

### Features

- -30V/-38A,  
 $R_{DS(ON)} = 11m\Omega(Typ.)@V_{GS}=-10V$   
 $R_{DS(ON)} = 16m\Omega(Typ.)@V_{GS}=-4.5V$
- Low  $R_{DS(ON)}$
- Super High Dense Cell Design
- Fast Switching Speed
- 100% Avalanche Tested
- 100% Rg Tested

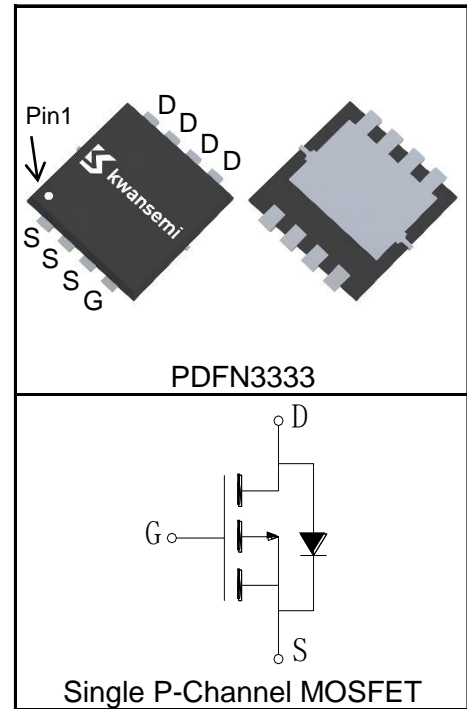
### Applications

- Switching Application Systems



Halogen-Free

### Pin Description



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
<b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted)				
$V_{DSS}$	Drain-Source Voltage	-30	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 25$		
$T_{Jmax}$	Maximum Junction Temperature	150	$^\circ C$	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to 150	$^\circ C$	
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ C$	-38	A
<b>Mounted on Large Heat Sink</b>				
$I_{DP}^{①}$	300 $\mu s$ Pulse Drain Current Tested	$T_C=25^\circ C$	-152	A
$I_D^{②}$	Continuous Drain Current@ $T_C(V_{GS}=-10V)$	$T_C=25^\circ C$	-38	A
		$T_C=100^\circ C$	-24	
	Continuous Drain Current@ $T_A(V_{GS}=-10V)^{③}$	$T_A=25^\circ C$	-13	
		$T_A=70^\circ C$	-10	
$P_D$	Maximum Power Dissipation@ $T_C$	$T_C=25^\circ C$	32	W
		$T_C=100^\circ C$	13	
	Maximum Power Dissipation@ $T_A^{③}$	$T_A=25^\circ C$	3.5	
		$T_A=70^\circ C$	2.3	

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3.95	°C/W
$R_{\theta JA}$ ③	Thermal Resistance-Junction to Ambient	35	°C/W
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}$ ④	Avalanche Energy, Single Pulsed	132	mJ

**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

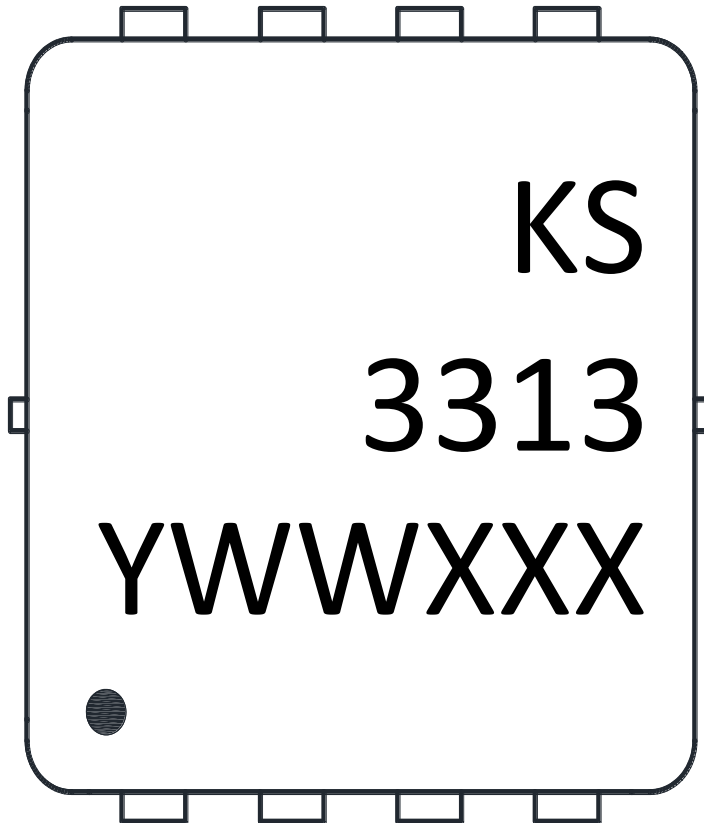
Symbol	Parameter	Test Condition	KS3313MA			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=-250\mu A$	-30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-30V, V_{GS}=0V$			-1	$\mu A$
		$T_J=125^\circ\text{C}$			-30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.1	-1.6	-2.3	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 25V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}$ ⑤	Drain-Source On-state Resistance	$V_{GS}=-10V, I_{DS}=-18A$		11	13	$m\Omega$
		$V_{GS}=-4.5V, I_{DS}=-14A$		16	21	$m\Omega$
<b>Diode Characteristics</b>						
$V_{SD}$ ⑤	Diode Forward Voltage	$I_{SD}=-20A, V_{GS}=0V$		-0.89	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=-20A, di_{SD}/dt=100A/\mu s$		44		ns
$Q_{rr}$	Reverse Recovery Charge			29		nC
<b>Dynamic Characteristics</b> ⑥						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		18		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=-15V,$ Frequency=1.0MHz		1640		pF
$C_{oss}$	Output Capacitance			245		
$C_{riss}$	Reverse Transfer Capacitance			190		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-15V, I_{DS}=-20A,$ $V_{GS}=-10V, R_G=3\Omega$		11		ns
$t_r$	Turn-on Rise Time			23		
$t_{d(OFF)}$	Turn-off Delay Time			38		
$t_f$	Turn-off Fall Time			10		
<b>Gate Charge Characteristics</b> ⑥						
$Q_g$	Total Gate Charge	$V_{DS}=-15V, V_{GS}=-10V,$ $I_{DS}=-20A$		29		nC
$Q_{gs}$	Gate-Source Charge			6		
$Q_{gd}$	Gate-Drain Charge			7		

**Notes:**

- ①Pulse width limited by safe operating area.
- ②Calculated continuous current based on maximum allowable junction temperature.
- ③When mounted on 1 inch square copper board,  $t \leq 10\text{sec}$ .
- ④Limited by  $T_{Jmax}$ , Starting  $T_J = 25^\circ\text{C}$ ,  $I_{ASmax} = -23\text{A}$ ,  $L=0.5\text{mH}$ ,  $V_{DD} = -20\text{V}$ ,  $R_G = 25\Omega$ ,  $V_{GS} = -10\text{V}$ . Part not recommended for use above this value. 100% Final Test at  $I_{AS} = -12\text{A}$ ,  $L=0.5\text{mH}$ .
- ⑤Pulse test; Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- ⑥Guaranteed by design, not subject to production testing.

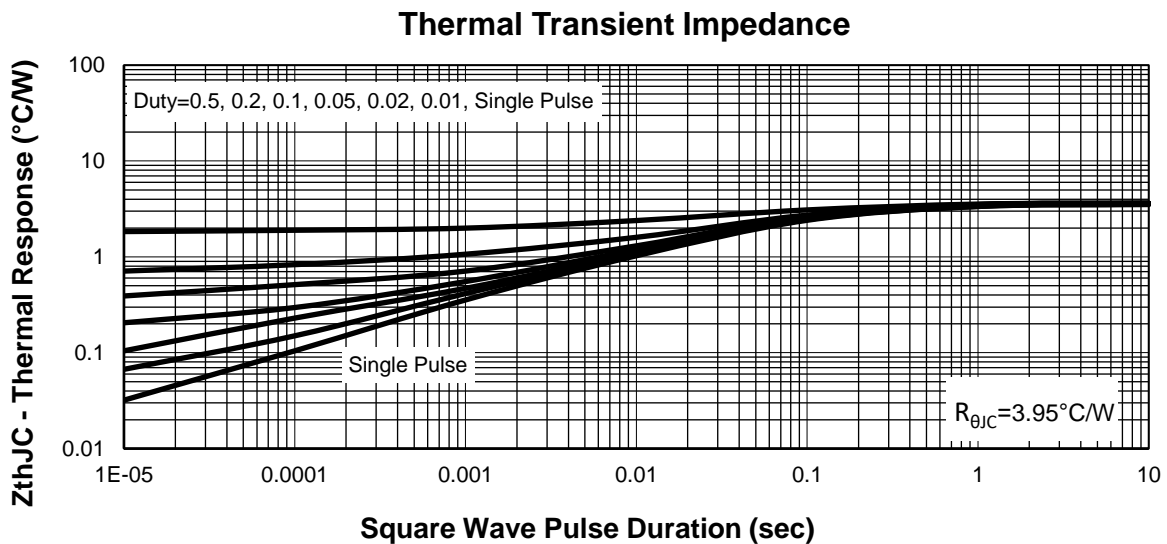
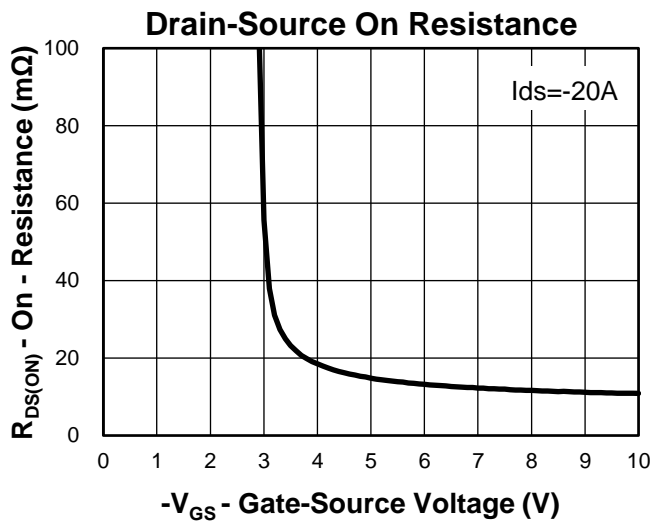
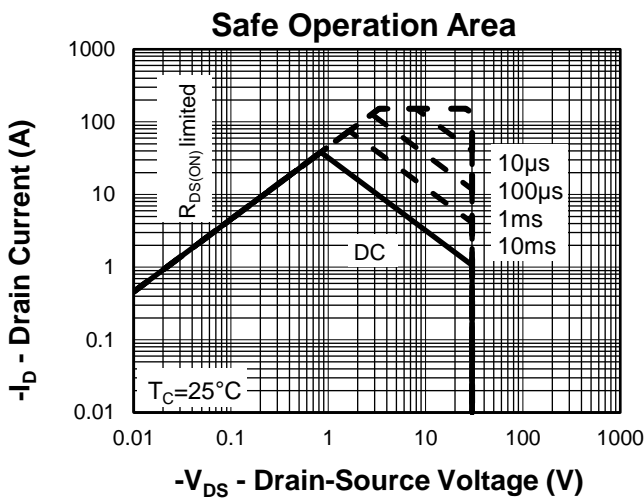
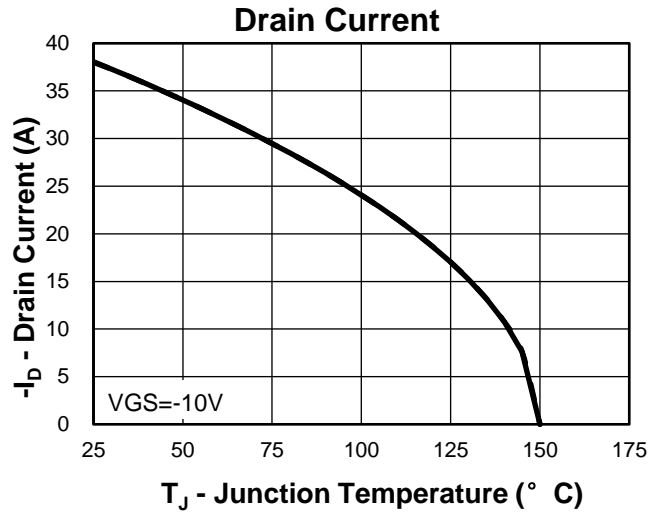
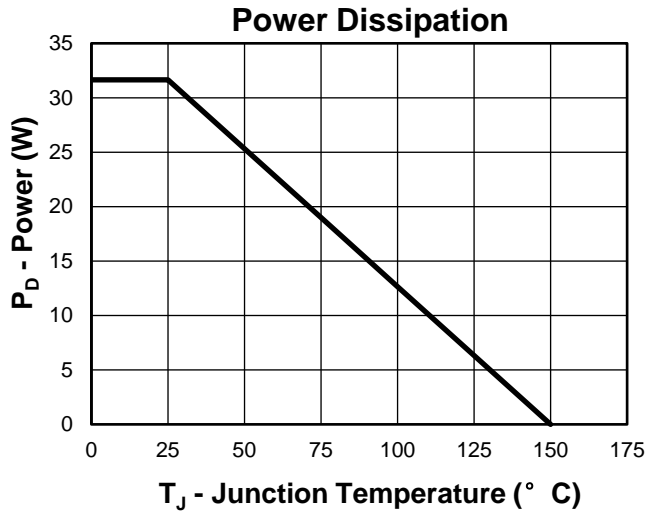
**Ordering and Marking Information**

Device	Package	Packaging	Quantity	Reel Size	Tape width
KS3313MA	PDFN3333	Tape&Reel	5000	13"	12mm

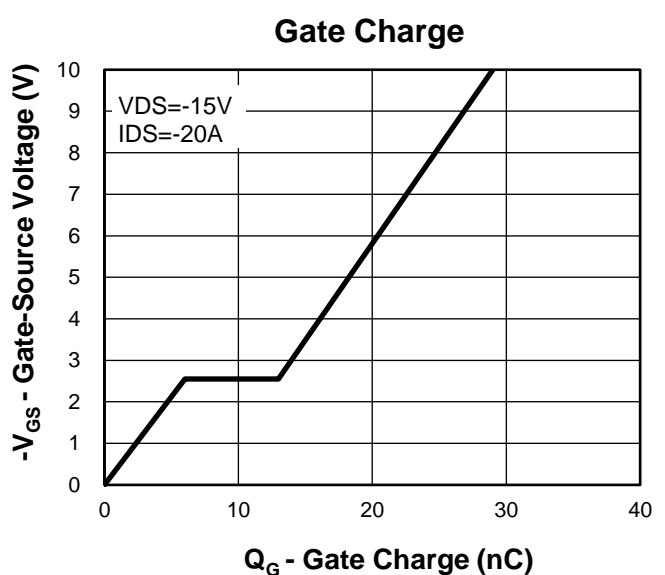
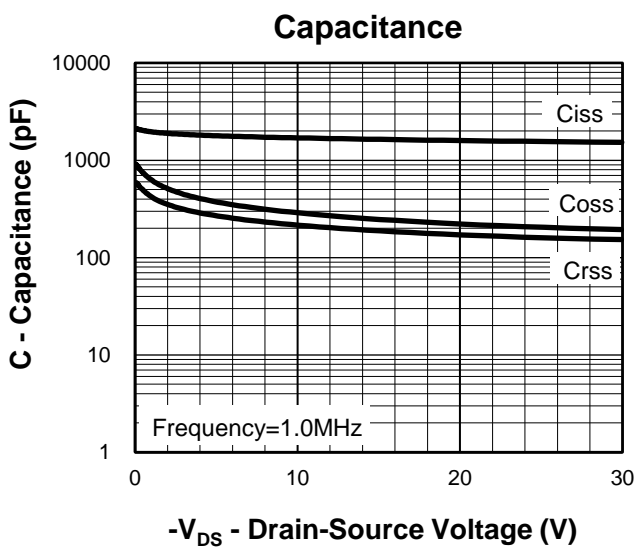
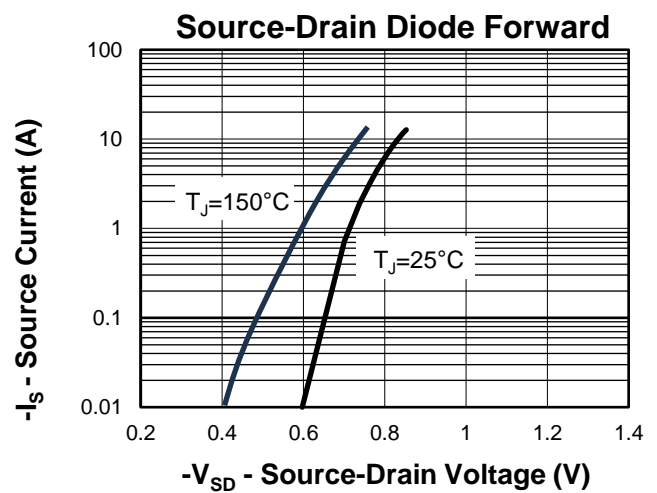
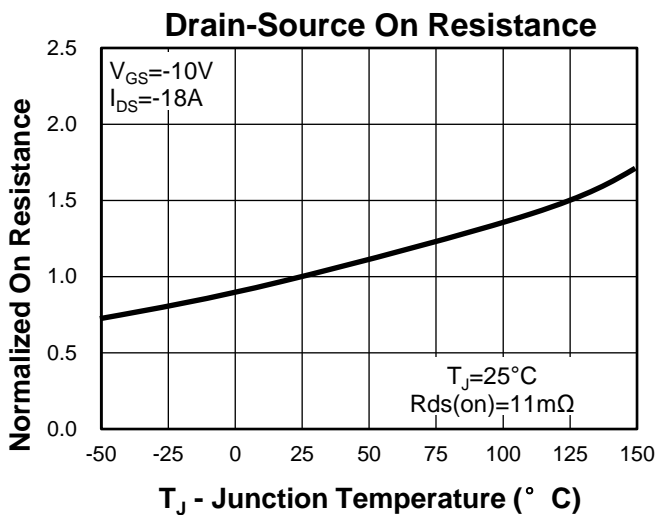
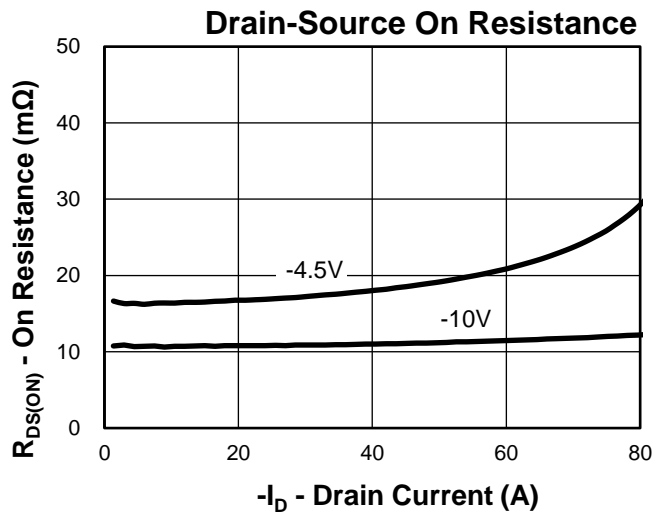
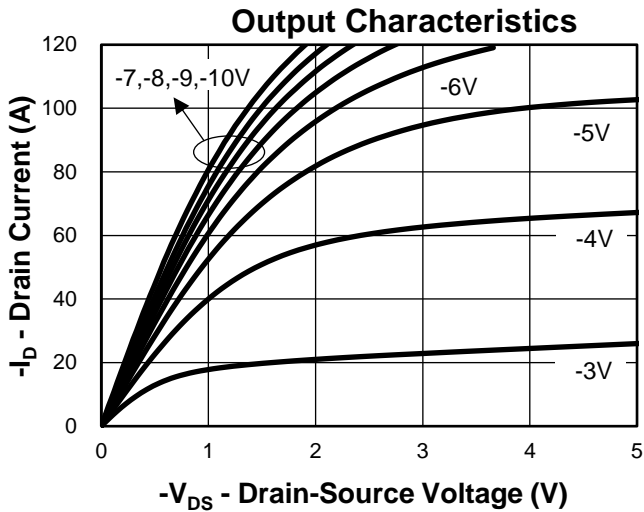


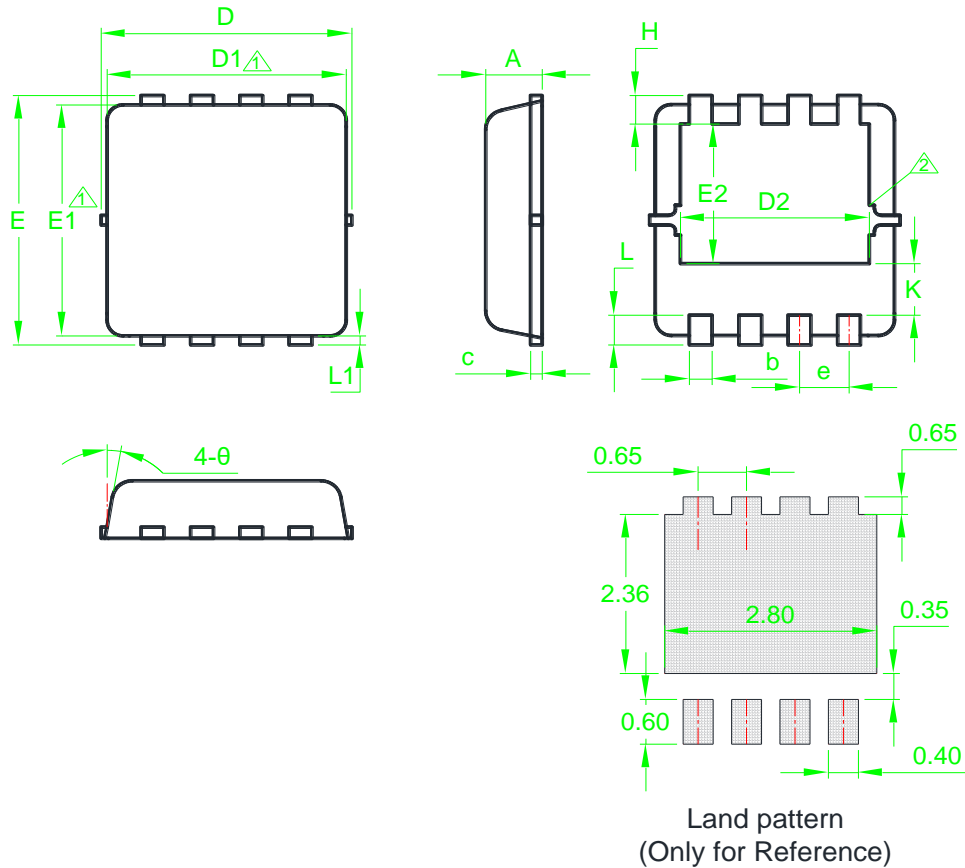
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 2nd Line: Part Number(3313)  
 3rd Line: Lot Number(YWWXXX)

**Typical Characteristics**



Typical Characteristics



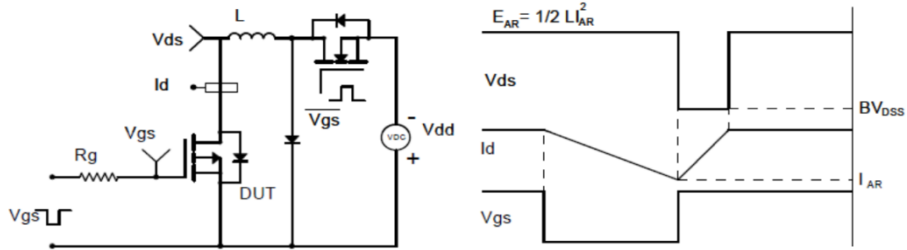
**Package Information**
**PDFN3333**


SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.80	0.90	0.028	0.031	0.035	E2	1.40	*	1.95	0.055	*	0.077
b	0.25	0.30	0.35	0.010	0.012	0.014	e	0.65BSC			0.026BSC		
c	0.10	0.20	0.30	0.004	0.008	0.012	H	0.30	0.40	0.50	0.012	0.016	0.020
D	3.20	3.30	3.40	0.126	0.130	0.134	K	0.50	*	*	0.020	*	*
D1	3.00	3.10	3.20	0.118	0.122	0.126	L	0.30	0.40	0.50	0.012	0.016	0.020
D2	2.35	2.45	2.55	0.093	0.096	0.100	L1	0.15BSC			0.006BSC		
E	3.20	3.30	3.40	0.126	0.130	0.134	θ	6°	*	12°	6°	*	12°
E1	2.90	3.05	3.20	0.114	0.120	0.126							

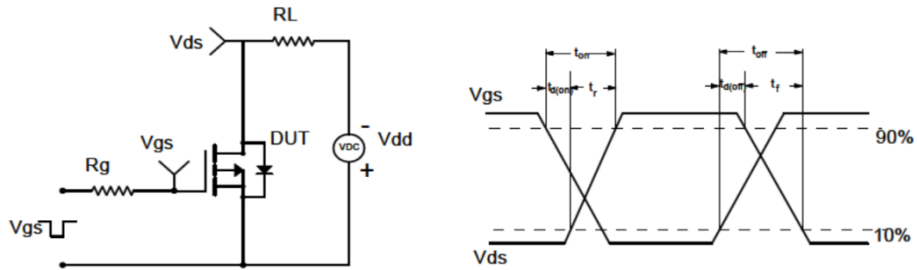
① Dimensions D1 and E1 do not include mold flash protrusions or gate burrs.

② The size and shape of exposed pad are variable depending on mold.

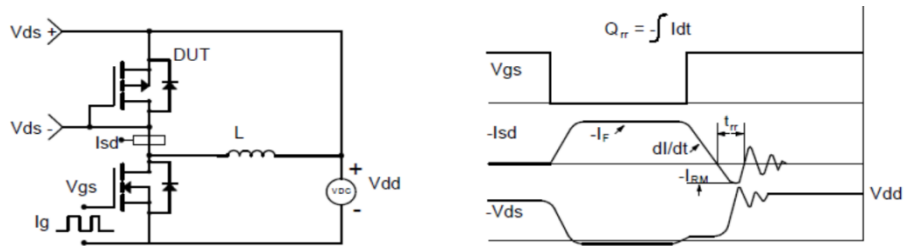
### Avalanche Test Circuit and Waveforms



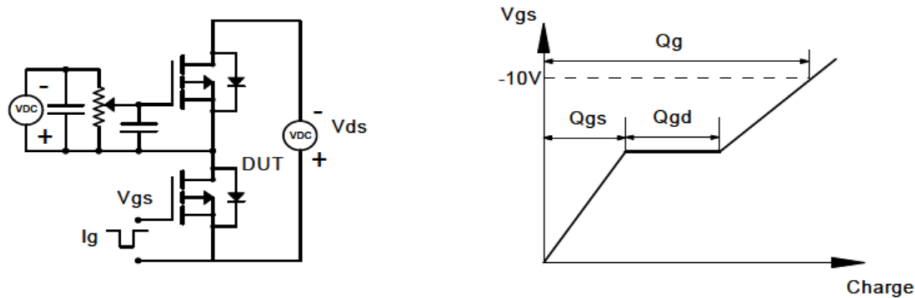
### Switching Time Test Circuit and Waveforms



### Diode Recovery Test Circuit and Waveforms



### Gate Charge Test Circuit and Waveform



### Customer Service

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