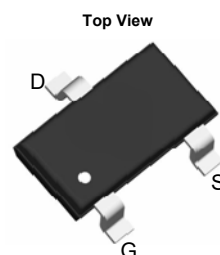
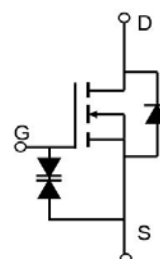
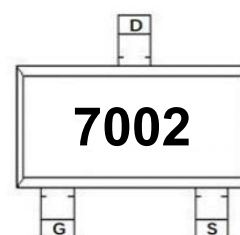


**2N7002K****60V N-Channel MOSFET**

Features

- 60V, 0.3A
 $R_{DS(ON)}$ Typ = 1.7 Ω @ $V_{GS} = 10V$
 $R_{DS(ON)}$ Typ = 2.0 Ω @ $V_{GS} = 4.5V$
- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead Free
- ESD Protected: 2KV

**SOT23**

Application

- Battery Operated Systems
- Direct logic-level Interface:
TTL/CMOS
- Solid-State Relays

Absolute Maximum Ratings (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

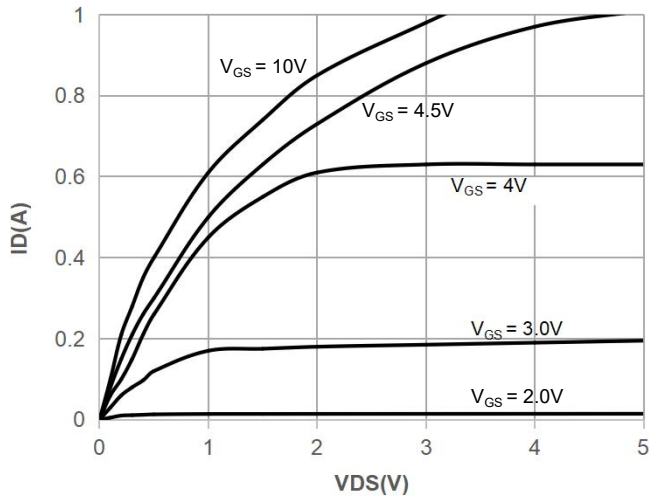
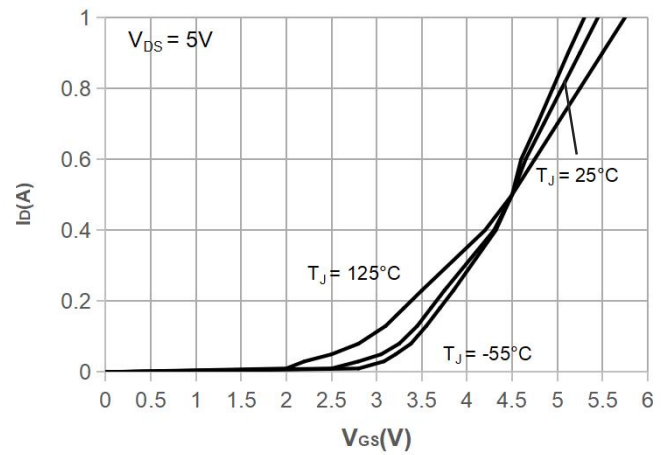
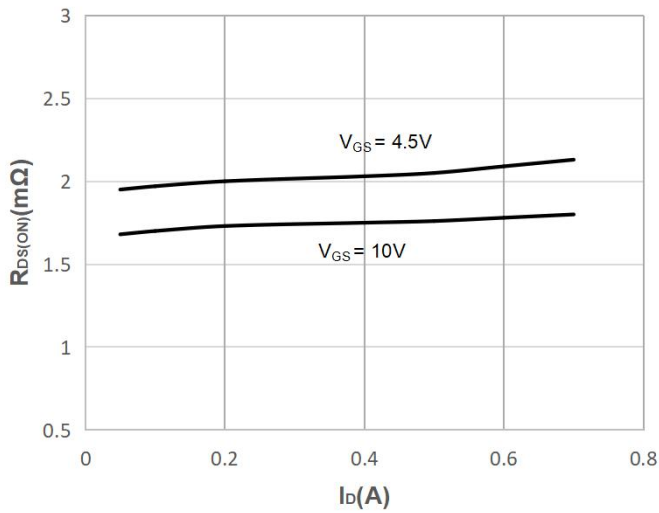
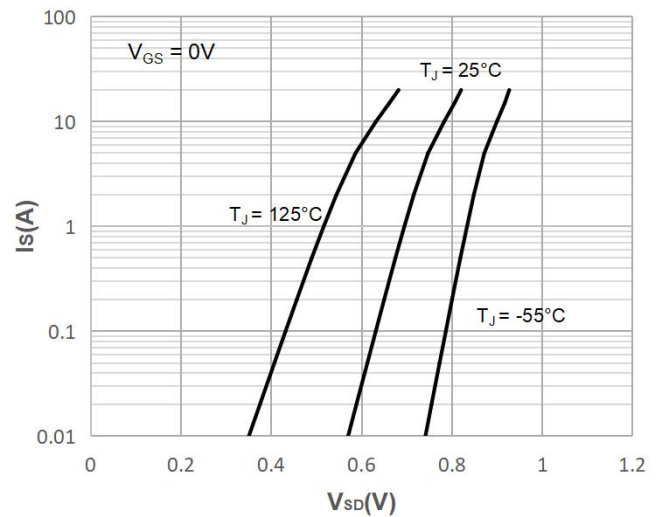
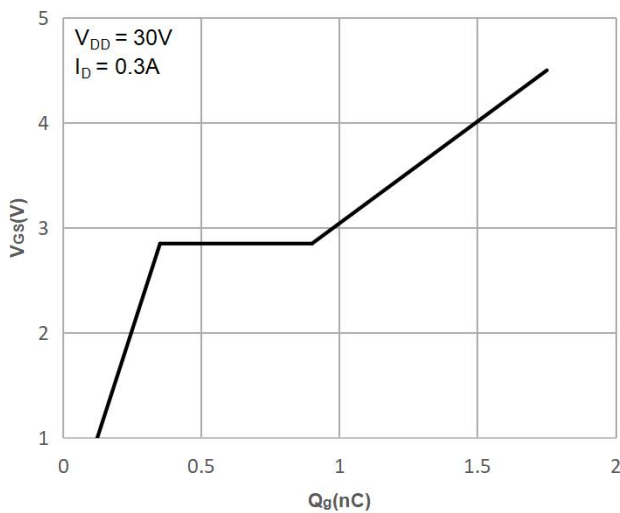
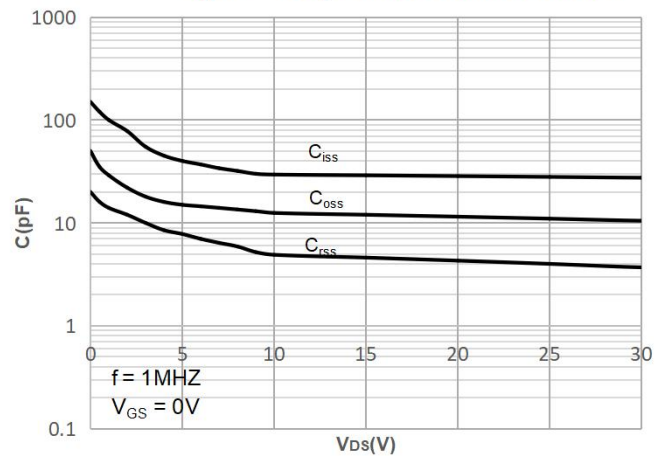
Symbol	Parameter		Value	Units
V_{DS}	Drain-to-Source Voltage		60	V
V_{GS}	Gate-to-Source Voltage		± 20	V
I_D	Continuous Drain Current	$T_A = 25^\circ\text{C}$	0.3	A
		$T_A = 100^\circ\text{C}$	0.2	
I_{DM}	Pulsed Drain Current ⁽¹⁾		1.2	A
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$	0.35	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽²⁾		356	$^\circ\text{C/W}$
T_J, T_{STG}	Junction & Storage Temperature Range		-55 to 150	$^\circ\text{C}$

**2N7002K****60V N-Channel MOSFET****Electrical Characteristics** ($T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D = 250μA, V _{GS} = 0V	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 60V, V _{GS} = 0V	-	-	1.0	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = ±20V	-	-	±10	μA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1	1.6	2	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽³⁾	V _{GS} = 10V, I _D = 0.3A	-	1.7	2.1	Ω
		V _{GS} = 4.5V, I _D = 0.2A	-	2.0	2.4	Ω
			-	-	-	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 25V, f = 1MHz	-	28	-	pF
C _{oss}	Output Capacitance		-	11	-	pF
C _{rss}	Reverse Transfer Capacitance		-	4	-	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 4.5V V _{DS} = 10V, I _D = 0.3A	-	1.7	-	nC
Q _{gs}	Gate Source Charge		-	0.3	-	nC
Q _{gd}	Gate Drain("Miller") Charge		-	0.6	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 10V I _D = 0.2A, R _{GEN} = 10Ω	-	2	-	ns
t _r	Turn-On Rise Time		-	15	-	ns
t _{d(off)}	Turn-Off DelayTime		-	7	-	ns
t _f	Turn-Off Fall Time		-	20	-	ns
Drain-Source Diode Characteristics and Max Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	0.3	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	1.2	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _S = 0.3A	-	-	1.2	V

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB
 3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

Typical Performance Characteristics

Figure 1: Output Characteristics

Figure 2: Typical Transfer Characteristics

Figure 3: On-resistance vs. Drain Current

Figure 4: Body Diode Characteristics

Figure 5: Gate Charge Characteristics

Figure 6: Capacitance Characteristics


Typical Performance Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

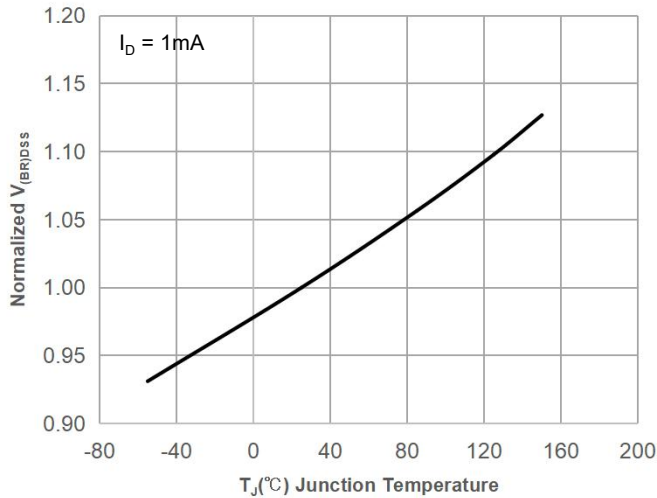


Figure 8: Normalized on Resistance vs. Junction Temperature

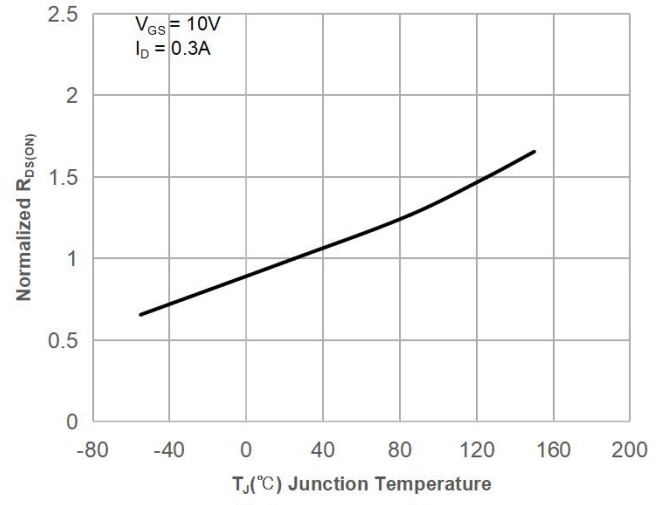


Figure 9: Maximum Safe Operating Area

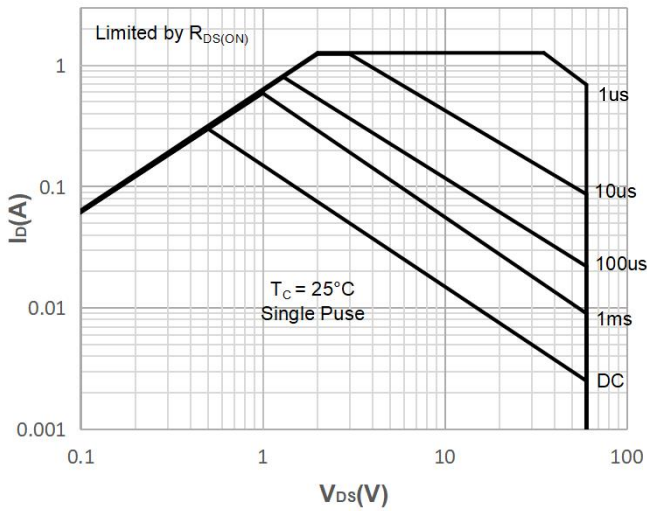


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

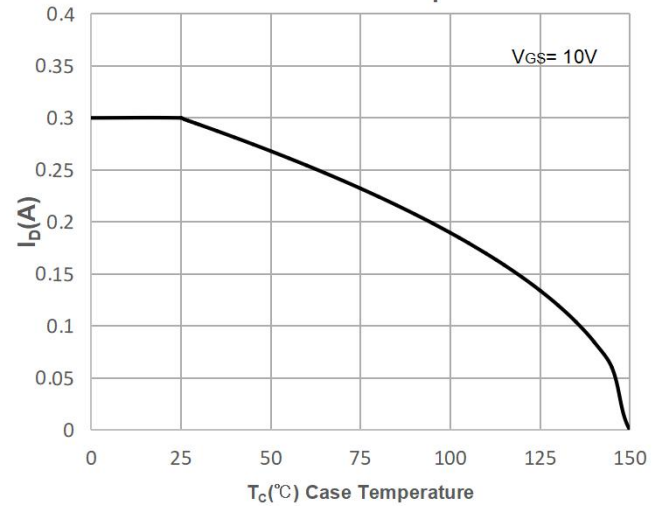


Figure 11: Normalized Maximum Transient Thermal Impedance

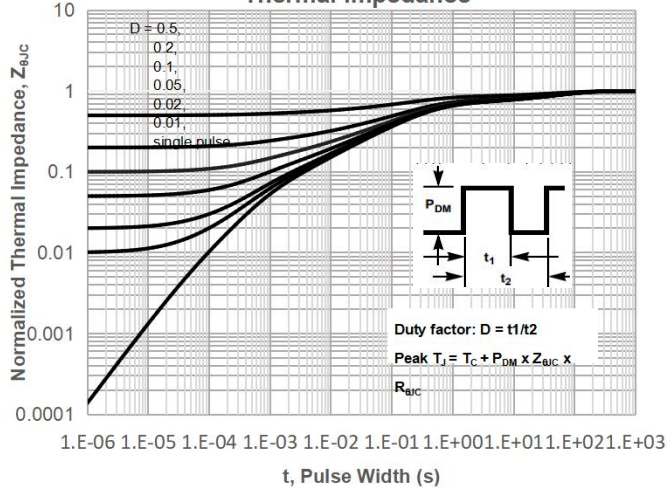
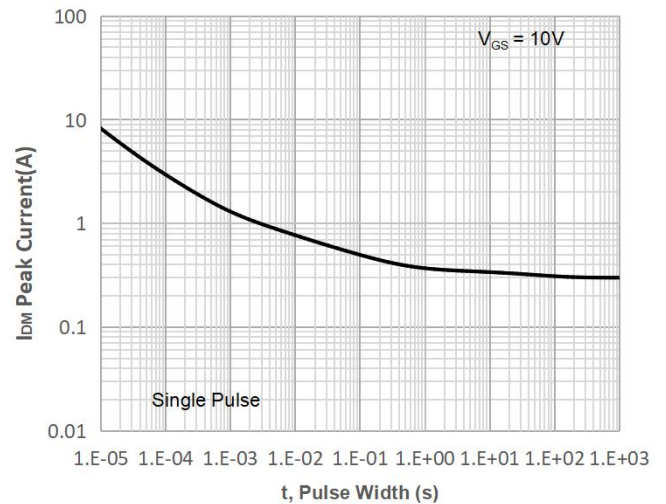


Figure 12: Peak Current Capacity



Test Circuit

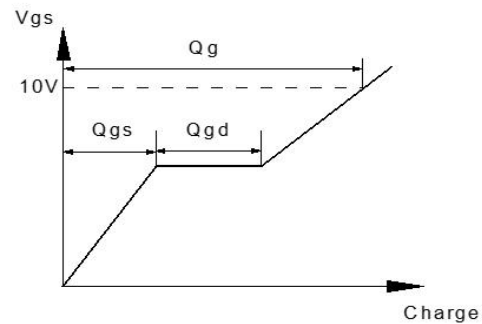
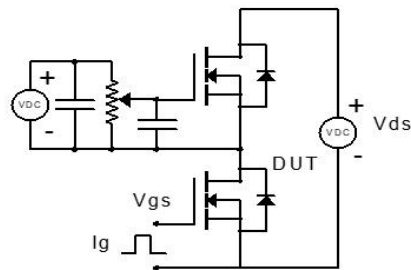


Figure 1: Gate Charge Test Circuit & Waveform

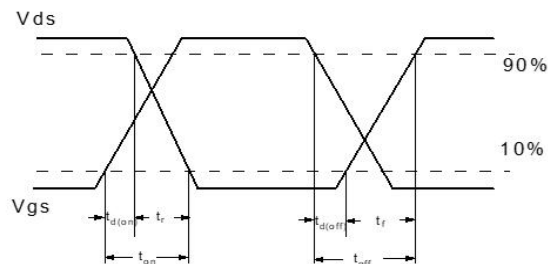
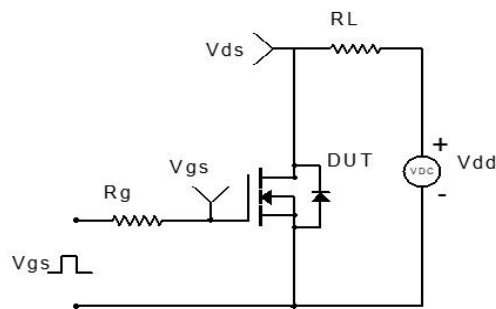


Figure 2: Resistive Switching Test Circuit & Waveform

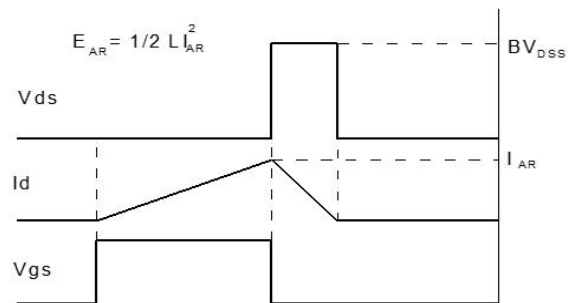
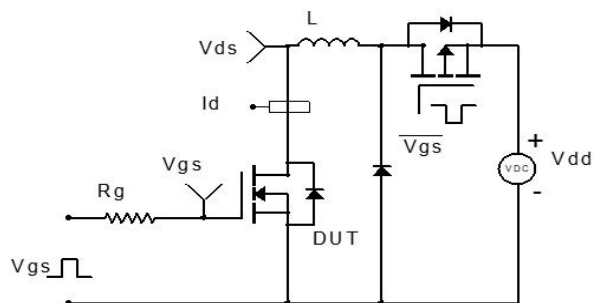


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

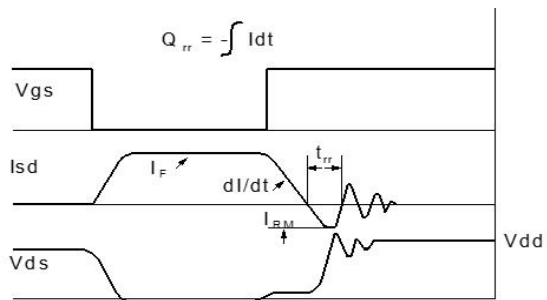
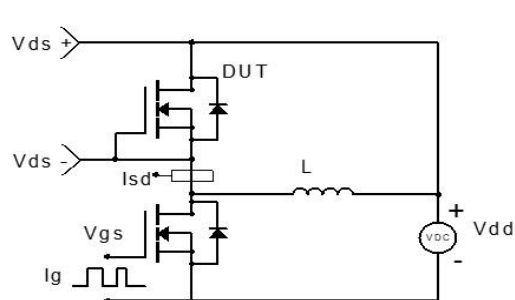
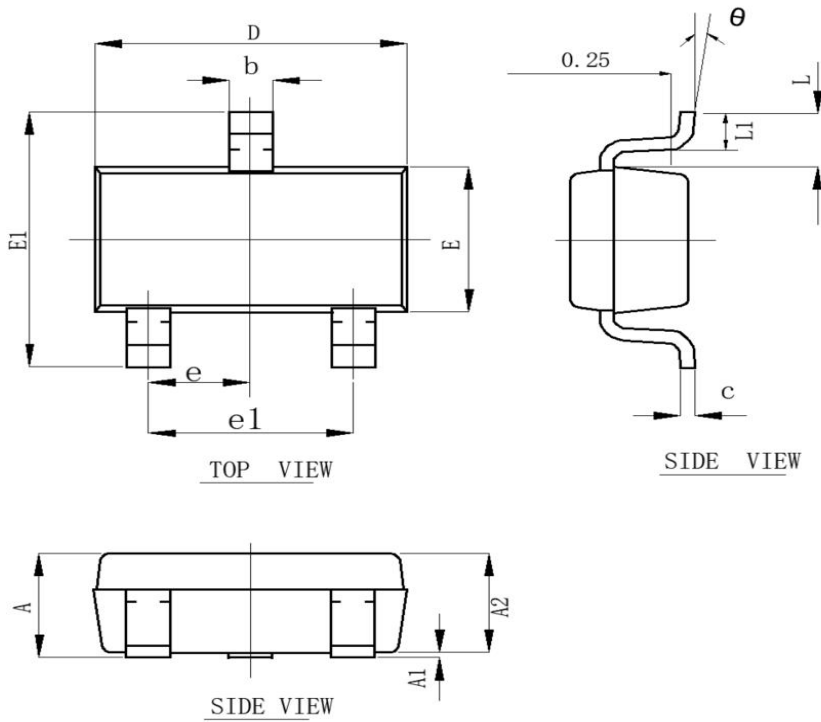


Figure 4: Diode Recovery Test Circuit & Waveform

Package Mechanical Data(SOT-23)



COMMON DIMENSIONS In Millimeters		
SYMBOL	MIN	MAX
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
L	0.550 REF.	
θ	0°	8°
L1	0.300	0.500
e	0.950 TYP.	
e1	1.800	2.000