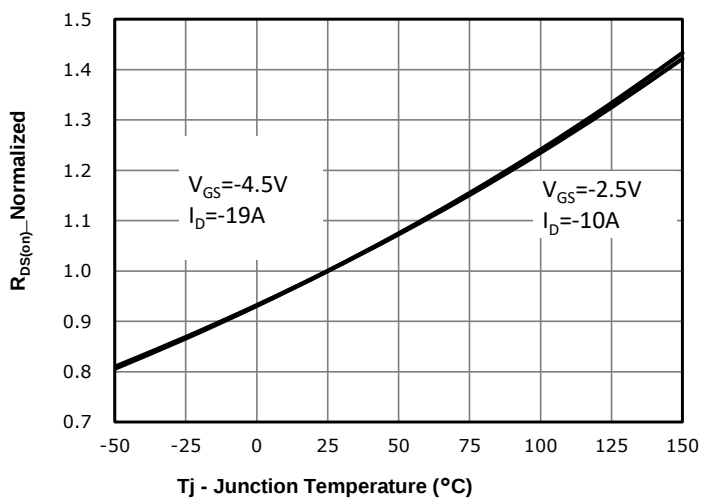
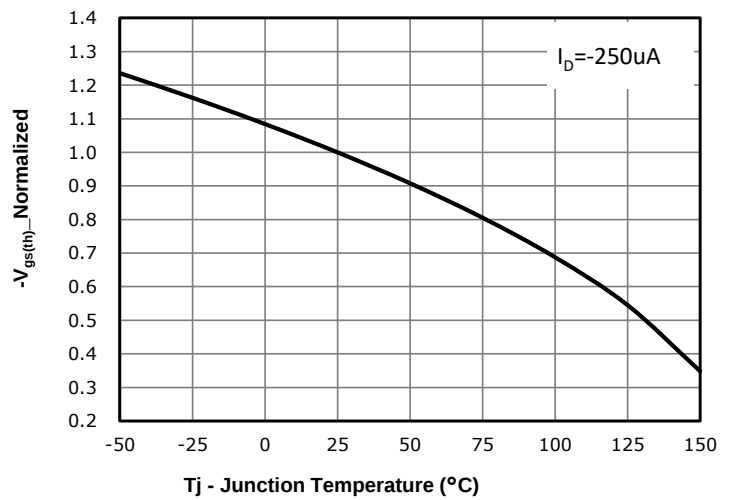


Fig 6: $V_{GS(th)}$ vs. Temperature



Typical Performance Characteristics

Fig 7: BVdss vs. Temperature

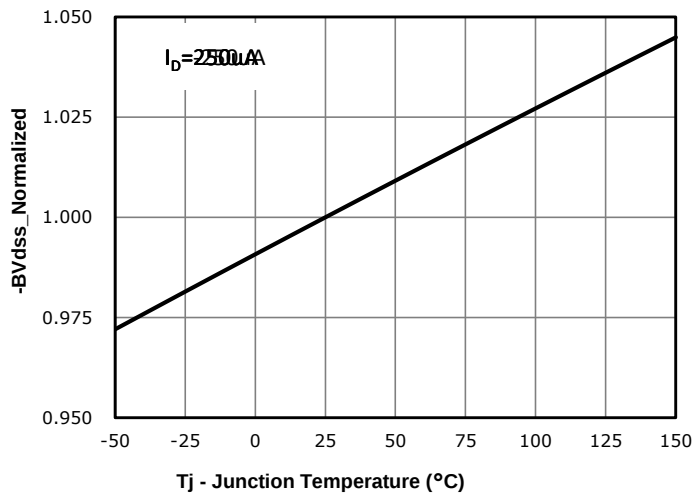


Fig 8: Body-diode Forward Characteristics

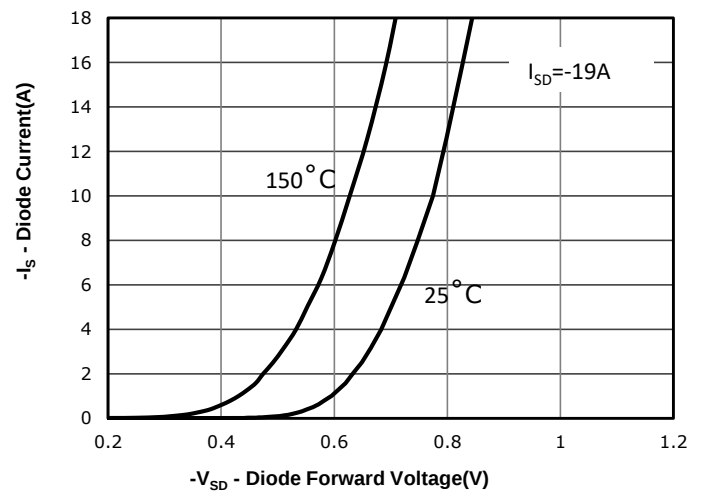


Fig 9: Gate Charge Characteristics

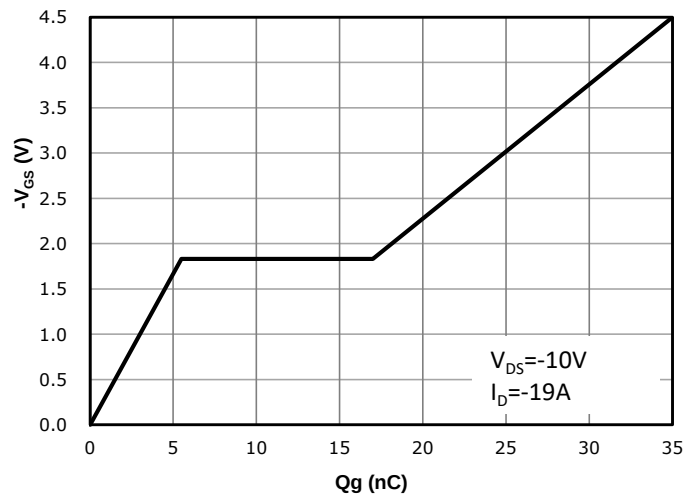


Fig 10: Capacitance Characteristics

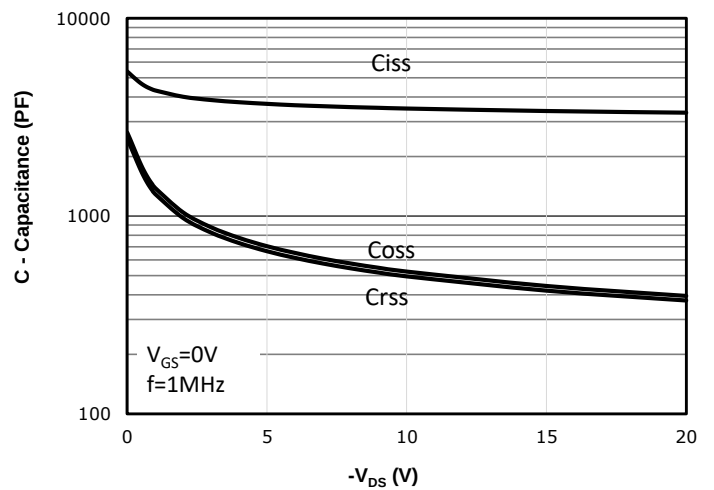


Fig 11: Drain Current Derating

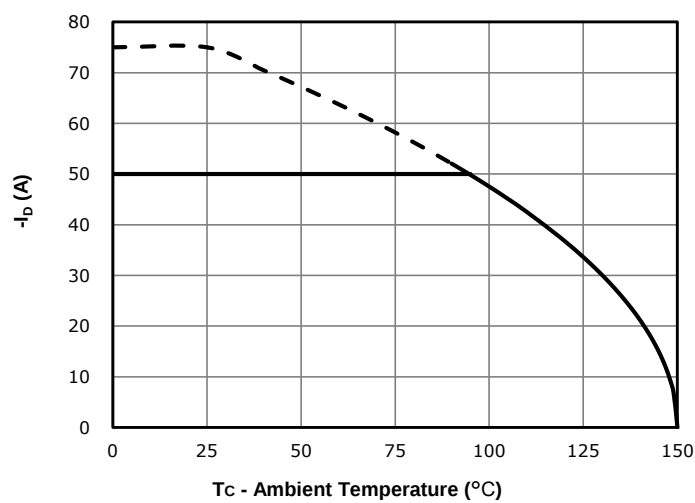


Fig 12: Power Dissipation

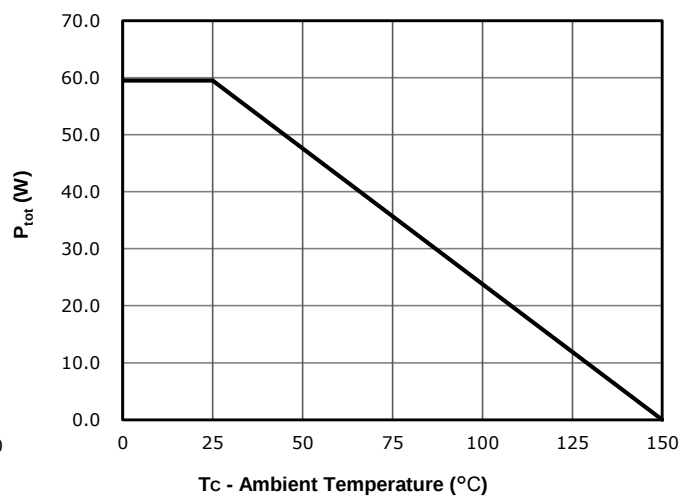


Fig 13: Safe Operating Area

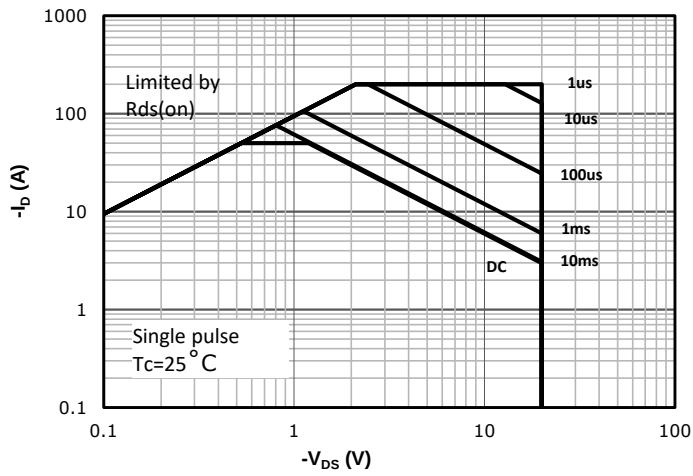
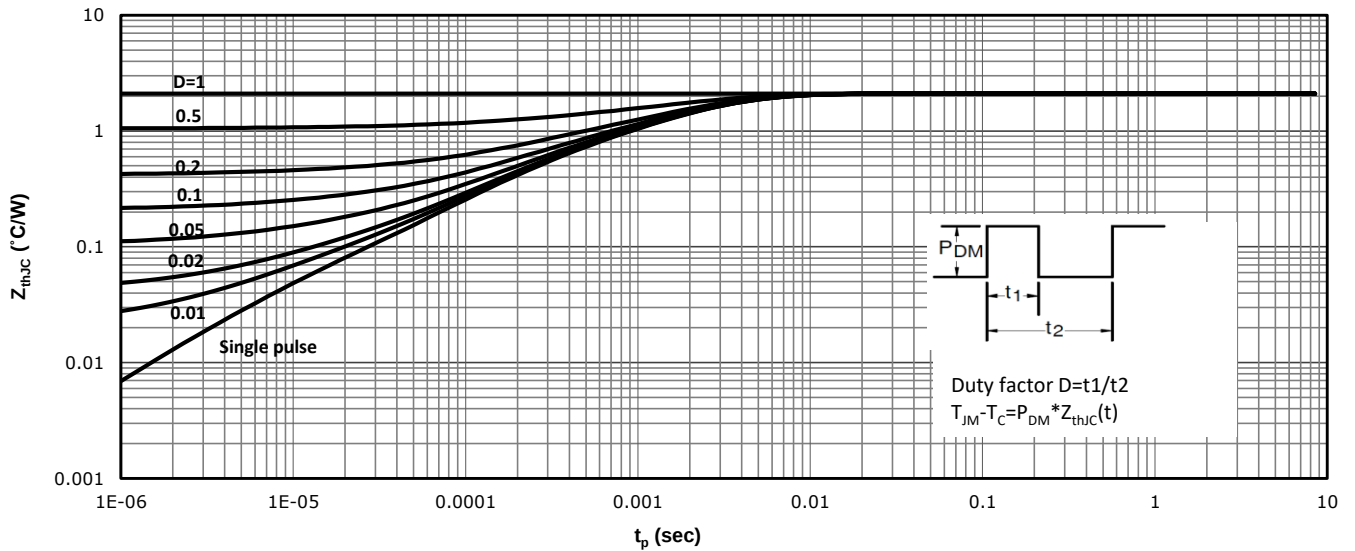
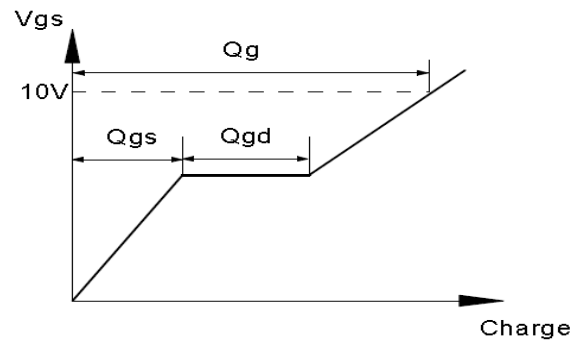
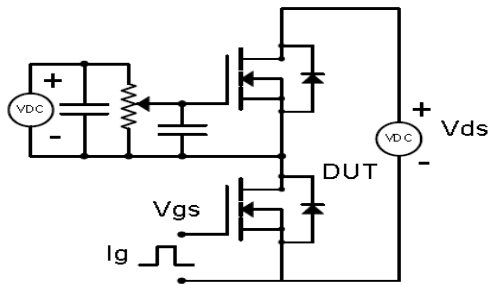


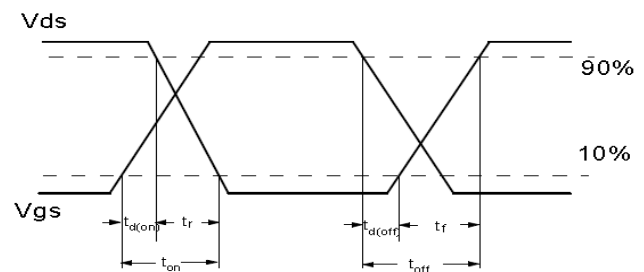
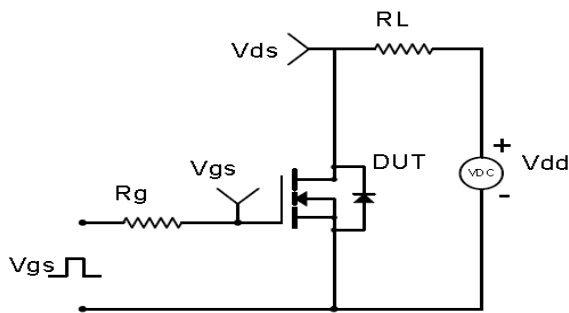
Fig 14: Max. Transient Thermal Impedance



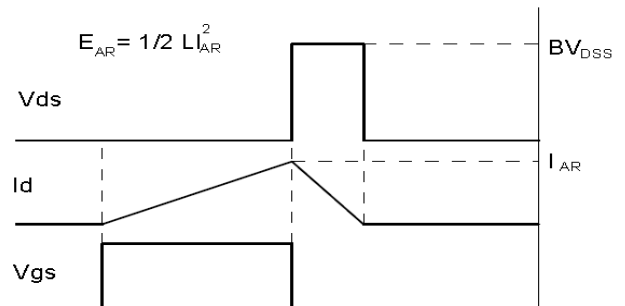
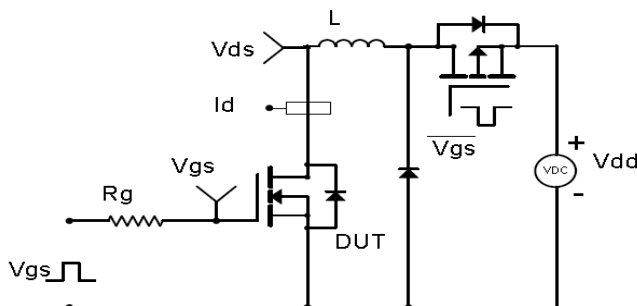
Gate Charge Test Circuit & Waveform



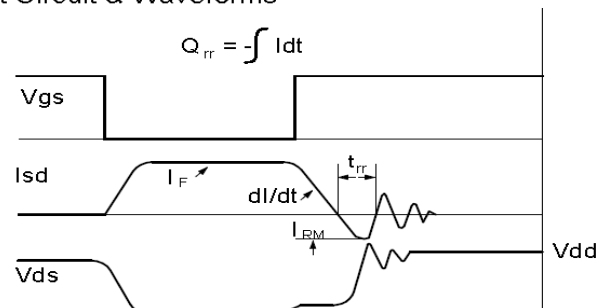
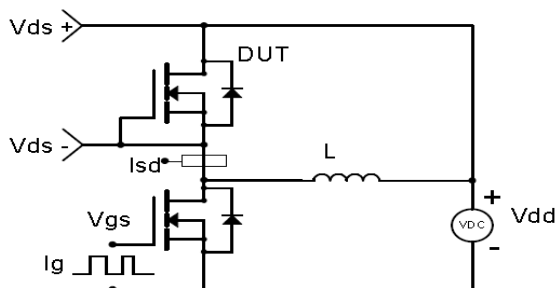
Resistive Switching Test Circuit & Waveforms

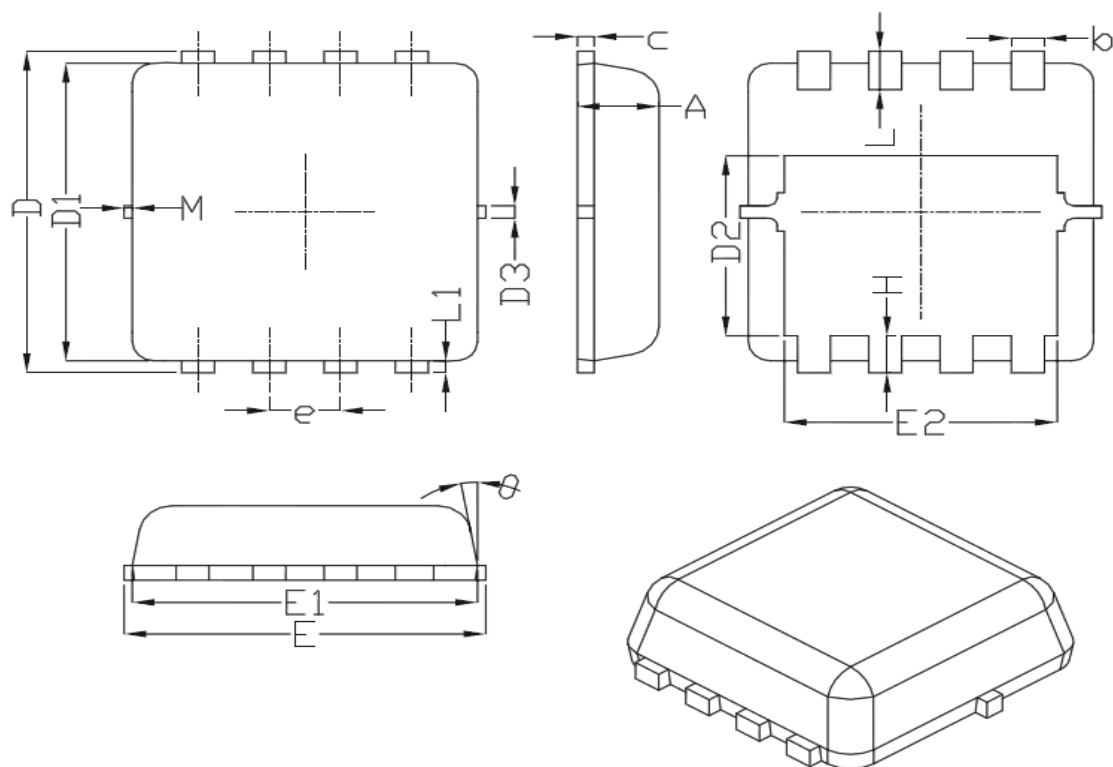


Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms





DIMENSIONS (unit : mm)

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	0.70	0.75	0.80	b	0.25	0.30	0.35
C	0.10	0.15	0.25	D	3.25	3.35	3.45
D1	3.00	3.10	3.20	D2	1.78	1.88	1.98
D3	--	0.13	--	E	3.20	3.30	3.40
E1	3.00	3.15	3.20	E2	2.39	2.49	2.59
e	0.65BSC			H	0.30	0.39	0.50
L	0.30	0.40	0.50	L1	--	0.13	--
θ	--	10°	12°	M	*	*	0.15
*Not specified							